



# International Conference on Operations Research

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# 3<sup>th</sup>



## OPTIMAL DECISIONS FOR MARINE TOURISM

Sam Ratulangi University, Manado, Indonesia  
20 – 21 September 2018

# Book of Abstracts



## **The 3<sup>rd</sup> ICOR 2018**

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Operations Research (OR) had become powerful decision making tools worldwide. In its use, Management Science (MS) is used as another term for OR. Concept of OR is borderless as it can be derived from various discipline such as Mathematics, Statistics, Economics, Engineering, Marine Science, Social, etc. to make a new set of knowledge for decision making. Today, OR has become a professional discipline which deals with the application of scientific methods in decision making theory.

The scope of OR can be used to find best solution for both simple and complex problem. It is beneficial in every aspect of human life regarding resources optimization. OR is widely used in important and main fields such as national planning and budgeting, transportation, education, agriculture, and marine management. Therefore, research and study involving OR are inevitable.

Number of research and study about OR or using OR as tools is high these years. This is accommodated by Indonesian Operations Research Association (IORA) IORA as one of OR organisations in an annual international conference entitled International Conference on Operations Research (ICOR). ICOR 2018 is the third conference. This initiates to bring together OR/MS researchers, academicians and practitioners, whose collective work has sustained continuing OR/MS contribution to decision-making in many fields of application. It can be considered as good platforms for the OR/MS community, particularly in Indonesia, to meet each other and to exchange ideas.

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**WELCOMING SPEECH**  
**The 3<sup>rd</sup> International Conference on Operations Research 2018**

Minister of Marine Affairs and Fisheries of Indonesia Susi Pudjiastuti or Representative.  
Governor of North Sulawesi, Indonesia Olly Dondokambey, S.E.  
Rector of Sam Ratulangi University Prof. Dr. Ir. Ellen Joan Kumaat, MSc, DEA.  
IORA President and Dean of FMIPA University of Padjadjaran Prof. Dr. H. Sudradjat Supian, MSc.

Distinguished Guests, Ladies and Gentlemen.

On behalf of ICOR 2018 Organizing Committee, I would like to Welcome you all and thank you for being here. Especially to Rector of Universitas Sam Ratulangi for fulfilling our invitation and to give opening speech for this conference. Special thanks also for Keynote Speakers, Plenary Speakers, Contributed Speakers and All Participants of this conference.

This conference can be held in collaboration of Indonesian Operations Research Association (IORA) and Faculty of Science Universitas Sam Ratulangi.

The point of this conference is to provide a perfect event for researchers, academics, and practitioners of Operations Research, to share experience, build communication and network with experts from all over the world. Furthermore, this conference is aimed at promotion and spread of scientific operations research field in Indonesia through Indonesian Operations Research Association (IORA).

The same conference had previously been held twice, initially hosted by Universitas Pakuan Bogor, and followed by Universitas Terbuka Tangerang as second host. This conference is now held at Universitas Sam Ratulangi Manado for the third time, that is why it is known as the 3<sup>rd</sup> International Conference on Operations Research (ICOR) under a main theme entitled Optimal Decisions for Marine Tourism.

Number of participants of this conference are more than 200, from 9 countries. Selected Papers will be published on scopus indexed IOP Publications.

Lastly, we want to gratefully thank again rector for her help and support, all keynote speakers, plenary speakers, contributed speakers, all participants, and all organizing committee who have given contribution to make this conference happen.

Dr. Nelson Nainggolan, MSi  
Conference Chair

## FOREWORD

Welcome to Universitas Sam Ratulangi, welcome to The 3<sup>rd</sup> International Conference on Operations Research (ICOR) organized by the Indonesian Operations Research Association (IORA) and the Faculty of Mathematics and Natural Sciences, Universitas Sam Ratulangi.

The theme this year is *Optimal Decisions for Marine Tourism*. This theme is based on the fact that Indonesia is a maritime country as well as tourism is targeted to be the prime mover of the country development and that Operations Research is relevant and essential knowledge to apply to these areas.

We have more than 200 participants registered, which shows a wide range of interests on this topic. Hopefully all papers can be published in the IOP Proceeding indexed in Scopus.

It is a great honor for us to organized this event. We thank

IORA for appointed us and for the collaboration which I believe will be a door that open to more collaborations with more partners in the future. We get full support from and therefore we thank the Rector of Universitas Sam Ratulangi and the Governor of North Sulawesi Province.

Finally, we welcome you to Manado, for many of the participants maybe still long destination, but we hope that during your stay you will enjoy and take advantage of the many sights to see in the city and also experience wonderful moments in and on Bunaken Island as well as the many natural wonders in the surrounding areas.

*Pakatuan wo Pakalawiden. God bless you.*

Faculty of Mathematics and Natural Sciences, Universitas Sam Ratulangi.  
Dean

Prof. Dr. Benny Pinontoan, M. Sc.



## CONGRATULATORY SPEECH BY THE PRESIDENT OF THE INDONESIAN OPERATIONS RESEARCH ASSOCIATION (IORA)

Distinguished Guest, All invited Speakers, Participant, Ladies and Gentlemen,

It is great pleasure for me On behalf of the Association of the Indonesian Operations Research Association, I would like to welcome you all at this special event International Conference On Operations Research at the Universitas Sam Ratulangi. This event is the third event for IORA-ICOR and congratulations to the Universitas Sam Ratulangi be able to host and also thanks to the minister of maritime affairs and fisheries and Manado Provincial Governor.



The theme of the conference, Competing in the era of analytics, reflects our belief that many future challenges in our life need involvement of operations research and typical analytic operations research. Our future and our capacity to reach sustainable development goal such as ensure availability and sustainable management of water and sanitation for all; ensure access to affordable, reliable, sustainable and modern energy for all; take urgent action to combat climate change and its impacts; end poverty in all its forms everywhere; conserve and sustainably use the oceans, seas and marine resources for sustainable development; end hunger, achieve food security and improved nutrition and promote sustainable agriculture, ensure healthy lives and promote well-being for all at all ages, and other challenges require the advances the roles of operations research in collaboration with other disciplines. Operations Research is the application of scientific & mathematical methods to the study & analysis of problems involving complex systems. Analytics is defined as the scientific process of transforming data into insights for making better decisions.

Operations research is multi discipline therefore Interaction with other fields of science is indispensable and proven to have given rise to new areas that improve the ability in decision making and techniques used are modeling.

Typically, applications of Operations Research in these and other areas deal with decisions involved in planning the efficient allocation of scarce resources - such as material, skilled workers, machines, money and time - to achieve stated goals and objectives under conditions of uncertainty and over a span of time. Efficient allocation of resources may entail establishing policies, designing processes, or relocating assets. OR analysts solve such management decision problems with an array of mathematical methodologies. Completely of the operations research field can be seen in AMS 2000 or MCS 2010.

And now, I need to clarify that IORA is new association in Indonesia he is beginning piloted in workshops in Operations Research and Optimization modelling on June 4, 2011 in the Department of Mathematics Faculty of Mathematics and Natural Science, Universitas Padjadjaran, then be disseminated to several universities, government and industry.

IORA is a container that provides a forum for scientists Operational Research and to expand our horizons through the exchange of knowledge and application technology, IORA established on August 25, 2014 by deed of Notary Number 42 and the Minister of Justice and Human Rights Number. AHU-00439.60.10.2014.

IORA members came from a variety of fields, education, Resercher, government, industry, practitioners etc, in 2017 members numbered 130 members and until now IORA members numbered 240 members, and we wait for those who have become members through [www.iora.or.id](http://www.iora.or.id).

Ladies and gentlemen,

We need to inform that at the current conference will also be held meeting IORA board.

Finally, Have a nice International Conference on Operations Research. I hope there are plenty of benefits we can share and empower through this and hopefully your participations and contributions will make this conference a productive and successful one.

President, The Indonesia Operations research Association

Prof. H. Sudradjat SUPIAN, M.Sc., PhD



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## **Integer Multi-Commodity Flow in Tourism and Transport**

**Prof. Andreas Ernst**

Deputy Director of MAXIMA School of Mathematical Science Monash University, Australia

### **ABSTRACT**

Integer multi-commodity flow problems are an abstract class of optimisation problems, with a wide range of applications. Two diverse case studies will be discussed briefly. Firstly, scheduling recreational vehicles in the Australian & New Zealand tourism industry where the aim is to assign vehicles to customers in a way that provides the best service to the tourists at the minimum cost to the company. The second case study considers the container logistics transport infrastructure in Indonesia at a strategic planning level. While these problems are NP-hard, some evidence will be provided that Lagrangian methods can find high-quality solutions to sufficiently large instances of these applications in an acceptable amount of time.

## **Making Decisions Based on Customer Loyalty Survey Data**

**Prof. Stefan Steiner**

Chair of Department of Statistics and Actuarial Science  
Director of Business and Industrial Statistics Research Group University of Waterloo, Canada

### **ABSTRACT**

In the analysis of survey data, common objectives include estimating the population average, tracking time trends, and comparing population subgroups. When samples are taken over time, we can estimate using only the present time data or also include historical data. However, when the characteristic is drifting over time and sample sizes are small, the decision to include historical data trades precision for bias. We propose regulating the bias-variance tradeoff using Weighted Estimating Equations based on a suitable Generalized Linear Model that incorporates covariates. A customer loyalty survey for a smartphone vendor will be presented and resulting present time estimates of Net Promoter Score will be compared across various approaches applied to example data and simulated data.



**Prof. Abby Tan Chee Hong, Ph.D**

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**ABSTRACT**

The purpose of this paper is to incorporate a random component into interest rate of the Black-Scholes model. The interest rate is assumed to be non-constant. We assume a simple random short memory process for the interest rate. Using Green's function method, we derive confidence interval around the Classical Black-Scholes price. The purpose of this paper is not to derive mathematically intractable option pricing formula but rather to deduce confidence interval around the classical Black-Scholes price. Subsequently, we use this new price to deduce the interest rate implied from the Black-Scholes model. We not only deduce that the interest rate is non-constant and varies with time but also manage to recover the interest rate "smile".

**Keywords:** option pricing, stochastic, short memory

## **Maritime Matrix Formulating Optimal Marine Tourism Decisions: "East Of The Wallace Line - Beyond Bali"**

**Prof. Alexander R. Melbourne**

President Director Asia Global Raya Group, Indonesia  
Chairman of Victoria International Universities Educational Group  
Indonesia-United Kingdom-Seychelles-Switzerland-Australia and New Zealand

### **ABSTRACT**

#### **Background**

The transition of humankind from a rural species to an urban one in Indonesia and Asean is further along than we may think!

The secondary set of statistics on the rate of population growth around the World compiled by the UN advised us that the global population passed the 50% per cent urbanisation threshold in 2008 and is now set to hit 70 % per cent by 2050!

However it is anticipated to reach 70% in Indonesia / Asean countries even before 2040!

This has huge implications on the type and demand of food resources, renewable energy and leisure activities all impacting an urgent demand for growth in maritime support logistics. Population growth/migrations to food sources/areas present significant challenges and enormous opportunities for global development.

Getting it right is not an option but now an essential priority mandate towards enabling a safe, healthy harmonious future society in its "urbanised mega cities".

Larger populations in limited space puts pressure on infrastructure and services; creating concerns about how to ensure people have access to high quality food, jobs and healthcare.

Presently Indonesia imports upwards of 35% of its population's food needs and today for international visitor needs as much as 45% import of foodstuffs in overseas tourism gateways such as Bali, Lombok, Manado and Jogjakarta.

Clearly this high level of overseas expenditure is not sustainable in the neither medium nor longer term. Indonesia needs to become self-sufficient, not reliant on this very high level of imported food produce and goods. One area that it can achieve this goal within a decade is in advancing Maritime Aquaculture; implementing organic horticulture technologies; and in by quality managing their Sustainable Fisheries.

On the other hand, cities are centres of economic growth, and innovation where new technologies are being increasingly adopted to manage and mitigate the new pressures from population growth. Some countries such as Singapore and Israel have been early adopters of new horticultural technologies; this gave them give them a significant competitive advantage implementing cost effective change management opportunities to reduce their dependence on importing food, water and energy resources essential in sustaining their own economic growth.

Indonesia is a unique archipelago of islands blessed with many natural resources yet struggles because of its logistical challenges to satisfy even its own domestic consumption; also failing to satisfy international visitor quality expectations outside its established visitor arrival hubs!

Tourism income generated from overseas visitor arrivals have very high expectations during the decade ahead; achieving this is also dependent on the quality of natural produce presented that meets overseas guest's expectations of their wonderful Indonesian experience. An essential part of our consumption process is eating food sourced from and in tasting its special natural character from the famous spice islands of Indonesia. Not delivering the same "me too" product many visitors experience today in major cities in Asean and many other parts of the world today actively competing for tomorrows visitor \$.

Combined natural resources from the surrounding Indonesian Seas, their rich volcanic lands cultivated and conserved organically; adds value to the visitor experience, giving Indonesia its added competitive edge. Utilising international technologies shared with successful countries and organisations that are leading the world in sustainable aquaculture, horticulture, and organic husbandry are key elements of the Meribbean strategy employed. Technology is the key for delivering the quantity and quality of sustainable food and beverages required to satisfy future urbanisation demand and sustainable economic tourism growth of Indonesia as determined by the President.

Tourism combined with sustainable fisheries is its two key economic drivers in the decade ahead. Synergy between the two integrating vastly improved food logistics using water access is now critical in the fight against climate change.

Cities are responsible for 70+% per cent of global carbon emissions; whilst many in Asia Pacific are highly vulnerable to the negative consequences of global temperature rises. It is predicted and agreed amongst the leaders in the global scientific community that the first impact of climate change for an Asian country impacts Indonesia first from 2019.

During 2018 Indonesia started to experience significant changes in its weather patterns, seasonality and growing seasons; increasing temperatures and rising levels of oceans indicates this process is already well underway; its impacts clear ranging from its reducing crop yields, shortened growing periods, high incidence of heavy rainfalls affecting quality of harvest/ yields from paddy fields, across to species of indigenous fruit and vegetables.

The speed of global urbanisation and its impacts in Indonesia makes it even more pressing to now find sustainable solutions through technology based applications that can counter the negative impacts of climate change Indonesia faces today! Investing in the short term for the long term good following an inevitable drift serving urban populations.

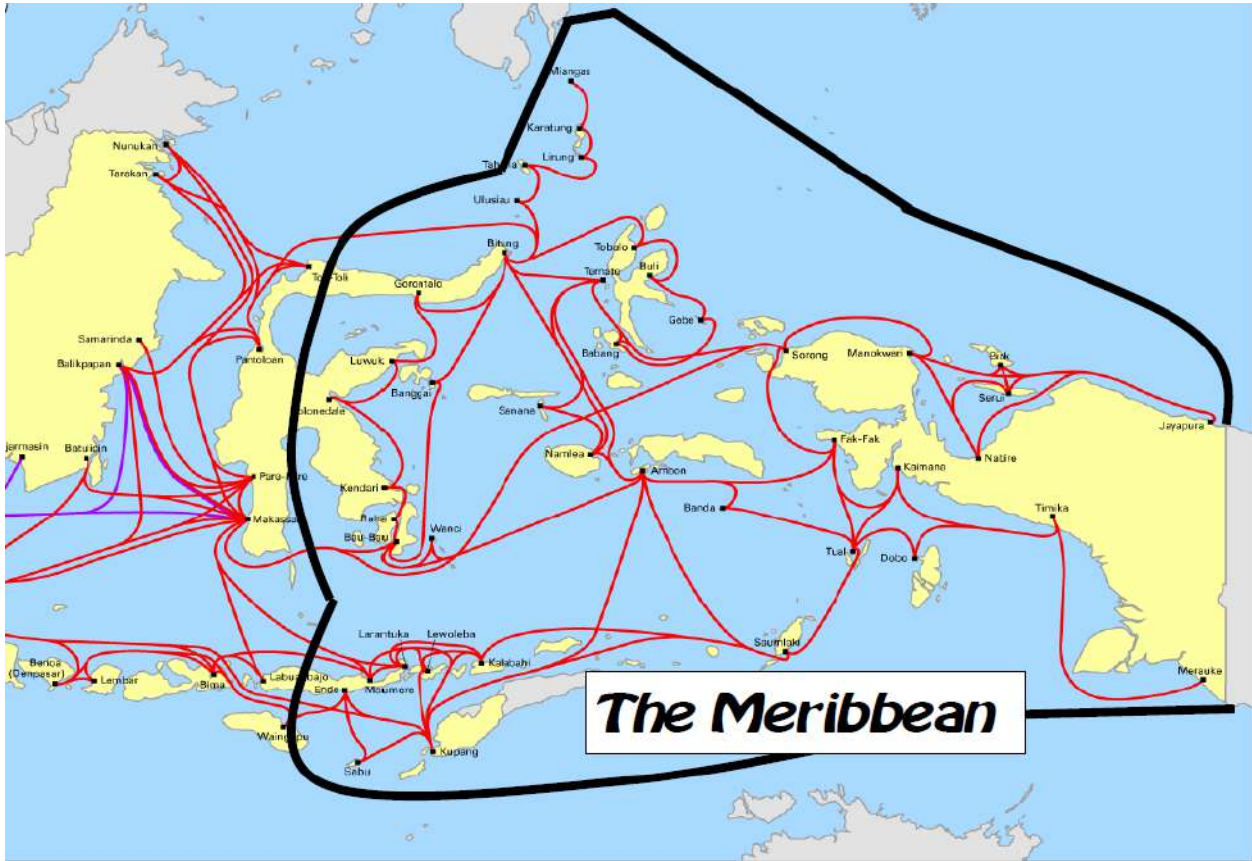
Never before has the future depended so heavily on what we do today.

*"East of the Wallacea Line Beyond Bali"* brings an integrated maritime, land and ocean technology based consortia ensuring the region's combined food and fisheries capacity of Sulawesi / Flores sustains future demand during a critical decade ahead whilst developing the Meribbean region into the sustainable food bowl of Indonesia's tomorrow!

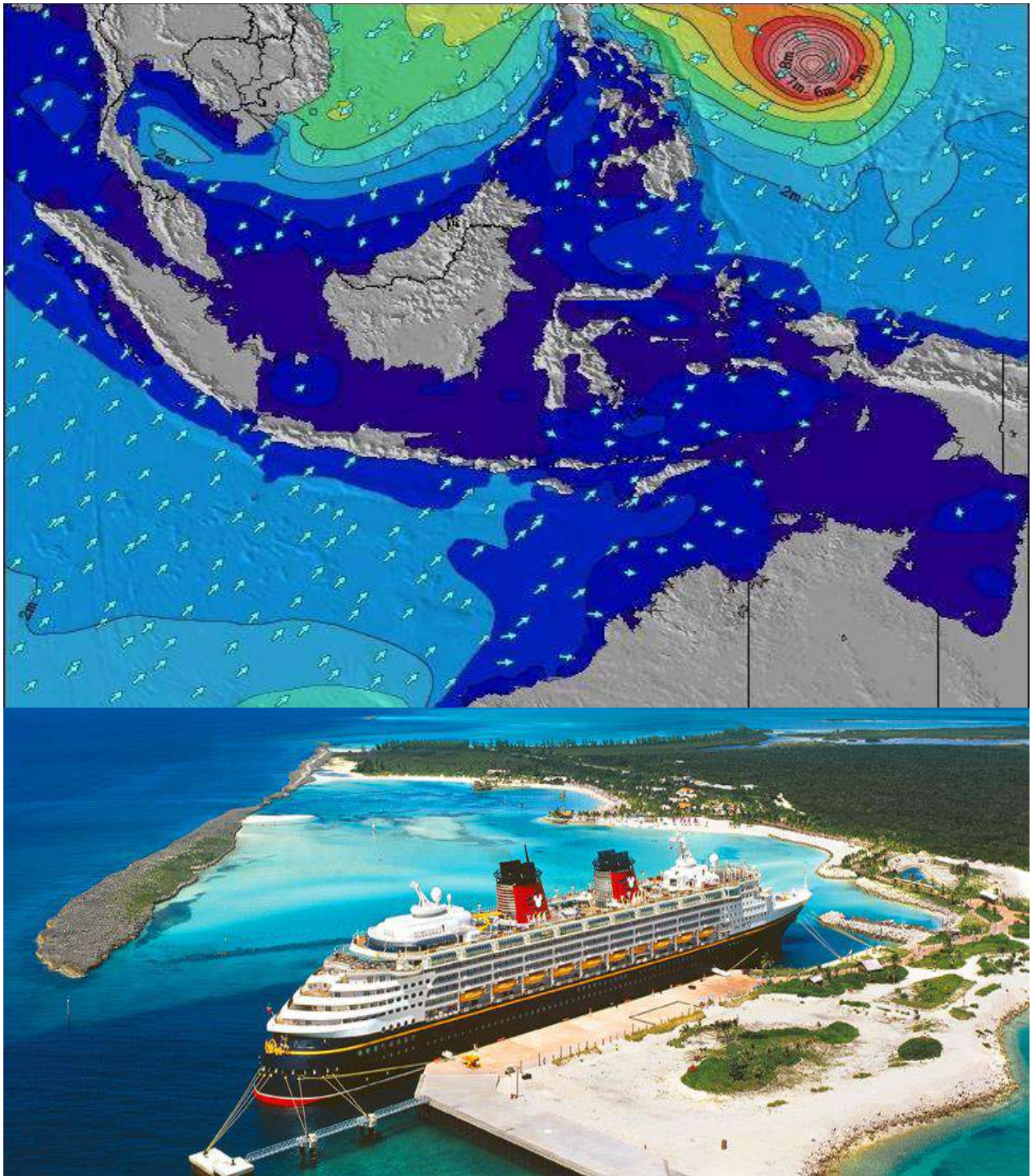
"The Meribbean" region meets and surpasses quality, logistical and services demand expectations covering domestic urban populations together with the spectrum of overseas visitor demand projected developing "Beyond Bali" during the next decade.

Attachments:

*The Meribbean*









## Biological Survey on the Indonesian Coelacanth

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### ABSTRACT

Habitats of Indonesian coelacanth, *Latimeria menadoensis*, were investigated by ROV survey in north of Sulawesi Island by collaboration of Aquamarine Fukushima, Indonesian Institute of Sciences, and Sam Ratulangi University. Totally 30 individuals were encountered in 115.6 m to 218.9 m depth. A live juvenile of coelacanth was also observed in a small crack of 165 m depth for the first time in the world during the surveys.

One specimens of *L. menadoensis* was caught in 2011 by local fishermen accidentally. The body weight of the specimen was 13.1 kg and two pieces of plastics were found in the stomach. The marine pollutions are affecting one of the most important living fossils.

## Four Wheel Foreign Footwear Model Reviewed From The Geometry Aspects Of Road And Traffic (Case Study: Batu City Area)

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### INTRODUCTION

WHO's concern for road transport safety is realized by establishing World Health Day of 2004 with the theme: *Road Safety is no Accident*. According to WHO the level of road transport accidents in the world has reached 1.2 million deaths and more than 30 million victims of injuries / disabilities per year. As much 85 % of the victims who died from accidents occurred in developing countries, the number of vehicles only 32 % of the total number of vehicles around the world (ADB, 2004).

Kementerian The Ministry of Transportation of the Republic of Indonesia (Kemenhub) targets a decrease in the number of traffic accidents 50% in the year of 2019. " In 2019 to come, we are targeting the number of traffic accidents down fifty percent of the year accident rate 2014," said Transportation Minister Ignatius Jonan, when giving a speech at the Indonesian event Road Safety Award (IRSA),(Joko Susilo, 2015).

The number of accidents as described above, is inseparable from the geometric characteristics of existing road conditions. Where the characteristics of this road is a component of road construction, such as number of lanes, number of lanes, flat and not flat road, flat and uneven road surface and weather conditions (Tjahjono, T. 2007).

Motor vehicle accidents on roads in the Batu City area are the problems that need to get the attention of the transporters, especially four-wheeled car accidents. From the description above, the purpose of this research are:

- Knowing the geometric characteristics of road and traffic to automobile accident in Batu City Area.
- Knowing the shape of the prediction model of the number of automobile accident in the city of Batu.

### RESULTS AND DISCUSSION

Model of four-wheeled vehicle accident on streets in Koat Batu by using *Generalized Linear Model (GLM)*, can be written as follows:

$$CA = kQ^{\alpha} e^{(b_1SW+b_2Gradien+b_3Median+b_4Speed)}$$

To predict the equation of four-wheeled car accident model in the form of non linear regression equation. By using *software SPSS 17 for windows* where the value of unstandardized coefficients (B) as the starting price to predict the model of nonlinear equations, is the equation:

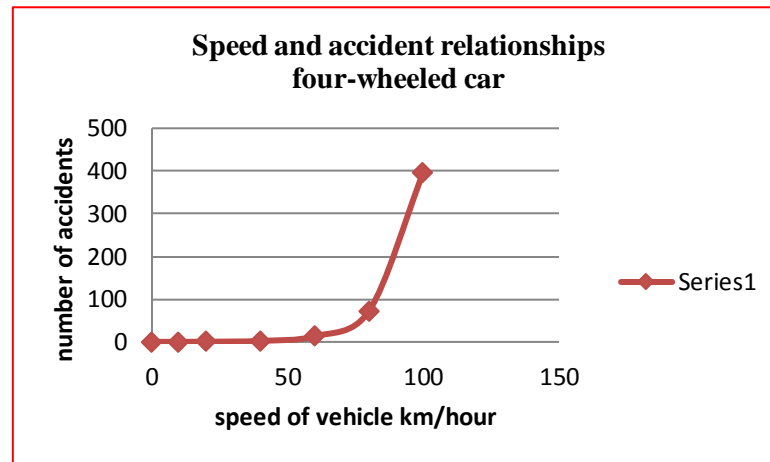
$$CA = 8,09 \times 10^{-4} Flow^{0,897} e^{0,085 Speed}$$

Where:

- CA = Four-wheeler accident (speed/year).  
Flow = Traffic volum (pcu/hour)  
Speed = Speed (km/hour)

From the contribution of the model can be seen the volume of traffic and vehicle speed greatly affect the occurrence of four-wheeled car accidents. The number of four-wheeled car accidents will increase along with the increase in vehicle volume on the road in Batu City Area. When in a condition of vehicle vehicle speed remains. So with an increase in vehicle volume of 10% will increase the number of car accidents as much as four wheels 11,20%. And from the speed of the vehicle also so, the higher the speed will increase

the number of traffic accidents four-wheeled vehicles. Or with an increase in vehicle speed of 10%, it will increase the number of automobile accident four wheels 32,82% per year.



Source: Analysis Results

Figure 1. Speed and Vehicle Relationships Four Wheel Car Accident

**Keywords:** transportation, road segment, accident, distribution, mathematical model.

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## Properties of Anti-Adjacency Matrix of Directed Cyclic Sun Graph

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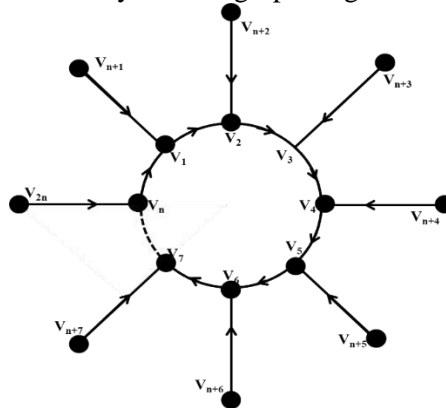
### INTRODUCTION

The sun graph is a graph obtained by adding a vertex and an edge at each vertex of a cycle graph. The sun graph denoted by  $C_n \circ \overline{K_1}$  consists of a set of vertices  $V(C_n \circ \overline{K_1}) = \{v_i \mid 1 \leq i \leq n\} \cup \{v_j \mid n+1 \leq j \leq 2n\}$  and a set of edges  $E(C_n \circ \overline{K_1}) = \{v_i - v_{i+1} \mid 1 \leq i \leq n-1\} \cup \{v_n - v_1\} \cup \{v_i - v_j \mid 1 \leq i \leq n, n+1 \leq j \leq 2n\}$ .

An adjacency matrix of directed graph  $G$  with the set of vertices  $V(G) = \{v_1, v_2, \dots, v_n\}$  is an  $n \times n$  matrix  $A = [a_{ij}]$  where  $a_{ij} = 1$  if there exists a directed edge from  $v_i$  to  $v_j$  and  $a_{ij} = 0$  otherwise. On the other hand, an anti-adjacency matrix of the directed graph  $G$  is a matrix  $B = J - A$ , where  $J$  is an  $n \times n$  matrix of which all the entries are 1 and  $A$  is an  $n \times n$  adjacency matrix. Here, we focus on anti-adjacency of directed cyclic sun graph and show the general form of characteristic polynomial of the anti-adjacency matrix of directed cyclic sun graph.

### RESULTS AND DISCUSSION

We will give a depiction of the directed cyclic sun graph to give a clear representation of it.



We will also give the anti-adjacency matrix of the directed cyclic sun graph below.

$$B = \begin{matrix} & v_1 & v_2 & v_3 & v_4 & \cdots & v_{n-1} & v_n & v_{n+1} & v_{n+2} & v_{n+3} & \cdots & v_{n+2} & v_{n+2} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ \vdots \\ v_{n-1} \\ v_n \\ v_{n+1} \\ v_{n+2} \\ v_{n+3} \\ v_{n+4} \\ \vdots \\ v_{2n-1} \\ v_{2n} \end{matrix} & \left[ \begin{array}{cccccccccccccccc} 1 & 0 & 1 & 1 & \cdots & 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ 1 & 1 & 0 & 1 & \cdots & 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ 1 & 1 & 1 & 0 & \cdots & 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ \vdots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 1 & 1 & 1 & 1 & \cdots & 0 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ 0 & 1 & 1 & 1 & \cdots & 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ 0 & 1 & 1 & 1 & \cdots & 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ 1 & 0 & 1 & 1 & \cdots & 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ 1 & 1 & 0 & 1 & \cdots & 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ 1 & 1 & 1 & 0 & \cdots & 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ \vdots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 1 & 1 & 1 & 1 & \cdots & 0 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \\ 1 & 1 & 1 & 1 & \cdots & 1 & 0 & 1 & 1 & 1 & 1 & \cdots & 1 & 1 \end{array} \right] \end{matrix}$$

According to R. B. Bapat in his book “Graphs and Matrices”, since the directed cyclic sun graph has a set of vertices  $V(C_n \circ \overline{K_1}) = \{v_1, v_2, \dots, v_n\}$  then the characteristic polynomial of the anti-adjacency of the graph is

$$P(B(G)) = \det(B(G) - \lambda I) = \lambda^{2n} + b_1 \lambda^{2n-1} + b_2 \lambda^{2n-2} + \dots + b_n \lambda^n + \dots + b_{2n-1} \lambda + b_{2n}$$

To find the value of  $b_1, b_2, \dots, b_{2n}$ , and  $b_6$  we will use the theorem from a thesis written by Wildan that says that

$$b_i = (-1)^i \left( \sum_{j_1=1}^{w_1} \left| B(\langle U \rangle_{acyclic})_i^{(j_1)} \right| + \sum_{j_2=1}^{w_2} \left| B(\langle U \rangle_{cyclic})_i^{(j_2)} \right| \right),$$

for  $i = 1, 2, \dots, n$ ; where  $\sum_{j_1=1}^{w_1} \left| B(\langle U \rangle_{acyclic})_i^{(j_1)} \right|$  is the sum of all the determinants of anti-adjacency matrices of the directed acyclic induced subgraphs and  $\sum_{j_2=1}^{w_2} \left| B(\langle U \rangle_{cyclic})_i^{(j_2)} \right|$  is the sum of all the determinants of anti-adjacency matrices of the directed cyclic induced subgraphs.

In this paper, we will make a theorem and its proof that

$$b_1 = b_2 = \dots = b_{n-1} = 2n, b_n = 2n - 1, \text{ and } b_{n+1} = b_{n+2} = \dots = b_{2n} = 0$$

Hence, we can make a corollary and its proof that the characteristic polynomial of the anti-adjacency matrix of directed cyclic sun graph is

$$P(B(G)) = \lambda^{2n} + (-1)(2n)\lambda^{2n-1} + (-1)^2(2n)\lambda^{2n-2} + \dots + (-1)^{n-1}(2n)\lambda^{n+1} + (-1)^n(2n-1)\lambda^n$$

**Keywords:** sun graph, induced subgraph adjacency matrix, anti-adjacency matrix, characteristic polynomial

**Acknowledgment**

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## Multi-objective Assignment Problem with Traveling Time and Territory Control for Optimizing Mail Carrier Assignment on the Central Post Office Bandung by Using Hungarian Methods

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**Abstract.** This paper presents multi-objective assignment problem with traveling time and territory control of the mail carrier from the central post office Bandung in delivering the package to the destination location, where all the objectives are optimized by using Hungarian method. Sensitivity analysis against data changes that may occur was also conducted. The sampled data in this study are the territory control and traveling time of 10 mail carriers who will be assigned to deliver mail package to 10 post office delivery centers in Bandung. The result of this research is the combination of traveling time and territory control optimal from 10 mail carriers as follows: mail carrier 1 to Soreang, mail carrier 2 to Dayeuh Kolot, mail carrier 3 to Ujung Berung, mail carrier 4 to Padalarang, mail carrier 5 to Situ Saeur, mail carrier 6 to Cipedes, mail carrier 7 to Cimahi, mail carrier 8 to Asia-Afrika, mail carrier 9 to Cikutra, mail carrier 10 to Cikeruh. Based on this result, manager of the central post office Bandung can make optimal decisions to assign tasks to their mail carriers.

**Keyword:** multi-objective assignment problem, traveling time, territory control, Hungarian method, optimal decisions.

## Reserve of Equity-Linked Life Insurance Premium by using the Zillmer Method

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### INTRODUCTION

Initially life insurance only provides benefits when the insured is at risk. Such insurance is known as traditional life insurance. Traditional life insurance products get less attention for prospective customers because the benefits are only obtained when there is a risk. Along with the development of life insurance products, insurance products appear endowment soul that provides benefits not only when the insured person experiences risk, but when the insured party does not experience the risk also still get a profit. In addition to endowment life insurance, there is also insurance that provides protection and investment benefits known as equity-linked life insurance.

As with other insurance products, equity-linked life insurance uses the Mortality Table as a tool to calculate premiums. But, according to Tsai, et al, (2014) the use of Mortality Tables gives two problems, first the Mortality Table only reflects death information historically so that it cannot predict the rate of security to evaluate insurance. Second, it cannot determine the mortality rate information between two ages because the Mortality Table presents the mortality rate in discrete periods. These things can provide a premium determining the price of the premium, which should be higher than the premium price offered so that it can cause losses to the company.

The solution was used a combined Mortality Model that refers to Carriere, J.F (1992), Tsai, et al, (2014) to estimate the mortality rate. Tsai, et al (2014) made a mortality model by combining the survival functions of Gompertz, Weibull and Inverse-Weibull. In this study, used the Indonesian Mortality Table 2011 issued by AAJI (Indonesian Life Insurance Association) to determine the Joint Mortality Model suitable for use in Indonesia and its effect on the calculation of equity-linked life insurance premiums. Calculation of premium reserves is also very important because it can give losses to the company if it is not appropriate in the calculation. The calculation of reserves must be adjusted so that no losses occur. For example in the first year the required costs are greater than the costs in the following years, because for new policy accounting more expensive than storing policy books. Therefore, the calculation of reserves of equity-linked life insurance premiums in this study uses the premium reserve modification by the Zillmer. Rohaena, O (2007) method using the Zillmer method to determine premium reserves for premium reserves. obtained according to the actual situation. Modification of the premium reserve Zillmer method is widely used in life insurance companies in Indonesia. In this paper the author will look for equity-linked life insurance premium reserves by the Zillmer method.

### RESULTS AND DISCUSSION

Like the research conducted by Tsai, et al (2014), the basic model used is as in equation (1). To create a Combined Mortality Model, parameter values must be found from  $\psi_1, \psi_2, \psi_3, m_1, m_2, m_3, \sigma_1, \sigma_2, \sigma_3$  by minimizing the loss function found in the journal Carriere, J.F (1992) as follows:

$$\sum_{x=0}^{111} \left( 1 - \left( \frac{\hat{q}_x}{q_x} \right) \right)^2 \quad (1)$$

where  $q_x$  is probability of death from *Tabel Mortalita Indonesia* TMI 2011 for age  $x$ ,  $\hat{q}_x$  probability of death, that will be estimated at age  $x$  by equation :

$$\hat{q}_x = 1 - \left( \frac{\hat{s}(x+1)}{\hat{s}(x)} \right) \tag{2}$$

$\hat{s}(x)$  is a joined mortality model in the equation (1).

First the parameters will be determined for  $\psi_1, \psi_2,$  and  $\psi_3$  by first calculating the  $d_x$  value based on the Indonesian Men and Women Joint Mortality Table. The equation that is proposed to determine the values of the parameters of  $\psi_1, \psi_2,$  and  $\psi_3$ , is as follows.

$$\psi_k = \frac{\sum_a^b d_x}{\sum_0^{111} d_x} \tag{3}$$

Where  $a$  is the lower limit of age and  $b$  is the upper limit of age for probability of death due to  $k$ . The parameter values of  $\psi_1, \psi_2,$  dan  $\psi_3$  were obtained using computer programs, whose results are presented in Table 3.1 as follows.

**Table 1.** Value  $\psi_1, \psi_2,$  and  $\psi_3$

$\psi_1$	0,011480601
$\psi_2$	0,008890123
$\psi_3$	0,979629276

Then by using computer software and the results of the parameters  $\psi_1, \psi_2,$  and  $\psi_3$  in Table 1, the dispersion parameter limits  $0 < m_1 \leq 17, 17 < m_2 \leq 33, 33 < m_3 \leq 111$ , as well as the value of the probability variables that have a range from zero to one by minimizing the loss function obtained the parameter values presented in the table as follows.

**Table 2.** Values of parameters model of Joint Mortality

Parameter	Value
$\psi_1$	0,011480601
$\psi_2$	0,008890123
$\psi_3$	0,979629276
$m_1$	0,591570041882516
$m_2$	25,092977541286100
$m_3$	68,445354829850400
$\sigma_1$	0,850772707015585
$\sigma_2$	0,972238863292677
$\sigma_3$	10,274641155524000

The parameter results in Table 2 are obtained after iterating 3933 iterations. Substitute the parameter values to equation (1) in order to obtain the Combined Mortality Model based on the Indonesian Mortality Table 2011 made by AAJI (Indonesian Life Insurance Association). The Combined Mortality Model can estimate life chances and chance of death at an age that will later affect the premium value of the equity-linked life insurance products.

**Keywords:** life insurance, equity-linked, mixture mortality model, premiums, reserves, Zillmer method.

### Acknowledgment

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## Constrained Non-Linear Optimization Using Leaders and Followers Algorithm

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### INTRODUCTION

Leaders and Followers (LaF) algorithm is a novel metaheuristic algorithm proposed by Gonzalez-Fernandez and Chen [1]. It can perform better exploration than the other well-known metaheuristics, e.g. Particle Swarm Optimization (PSO) and Differential Evolution (DE), because it avoids direct comparison of new solutions with the current best-known solution which may lead to premature convergence. In this study, LaF is modified to solve constrained optimization problems using the separation of objective function and constraint technique for handling constraints [2]. The proposed algorithm is evaluated using several well-known benchmark of constrained minimizing problems and the results are compared with the evaluation result of Genetic Algorithm (GA) [3] and PSO [4] with the same problems and parameters.

### RESULTS AND DISCUSSION

The evaluation result shows that the proposed algorithm is competitive in achieving high-accurate solution in low dimensional non-linear optimization problem, i.e.  $\leq 5$ . Also, it consistently find feasible solution for high dimensional non-linear optimization problems. However, it finds difficulties to obtain optimal solution in high dimensional optimization problems, except the problem only has linear inequality constraints, and in any problem which has more than one equality constraints. Moreover, in the comparison to GA and PSO, it generally has better performance. Figure 1 shows the algorithm convergence of LaF, PSO and GA on two of the test functions. It shows that LaF is able to explore better solutions, avoid premature convergence and converge faster.

**Keywords:** leaders and followers, metaheuristics, non-linear, optimization

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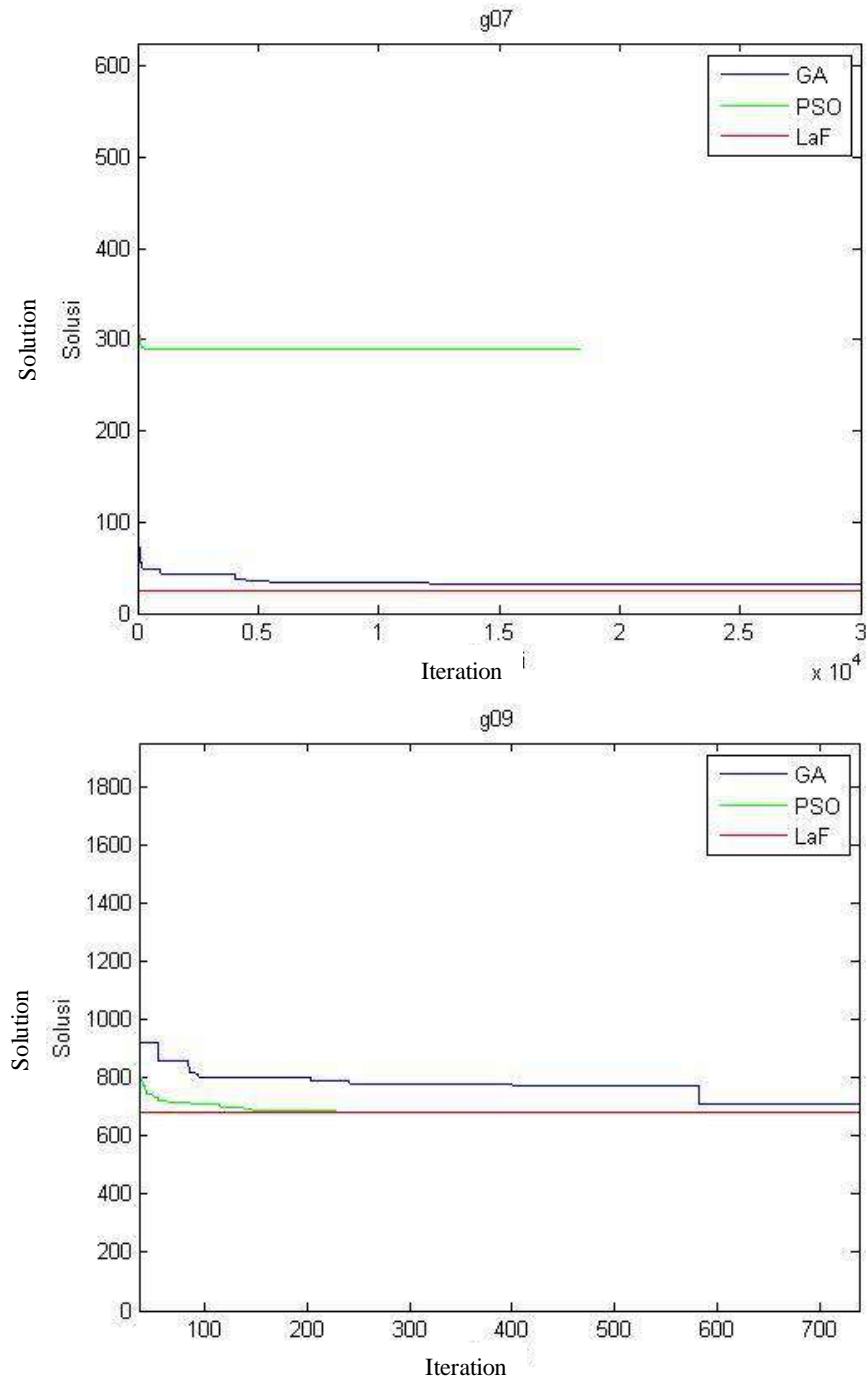


Figure 1. Algorithm convergence of LaF, PSO and GA on some test functions

## The Convergence Properties of New Hybrid Conjugate Gradient Method

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### INTRODUCTION

Let us consider the nonlinear unconstrained optimization problem

$$\min\{f(x) : x \in R^n\}, \quad (1)$$

where  $f$  is smooth and its gradient  $g$  is available. Conjugate gradient methods are very efficient for solving (1), especially when the dimension  $n$  is large. The iterates of (CG) method for solving (1) are obtained by

$$x_{k+1} = x_k + \alpha_k d_k, \quad k = 0, 1, 2, \dots$$

where  $\alpha_k$  is the current iterate,  $\alpha_k$  is a positive scalar and called the steplength which is determined by some line search, and  $d_k$  is the search direction. In this section, we present a new Hybrid conjugate gradient method, namely YHM2, where YHM2 denotes Yasir, Hamoda and Mamat. The combination of classical CG techniques Used in this paper is referred to PRP and DPRP methods respectively [1-3]. Using these formulas, we proposed  $\beta_k^{YHM2}$  which defined by

$$\beta_k^{YHM2} = \begin{cases} \beta_k^{PRP} & \text{if } \|g_k\|^2 \geq |g_k^T g_{k-1}| \\ \beta_k^{DPRP} & \text{otherwise} \end{cases}$$

### NUMERICAL EXPERIMENTS AND DISCUSSIONS

In this section, we selected some preliminary numerical experiments considered in Andrei[4]. The performance of this method is compared with other coefficients such as FR[5], PRP[1,2], WYL[6], and DPRP[3] methods we considered  $\varepsilon = 10^{-5}$  and the gradient value as the stopping criteria. As suggested by Hillstom [7]. For every test function used, there are four or five initial points has been tested randomly from it. All problems are solved by MATLAB version 8.3.0.532 (R2014a). We used the exact line search to compute the step size. Fig.1 list the performance of the above methods relative to the number of iterations.

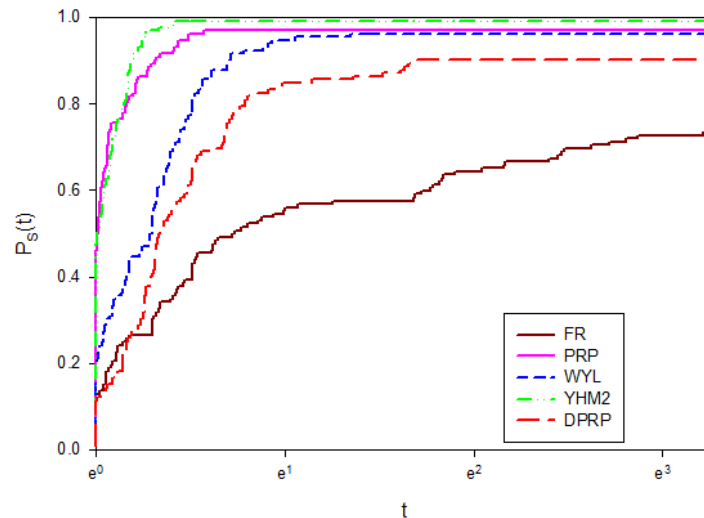


Figure 1. Performance profile relative to the number of iterations.

## Conclusion

The new hybrid conjugate gradient methods have been proven that satisfies the sufficient descent condition and global convergence prosperities under exact line search. The numerical results for this method are more efficient when as compared to other CG methods

**Keywords :** Conjugate Gradient Method, Descent Property, Global Convergence, Large Scale, Exact Line Search.

## Acknowledgement

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## On Model of Supply Chain Using Max-Plus Algebra

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### INTRODUCTION

Indonesia has been known as agricultural country. Rice is most important agricultural commodity. The demand of rice must be fulfilled by the supply of rice. Chain between supply-distribution-demand of rice has to be stable. Supply chain is defined as a group of inter-connected participating companies that add value to a stream of transformed inputs from their source of origin to the end products or services that are demanded by designated end-customers [4]. There are four intrinsic flows of supply chain, i.e. material flow, information flow, finance flow, and commercial flow.

Indonesian Bureau of Logistics (Bulog) is a company which distributes rice in Indonesia. In this paper, supply chain of rice using data from Bulog regional division of Yogyakarta and its subsidiary company i.e. PT Jasa Prima Logistik (JPL).

In [1], [3], [7] supply chain model of rice uses causality diagram of supply chain, linear programming and LINDO, and goal programming model respectively. All the models use social variable approach and linear quantification.

Max-plus algebra is the system of algebra with two operations maximization and addition. The structure of this system is a semiring [2]. Some work of transportation such as scheduling at bus station, railway station, and airport using max-plus algebra [2], [6]. Max-plus algebra is also used to model supply chain of oil feedstock between two fuel terminals using tankers [5], [6].

In this paper we will discuss the model supply chain of rice that distributes from Bulog and JPL using max-plus algebra. Furthermore, we discuss optimization of the model in the supply chain.

### RESULTS AND DISCUSSION

Supply chain of rice in Bulog Division Yogyakarta as follows in the figure.

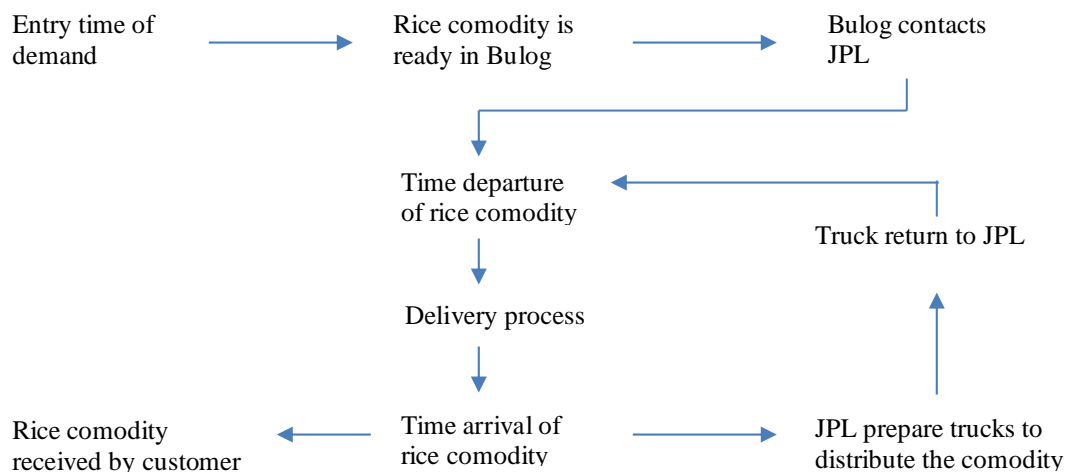


Figure 1. Supply Chain of Rice in Bulog Division Yogyakarta

If  $n$  is the number of truck then system of equation in max-plus algebra as follows.

$$\begin{cases} t_1(k) = p_r \otimes t_2(k-n) \otimes p_w \oplus u(k) \\ t_2(k) = p_d \otimes t_1(k) \\ y(k) = t_2(k) \end{cases} \quad (1)$$

with  $t_1(k)$  and  $t_2(k)$  are the time of rice departure from Bulog and the time of rice arrive to customer.

Time spent by the truck to delivery is  $p_d(k)$  and return to Bulog is  $p_r(k)$ . JPL need time to prepare the trucks  $p_w(k)$ . Finally,  $u(k)$  and  $y(k)$  are entry time of rice demand and time of rice supply arrive to customers. The model of equation system (1), in the matrix form as follows

$$\vec{t}(k) = A_0 \otimes \vec{t}(k) \oplus A_1 \otimes \vec{t}(k-n) \oplus B_0 \otimes u(k) \quad (2)$$

$$y(k) = C \otimes \vec{t}(k) \quad (3)$$

where,

$$\vec{t}(k) = \begin{bmatrix} t_1(k) \\ t_2(k) \end{bmatrix}, A_0 = \begin{bmatrix} \varepsilon & \varepsilon \\ p_d & \varepsilon \end{bmatrix}, A_1 = \begin{bmatrix} \varepsilon & p_r \otimes p_w \\ \varepsilon & \varepsilon \end{bmatrix}, B_0 = \begin{bmatrix} e \\ \varepsilon \end{bmatrix}, \text{ and } C = [\varepsilon \quad e].$$

Simplify equation (2) and (3), and then

$$\vec{t}(k) = A \otimes \vec{t}(k-n) \oplus B \otimes u(k), \quad (4)$$

$$Y(k) = H \otimes U(k) \quad (5)$$

where  $A = \left[ \bigoplus_{i=0}^{\infty} A_0^{\otimes i} \right] \otimes A_1$ ,  $B = \left[ \bigoplus_{i=0}^{\infty} A_0^{\otimes i} \right] \otimes B_0$  and  $H$  is lower triangular matrix with

$[H]_{ij} = CA^{i-j}B$  is the model of rice supply chain in Bulog Yogyakarta. The model in equation (4) and (5) always has Largest sub-solution according to [2] and [6].

**Keywords:** max-plus algebra, rice distribution, supply chain.

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## Convergence of Binomial Tree Methods on Determining Stock Option Prices

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### INTRODUCTION

The movement of the investment world is now increasingly rapid and growing, this is indicated by more and more alternative investment tools used to be the choice of investors. One of them is derivative products. Derivative products are financial instruments whose value depends on the value of underlying assets can also be used to manage and minimize losses caused by fluctuations in the prices of underlying assets (Sembel & Ferdiansyah, 2002). Derivative products that are widely known and traded in financial markets are options. Options as one of the financial products that are widely assessed mathematically, both deterministically and stochastically. Option is a contract or agreement between two parties, whereby the contract holder has the right not the obligation to buy or sell an underlying asset from the seller to a certain asset at a certain price and time (Bugnevicius, 2004). Based on the type of option rights are divided into two, namely the purchase option (call option) and the selling option (put option). Buy options give the buyer the right to buy a particular stock at a predetermined price at any time during the contract, while the selling option gives the buyer the right to sell a certain price at a predetermined price at any time during the contract (Bezberodov, 2016 )

Options are divided into two types based on the type of time period for implementation, namely the American type option and the European type option. The American type option is an option that is done at or before maturity, while the European type option is an option that is done at maturity (Hull, 2009).

In buying shares that are more expensive than the market or selling stocks that are cheaper than the market, it is necessary to determine the option price to minimize risk, namely by determining the fair price of the option. This option pricing can be done in several ways, including the Binomial Tree Method and the Black Scholes Method (Bodie et al. 2014)

The Binomial Tree Method was first introduced by Cox, Ross, and Rubinstein in 1979. This method reveals that stock price movements in the market have two possibilities, namely up and down (Cox et al. 1979). Meanwhile, the Black Scholes method has been published since 1973 by Fisher Black and Myron Scholes in "The Pricing of Option and Corporate Liabilities". This method can only be done on the European type option pricing which can only be done at maturity, and has the assumption that no dividends will be paid during the option period, no transaction fees, risk free and constant interest rates over time, and the stock price follows geometric Brown motion. (Black, 1973).

### RESULTS AND DISCUSSION

The data that is used in this study is secondary data, namely historical stock price data from PT. Bank Central Asia Tbk. (BBCA) with a period of January 5, 2017-5 January 2018. The stock price used is the daily closing price (close price) and the option price calculated is only the European type call option. With a risk-free interest rate of 0.065 or 6.5% with an initial stock price of 15,675IDR, a strike price of 500IDR, a maturity of 3 months and the stock price is assumed to follow the lognormal distribution and no dividends are taken into account .

By using the data return of the stock price of PT. Bank Central Asia Tbk. (BBCA) is calculated to find the volatility value as follows:

**Table 1.** Closing Price Data

<i>date</i>	<i>Close Price (IDR)</i>
5 Januari 2017	15675
6 Januari 2017	15600
9 Januari 2017	15350
5 Januari 2018	22250

So that the expected return of the stock closing price is 0.0014. The calculation results of  $R_t - \bar{R}_t$  can be seen through Table 3.2.

**Table 2.** Values of parameters model of Joint Mortality

<i>t</i>	<i>Close Price (IDR)</i>	$R_t$	$R_t - \bar{R}_t$	$\left(R_t - \bar{R}_t\right)^2$
1	15600	-0,0048	-0.0062	0,00004
2	15350	-0,0162	-0.0176	0,00031
3	15400	0.0033	0.0019	0,0000
4	15300	-0,0065	-0,0079	0,00006
...	⋮	⋮	⋮	⋮
256	22250	0,0011	-0,0003	0,00000

So, obtained the value of  $\sigma$ , used in this study is equal to 0.1846 or 18.46% means that the stock price movement of PT. Bank Central Asia Tbk. (BBCA) of 18.46% during the period of January 5, 2017 - January 5, 2018.

**Keywords:** binomial tree method, Black Scholes method, convergence, option

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## 2-Cut Splicing and 4-Cut Splicing on DNA Molecule

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### INTRODUCTION

DNA or *deoxyribonucleic acid* is a molecule that carries the genetic information in living cell. DNA is a molecule composed of two chains (made of nucleotides) which coil around each other to form a double helix carrying the genetic instructions. Each nucleotide is composed of a sugar called deoxyribose, a phosphate group, and one of four nitrogen containing nucleobases (Adenine (A), Guanine (G), Thymine (T), or Cytosine (C)).

Splicing system was originally developed as a mathematical or dry model of the generative of DNA molecules in the presence of appropriate restriction enzyme and a ligase. According to the original model, a splicing system consist of finite initial set of words over an alphabet and a finite set of rules by which the words can be spliced together to form new words in addition to the initial words. The closure of the initial set under the splicing operation generates a splicing language [6].

DNA sequences are three-dimensional objects in a three dimensional space. Hence graphs seem to be more suitable objects for describing complex three dimensional objects independently from their actual position in three dimensional spaces [3]. So that the main structure of the DNA molecule (A, G, T, C) can be mapped into the binary alphabet (a,b).

Parikh matrix is a matrix generated from mapping words into matrix form. The Parikh Matrix mapping was introduced by Mateescu in [11] based on certain type of matrices is an extension of the Parikh vector with every word  $w$  over. A.E. Brouwer and W.H. Haemers [2] have introduced about the norm. The Norm of a matrix is a real number which is a measure of the magnitude of the matrix.

### RESULT AND DISCUSSION

#### 1. 2-Cut splicing on DNA molecule with strand 5' and 3' of sticky ends overhang

If the double strand DNA molecule's restriction site is 4 bases in length and produce lengthwise cuts in the 5'-end and 3'-end is described in graph form according to the graph splicing scheme that has been given will produce the following graph.

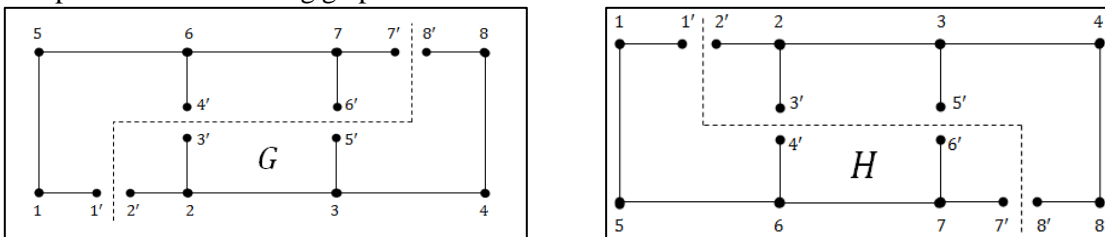


Figure 1. Representation *Sticky Ends Overhang* 3'-end (Left) and Overhang 5'-end (Right) with  $L=4$

Consider  $L = 4$ , the number of set of combinations required for 2-Cut splicing. Here  $P = 16$ ,  $q = 6$ ,  $q' = 8$ ,  $r = 1$ ,  $k = 2$ . Then  $P - (q + q') + r = 16 - (6 + 8) + 1 = 2 + 1 = 3 = k + 1$ . Euler's polyhedral formula  $P - (q + q') + r = k + 1$  is satisfied in 2-Cut splicing.

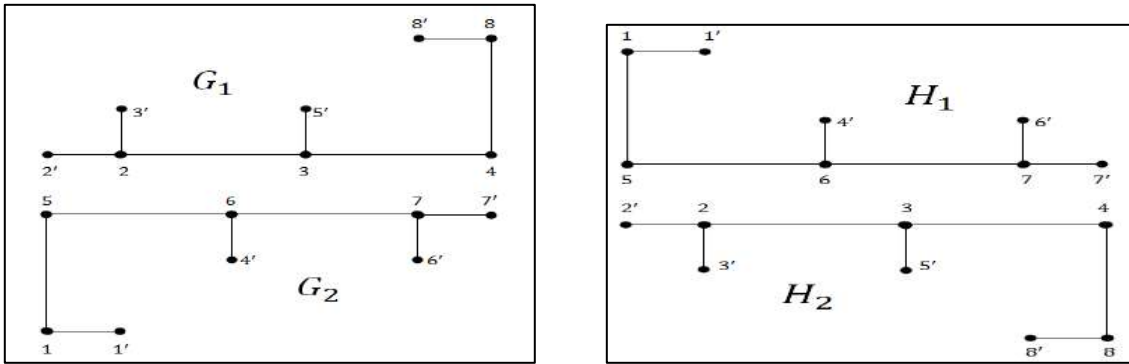


Figure 2. 2-cut spliced semi graph

Let the weight of each edge of a spliced semi graph as ‘b’ then the weight of each semi edge becomes  $\frac{b}{2}$ . After 2-Cut splicing on graph G and H, we get spliced semi graphs which form two bipartite semi graphs. Each one has four semi edges and three edges. Therefore let the language be  $\left(\frac{b}{2}\right)^4 b^3$ . Therefore the language obtained is  $L = \left(\frac{b}{2}\right)^4 b^3 = \left\{a^4 b^3 \mid a = \frac{b}{2}\right\}$ .

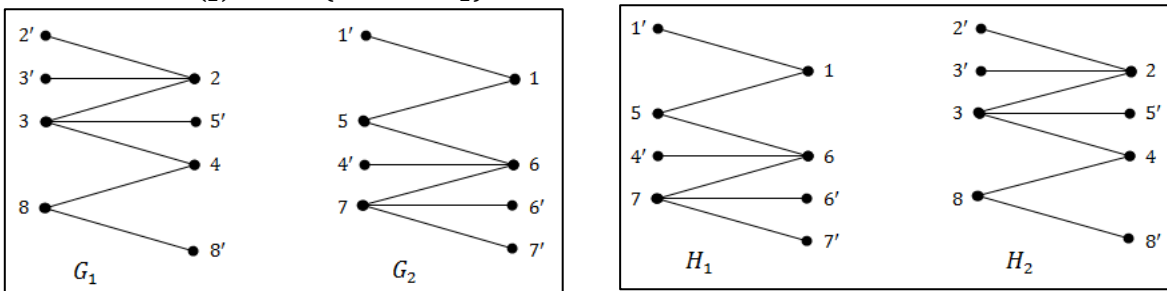


Figure 3. Representation of 2-cut spliced semi graph

Let  $G = (V_N, V_T, P, S)$  be the grammar defined on the languages on edges, where  $V_N = \{S\}$ ,  $V_T = \{a, b\}$ ,  $P = \{S \rightarrow (ASb, Aab), A \rightarrow a\}$ , the set of productions P is given from the language  $L(G) = \left\{a^4 b^3 \mid a = \frac{b}{2}\right\}$ . Since the language generated on the splicing graph is the same as the language generated with grammar G, is  $L = L(G) = \left\{a^4 b^3 \mid a = \frac{b}{2}\right\} = \left\{a^{n+2} b^{n+1} \mid n = 2, a = \frac{b}{2}\right\}$ , then L is splicing language. Based on the L, we obtained  $V_T = \{a, b\}$  with  $a < b$ . The whole set of words formed from the initial word on the L is  $V_T^*$  as much  $\frac{7!}{4!3!} = 35$  word.

The Parikh matrix mapping  $\Psi_2$  is a mapping from  $V_T^*$  to  $M_3$  with

$$\Psi_2(a) = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \quad \Psi_2(b) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

$\Psi_2(ab) = \Psi_2(a)\Psi_2(b)$ ,  $a, b \in V_T^*$ , where multiplication of matrices is the operation on the right side of this equation.

Table 1. Norm of Parikh Matrices for the 1-Cut splicing system words

Word	$\Psi(w_i)$	$\ \Psi(w_i)\ _1$	$\ \Psi(w_i)\ _\infty$
$w_1 = aaaabbb$	$\begin{bmatrix} 1 & 4 & 12 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	16	17
$w_2 = aaababb$	$\begin{bmatrix} 1 & 4 & 11 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	15	16

$w_3 = aaabbab$ $w_5 = abaabb$	$\begin{bmatrix} 1 & 4 & 10 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	14	15
$w_4 = aaabbba$ $w_6 = aababab$ $w_{11} = abaaabb$	$\begin{bmatrix} 1 & 4 & 9 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	13	14
$w_7 = aababba$ $w_8 = aabbaab$ $w_{12} = abaabab$ $w_{21} = baaaabb$	$\begin{bmatrix} 1 & 4 & 8 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	12	13
$w_9 = aabbaba$ $w_{13} = abaabba$ $w_{14} = ababaab$ $w_{22} = baaabab$	$\begin{bmatrix} 1 & 4 & 7 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	11	12
$w_{10} = aabbbaa$ $w_{15} = abababa$ $w_{17} = abbaaab$ $w_{23} = baaabba$ $w_{24} = baabaab$	$\begin{bmatrix} 1 & 4 & 6 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	10	11
$w_{16} = ababbba$ $w_{18} = abbaaba$ $w_{25} = baababa$ $w_{27} = babaaab$	$\begin{bmatrix} 1 & 4 & 5 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	9	10
$w_{19} = abbabaa$ $w_{26} = baabbba$ $w_{28} = babaaba$ $w_{31} = bbbaaab$	$\begin{bmatrix} 1 & 4 & 4 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	8	9
$w_{20} = abbbaaa$ $w_{29} = bababaa$ $w_{32} = bbbaaba$	$\begin{bmatrix} 1 & 4 & 3 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	7	8
$w_{30} = babbaaa$ $w_{33} = bbaabaa$	$\begin{bmatrix} 1 & 4 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	6	7
$w_{34} = bbabaaa$	$\begin{bmatrix} 1 & 4 & 1 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	5	6
$w_{35} = bbbaaaa$	$\begin{bmatrix} 1 & 4 & 0 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$	4	5

Norm of Parikh matrices produced on 2-cut splicing in Table 4.1 has a range  $4 \leq \|\Psi(w_i)\|_1 \leq 16$  and  $5 \leq \|\Psi(w_i)\|_\infty \leq 17$  and  $\|\Psi(w_i)\|_\infty = \|\Psi(w_i)\| + 1$

## 2. 4-Cut splicing on DNA molecule with strand 5' and 3' of sticky ends overhang

If a 6-base-length, double-stranded DNA restriction site that produces longitudinal pieces at 5'-end and 3'-end is describe in graph form according to the splicing chart scheme that has been given, it will produce the following graph.



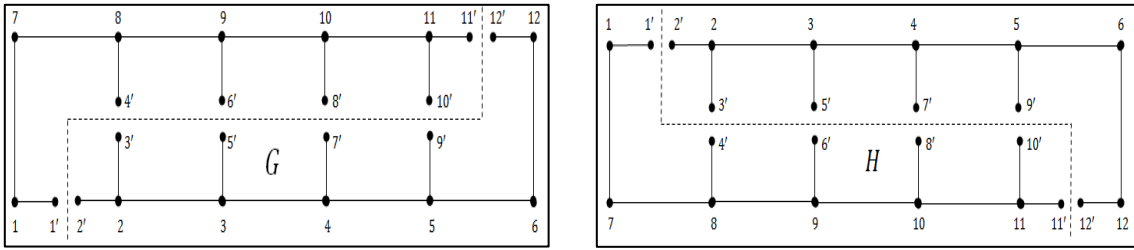


Figure 4. Representation *Sticky Ends* Overhang 3'-end (Left) and Overhang 5'-end (Right) with L=6

Consider  $L = 6$ , the number of set of combinations required for 4-Cut splicing. Here  $P = 24$ ,  $q = 10$ ,  $q' = 12$ ,  $r = 1$ ,  $k = 2$ . Then  $P - (q + q') + r = 24 - (10 + 12) + 1 = 2 + 1 = 3 = k + 1$ . Euler's polyhedral formula  $P - (q + q') + r = k + 1$  is satisfied in 2-Cut splicing. (from the following semi graph G and H).

From the graph G and H at 4-Cut splicing we get

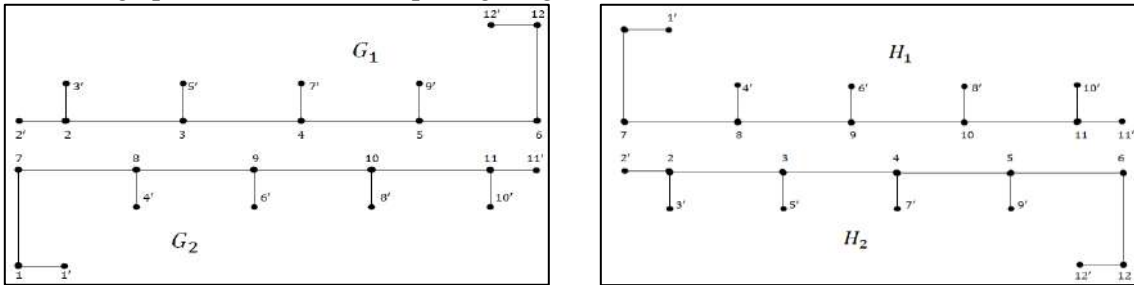


Figure 5. 4-cut spliced semi graph

Let the weight of each edge of a spliced semi graph as 'b' then the weight of each semi edge becomes  $\frac{b}{2}$ . After 4-Cut splicing on graph G and H, we get spliced semi graphs which form two bipartite semi graphs. Each one has six semi edges and five edges. Therefore let the language be  $\left(\frac{b}{2}\right)^6 b^5$ . Therefore the language obtained is  $L = \left(\frac{b}{2}\right)^6 b^5 = \left\{a^6 b^5 \mid a = \frac{b}{2}\right\}$ .

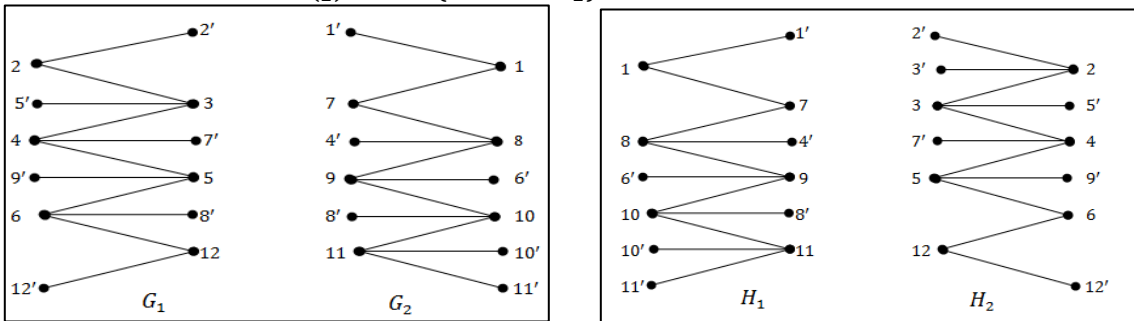


Figure 6. Representation of 4-cut spliced semi graph

The language of the grammar of  $G = (V_N, V_T, P, S)$  obtained from the set of result P, where  $V_N = \{S\}$ ,  $V_T = \{a, b\}$ ,  $P = \{S \rightarrow (ASb, Aab), A \rightarrow a\}$ , is  $L(G) = \left\{a^6 b^5 \mid a = \frac{b}{2}\right\}$ .

Since the language generated on the splicing graph is the same as the language generated with grammar G, is  $L = L(G) = \left\{a^6 b^5 \mid a = \frac{b}{2}\right\} = \left\{a^{n+2} b^{n+1} \mid n = 4, a = \frac{b}{2}\right\}$ , than L is splicing language. Based on the L, we obtained  $V_T = \{a, b\}$  with  $a < b$ . The whole set of words formed from the initial word on the L is  $V_T^*$  as much  $\frac{7!}{6! 5!} = 642$  word.

The Parikh matrix mapping  $\Psi_2$  is a mapping from  $V_T^*$  to  $M_3$  with

$$\Psi_2(a) = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \quad \Psi_2(b) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

$\Psi_2(ab) = \Psi_2(a)\Psi_2(b)$ ,  $a, b \in V_T^*$  where multiplication of matrices is the operation on the right side of this equation.

Norm of Parikh matrices produced on 4-cut splicing has a range of  $6 \leq \|\Psi(w_i)\|_1 \leq 36$  and  $7 \leq \|\Psi(w_i)\|_\infty \leq 37$  and  $\|\Psi(w_i)\|_\infty = \|\Psi(w_i)\| + 1$ .

Max column sum norm of Parikh matrix obtained by calculating the number of all entries in the third column of each matrix produced by the word where the first entry is the number of  $ab$  on the word, the second entry is the number of letters  $b$  in the word, and the third entry is 1. And max row sum norm of Parikh matrix obtained by calculating the number of all entries in the first row of each matrix produced by the word where the first entry is 1, the second entry is the number of letters  $a$  in the word, and the third entry is the number of  $ab$  on the word. The number of  $a$  in each word is  $n + 2$ , the number of  $b$  is  $n + 1$ , and the number of subwords  $ab$  is  $0 \leq |ab| \leq |a||b|$ , with  $n$  the number of splicing ( $n \geq 1$ ).

### Conclusion

1. DNA molecules hold the characterization of the semi graph at the time of splicing.
2. By using formal language and with the help of Algebra software, we can see the amount of splicing on DNA molecule from the norm value of the Parikh matrix.
3. The result of norm of Parikh matrices is  $n + 2 \leq \|A\|_1 \leq (n + 2)^2$  where  $n$  the number of splicing ( $n \geq 1$ ) and  $\|\Psi(w_i)\|_\infty = \|\Psi(w_i)\| + 1$ .

**Keyword:** DNA, Splicing System, Language, Parikh matrix, Norm of Parikh Matrices

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## Vector Space of Codons Sequence over Galois Field $GF(7^3)$

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### INTRODUCTION

DNA and RNA is genetic material that play an important role in living things metabolism process which called protein synthesis. DNA have four nucleic acid, they are adenine (A), guanine (G), cytosine (C), and thymine (T). Protein synthesis process closely related with standard genetic code. Standard genetic code is a set of rules that defines the order of nucleotide bases in DNA or RNA to determine the order of certain amino acids in protein synthesis. The standard genetic code is a combination of three nitrogen bases or triplet's bases. This standard genetic code can mathematically represented by algebraic structure. In this paper we will give that representation using the extended set of 7 elements from the set of four DNA's nucleic acid that are  $N = \{D, A, C, O, G, T, P\}$ . Then we construct new triplet set from  $N$ , called extended triplet set. In the end we analyze the vector space structure of it and find the significant field that correspond with that structure.

### RESULTS AND DISCUSSION

#### 1. Vector Space Construction over Galois Field $GF(7^3)$

In order to construct the vector space structure of codons sequence, we analyze first the extended triplet set then construct a mapping based on it algebraic structure.

- 1.1 Extended Triplet Set

The DNA nitrogen bases is extend to be  $N = \{D, A, C, O, G, T, P\}$ . Then we formed  $C_{343} = \{X_1, X_2, X_3 \mid X_i \in N, i = 1, 2, 3\}$  as extended triplet set with cardinality 343.

- 1.2 Mapping The Galois Field with  $C_{343}$

To construct a mapping from Galois field  $GF(7^3)$  to  $C_{343}$ , defined  $f$  as follows.

$$\begin{aligned}
 f : GF(7) &\rightarrow \{D, A, C, O, G, T, P\} \\
 0 &\mapsto D \\
 1 &\mapsto A \\
 2 &\mapsto C \\
 3 &\mapsto O \\
 4 &\mapsto G \\
 5 &\mapsto T \\
 6 &\mapsto P
 \end{aligned}$$

To construct Galois field  $GF(p^n)$  we can use  $\mathbb{Z}_p[x]$  ring and irreducible polynomial  $p(x)$   $n$ -degrees such that  $GF(p^n) = \mathbb{Z}_p[x]/\langle p(x) \rangle$ . Then we have  $GF(7^3) = \mathbb{Z}_7[x]/\langle p(x) \rangle = \{a_0 + a_1x + a_2x^2 \mid a_0, a_1, a_2 \in \mathbb{Z}_7\}$  for an irreducible polynomial  $p(x)$ .

After that, we defined a mapping named  $\varphi$ , from  $GF(7^3)$  to  $C_{343}$

$$\varphi : GF(7^3) \rightarrow C_{343}$$

with  $\varphi(a_0 + a_1x + a_2x^2) = (f(a_1) f(a_2) f(a_0)) = (X_1 X_2 X_3)$ . Consider that the polynomial coefficient  $a_2$  with maximal degree  $a_2x^2$  correspond with bases on second codon/triplet position and

polynomial coefficient  $a_1$  correspond with bases on first codon/triplet position and polynomial coefficient  $a_0$  correspond with bases on third codon/triplet position. This order is correspond with error frequency on that three bases from a triplet which analogous as degree of variable on  $GF(7^3)$  polynom.

According to above result, we can defined a bijection

$$f: S \rightarrow GF(7^3)$$

with  $S \in \{0,1,2, \dots, 342\}$  and  $f[\alpha] = a_0 + a_1x + a_2x^2$  where  $a_0, a_1, a_2$  is a form of basis 7's number from  $\alpha$ .

### 1.3 Algebra Structure of $C_{343}$

In order to analyse the vector space structure of  $C_{343}$  we must investigate the group structure first.

#### 1.3.1 Sum and Product operation on $C_{343}$ and its Group Structure

To investigate the group structure of  $C_{343}$ , first we defined sum operation on  $C_{343}$  as follows. For every  $X_1Y_1Z_1$  and  $X_2Y_2Z_2 \in C_{343}$ , define

$$\begin{aligned} X_1Y_1Z_1 + X_2Y_2Z_2 &= \varphi[(\varphi^{-1}(X_1Y_1Z_1) + \varphi^{-1}(X_2Y_2Z_2)) \bmod 7] \\ X_1Y_1Z_1 \cdot X_2Y_2Z_2 &= \varphi[\varphi^{-1}(X_1Y_1Z_1)\varphi^{-1}(X_2Y_2Z_2) \bmod g(x)] \end{aligned}$$

where  $g(x)$  is irreducible polynomial degree 3 with coefficient on  $GF(7)$ .

Then, showed that  $(C_{343}, +)$  and  $(C_{343}^*, \times)$  is Abelian group, with  $C_{343} - \{000\} = C_{343}^*$ .

#### 1.3.2 Codon Sequence's Vector Space Construction

After we know that  $(C_{343}, +)$  is Abelian group and  $(C_{343}, +, \cdot)$  is isomorphic to  $GF(7^3)$ , we give scalar product construction in order to investigate the vector space structure of  $C_{343}$  as follows.

For all  $XYZ \in C_{343}$  and  $\alpha \in GF(7^3)$ , defined :

$$\begin{aligned} \times: GF(7^3) \times C_{343} &\rightarrow C_{343} \\ (\alpha, XYZ) &\mapsto \alpha(XYZ) \end{aligned}$$

with :

$$\alpha(XYZ) = \varphi(\alpha_i \varphi^{-1}(XYZ) \bmod 7)$$

So we have that  $C_{343}$  is one dimensional vector space a vector space over Galois field  $GF(7^3)$  with  $DDA$  as its canonical base.

Let  $S = (C_{343})^N = C_{343} \oplus C_{343} \oplus \dots \oplus C_{343}$  ( $N$ -factor) and

$$\begin{aligned} s + s' &= (s_1, \dots, s_N) + (s'_1, \dots, s'_N) = (s_1 + s'_1, \dots, s_N + s'_N) \\ \alpha s &= \alpha(s_1, \dots, s_N) = (\alpha s_1, \dots, \alpha s_N) \end{aligned}$$

It can be showed that  $(S, +)$  is Abelian group with  $(DDD, DDD, \dots, DDD)$  as its identity.

Therefore,  $(C_{343})^N$  forms  $N$ -dimensional vector space over  $GF(7^3)$  with  $e_1 = (DDA, DDD, \dots, DDD), \dots, e_N = (DDD, DDD, \dots, DDA)$  as their canonic bases. So, we can conclude that for every  $s \in S$  there is unique representation as follows

$$s = a_1 e_1 + \dots + a_N e_N$$

or,  $(a_1, \dots, a_N)$  is representation coordinate from  $S$  over canonical bases  $e_i$ .

## 2. Conclusion

Based on our explanation before, here are some conclusions that we have :

1. The standard genetic code can represented as the elements of extended triplet set (notated by  $C_{343}$ ) with  $X_1X_2X_3 ; X_i \in \{D, A, C, O, G, T, P\}$  as its elements.
2. The  $C_{343}$  set form commutative group structure over addition and the set  $C_{343} - \{000\}$  form commutative group under multiplication with operation that have been defined. Then with scalar product

that have been defined,  $C_{343}$  form one dimensional vector space structure over Galois field  $GF(7^3)$  and the codons sequence is represented as  $(a_1, a_2, \dots, a_N) \in (C_{343})^N$ .

**Keyword :** DNA, Vector Space

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## Determination of the Status of Utilization and Effort of Little Tuna (*Euthynnus Affinis*) Caught in the North Bolaang-Mongondow Waters North Sulawesi

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### INTRODUCTION

Little tuna (*Euthynnus affinis*) classified as pelagic fishery resource is important and one of the non-oil export commodity in North Sulawesi. Little tuna in North Sulawesi (including North Bolaang-Mongondow waters) in 2016 reached 30,000 tons per year, with a value of about 300 billion rupiahs[1]. Research on little tuna generally discuss the exploitation in increase production, not much research on the status of utilization (including aspects of sustainability and efficiency) resources. Data on the level of utilization of the fish resources are very important, as it will determine whether the resource use is less than optimal, optimal, or excessive. Excessive utilization of fish resources would threaten its sustainability. By knowing the level of resource utilization on the Little tuna, is expected to be done in a planned and sustainable management.

The simplest model of the dynamics of fish populations is Surplus Production Model (SPM), by treating the fish as a single biomass that can not be divided, which is subject to the rules of simple increases and decreases in biomass. This model, commonly used in the assessment of fish stocks using only the data of catch and fishing effort generally available.

This study aims to get the best SPM, as well as knowing how much the result of maximum sustainable yields (MSY), utilization level, and the level of effort of Little tuna in the North Bolaang-Mongondow waters.

The simplest model of the dynamics of fish populations is a surplus production model that treats the fish population as a single biomass that can not be divided, which is subject to the simple rules of the rise and decline. The production model is dependent on the amount of four kinds, namely: biomass population at a given time  $t$  ( $B_t$ ), catches for a certain time  $t$  ( $C_t$ ), fishing effort at a certain time  $t$  ( $E_t$ ), and the natural growth rate constant ( $r$ ) [2]. This model was first developed by Schaefer, who was initially the same as the form of logistic growth model.

According to Coppola and Pascoe [3], equation surplus consists of several constants that are affected by natural growth, the ability of fishing gear, and carrying capacity. Constants allegedly using models of biological parameter estimators of surplus production equation, namely the model: Equilibrium Schaefer, Schaefer Disequilibrium, Schnute, and Walter - Hilborn. Based on the four models were selected the most appropriate or best fit of the estimation of others.

According to Sparre and Venema [4], formulas surplus production model is valid only if the slope parameter ( $b$ ) is negative, which means the addition of fishing effort will lead to a decrease in the catch per fishing effort. If the parameter  $b$  positive value, then it can not be done estimating the optimum amount of stock and effort, but it can only be concluded that the addition of fishing effort is still possible to increase the catch.

Prediction of optimum fishing effort ( $E_{opt}$ ) and the maximum sustainable catch ( $C_{MSY}$ ) approached the surplus production model. Between the catch per unit of effort (CPUE) and fishing effort can be either linear or exponential relationship [5]. Surplus Production Model consists of two models, namely basic model of Schaefer (linear relationship) and the Gompertz model developed by Fox with forms exponential relationship [5].

Surplus production models first developed by Schaefer, who was initially the same as the form of logistic growth model. The model is as follows:

$$\frac{dB_t}{dt} = G(B_t) = r B_t \left( 1 - \frac{B_t}{K} \right) \quad (1)$$

This equation does not include the effect of the catching, so Schaefer wrote back to :

$$\frac{dB_t}{dt} = r B_t \left( 1 - \frac{B_t}{K} \right) - C_t \quad (2)$$

K is the carrying capacity of the marine environment, and  $C_t$  is the catch that can be written as:

$$C_t = q E_t B_t \quad (3)$$

atchability, and  $E_t$  indicates fishing effort. This equation can be written as:

$$\frac{C_t}{E_t} = q B_t = \text{CPUE} \quad (4)$$

From the differential equation (2), the optimum catchment can be calculated at the time  $\frac{dB_t}{dt} = 0$ , also called settlement at the point of balance (equilibrium), in the form of:

$$r B_t \left( 1 - \frac{B_t}{K} \right) - C_t = 0, \quad \text{or}$$

$$C_t = r B_t \left( 1 - \frac{B_t}{K} \right) = q E_t B_t \quad (5)$$

From equation (3) and (5), find value of  $B_t$  obtained as follows :

$$B_t = K \left( 1 - \frac{q E_t}{r} \right) \quad (6)$$

So that equation (5) becomes :

$$C_t = q K E_t \left( 1 - \frac{q E_t}{r} \right)$$

$$= q K E_t - \frac{q^2 K}{r} E_t^2 \quad (7)$$

Equation (7) is simplified further by Schaefer becomes:

$$\frac{C_t}{E_t} = a - b E_t, \quad \text{or}$$

$$C_t = a E_t - b E_t^2 \quad (8)$$

$$\text{while the } a = q K \text{ and } b = \frac{q^2 K}{r}$$

This linear relationship is used widely for calculating  $C_{MSY}$  through the determination of the first derivative of  $C_t$  with  $E_t$  to find optimal solutions, both to catch and fishing effort. The first derivative of  $C_t$  to  $E_t$  is :

$\frac{dC_t}{dE_t} = a - 2b E_t$ , in order to obtain the alleged  $E_{opt}$  (optimum fishing effort) and  $C_{MSY}$  (maximum sustainable yields) respectively :

$$E_{opt} = \frac{a}{2b} = \frac{r}{2q} \quad (9)$$

by entering the value of  $E_{opt}$  in equation (8), will be obtained  $C_{MSY}$  as follows:

$$\begin{aligned} C_{MSY} &= a E_t - b E_t^2 \\ &= a \left( \frac{a}{2b} \right) - b \left( \frac{a}{2b} \right)^2 \\ &= \frac{a^2}{4b} \end{aligned}$$

by substituting  $a = qK$  and  $b = \frac{q^2 K}{r}$  will be obtained,

$$C_{MSY} = \frac{a^2}{4b} = \frac{q^2 K^2}{4q^2 K / r} = \frac{rK}{4} \quad (10)$$

The values of  $a$  and  $b$  are estimated by the least squares method approach that is commonly used to estimate the coefficient of a simple regression equation. Furthermore, by including the value of  $E_{opt}$  in equation (6) is obtained optimum biomass ( $B_{MSY}$ ) as follows :

$$\begin{aligned} B_{MSY} &= K - \frac{Kq}{r} E_{opt} \\ &= K - \frac{Kq}{r} \left( \frac{r}{2q} \right) \\ &= K - \frac{K}{2} \\ &= \frac{K}{2} \end{aligned} \quad (11)$$

The values of the parameter  $q$ ,  $K$ , and  $r$  can be calculated using the Fox algorithm, as referenced in Sularso [6], as follows:

$$q_t = \ln \left[ \left( zU_t^{-1} + \frac{1}{b} \right) / \left( zU_{t+1}^{-1} + \frac{1}{b} \right) \right] / (z) \quad (12)$$

where  $z = - (a / b) / E^*$ ,  $E^* = (E_t + E_{t+1}) / 2$ ,  $U_t = \frac{C_t}{E_t}$  and the value of  $q$  is the geometric mean of the

value of  $q_t$ . From the values of  $a$ ,  $b$ , and  $q$ , can then be calculated values of  $K$  and  $r$ .

Model of Fox has several characteristics that are different from the model Schaefer, that it biomass growth following the Gompertz growth model [7]. The relation of CPUE with effort ( $E$ ) follows a negative exponential pattern :

$$C_t = E_t \cdot \exp(a - b E_t) \quad (13)$$

Efforts optimum is obtained by equating the first derivative of  $C_t$  to  $E_t$  equal to zero and find :

$$E_{opt} = \frac{1}{b} \quad (14)$$

The maximum sustainable yields of catch ( $C_{MSY}$ ) is obtained by inserting the value of the optimum effort into equation (13), and obtained:

$$C_{MSY} = \frac{1}{b} e^{a-1} \quad (15)$$

Model of Schnute [8], suggests another version of the surplus production model is dynamic and

deterministic. Schnute method is considered as a modification of the model in the form of discrete Schaefer (Roff, 1983, referred by Tinungki) [9],

$$\begin{aligned} \ln\left(\frac{U_{t+1}}{U_t}\right) &= r - \frac{r}{qK} \left(\frac{U_t + U_{t+1}}{2}\right) - q \left(\frac{E_t + E_{t+1}}{2}\right) \\ &= a - b \left(\frac{U_t + U_{t+1}}{2}\right) - c \left(\frac{E_t + E_{t+1}}{2}\right) \end{aligned} \quad (16)$$

where  $a = r$ ,  $b = \frac{r}{qK}$ , and  $c = q$ , is the regression coefficient estimators.

Walter and Hilborn (1976) referred by Tinungki [9], to develop other types of surplus production model, known as the regression model. Walter - Hilborn Model, using a simple differential equation, by the following equation :

$$\begin{aligned} \frac{U_{t+1}}{U_t} - 1 &= r - \frac{r}{Kq} U_t - q E_t \\ &= a - b U_t - c E_t \end{aligned} \quad (17)$$

where  $a = r$ ,  $b = \frac{r}{Kq}$ , and  $c = q$ , is the regression coefficient estimators.

Estimation of biological parameters for the surplus production model can also be done through estimation techniques proposed by Clarke, Yoshimoto, and Pooley (CYP) [9, 10]. The parameters which allegedly is  $r$ ,  $K$ , and  $q$ , the model is expressed as follows:

$$\begin{aligned} \ln(U_{t+1}) &= \left(\frac{2r}{2+r}\right) \ln(qK) + \frac{2-r}{2+r} \ln(U_t) - \frac{q}{2+r} (E_t + E_{t+1}) \\ \text{where : } a' &= \frac{2r}{2+r}, \quad a = a' \ln(qK), \quad b = \frac{2-r}{2+r}, \quad c = \frac{q}{2+r} \end{aligned} \quad (18)$$

thus equation (18) can be written in the form :

$$\begin{aligned} \ln(U_{t+1}) &= a' \ln(qK) + b \ln(U_t) - c (E_t + E_{t+1}) \\ &= a + b \ln(U_t) - c (E_t + E_{t+1}) \end{aligned} \quad (19)$$

## RESULTS AND DISCUSSION

Catches of Little tuna fisheries in the North Bolaang-Mongondow waters fluctuate from year to year. Data catching in 2008-2017, are presented in Table 1.

From the analysis of regression, equation for Schaefer Model :  $\frac{C_t}{E_t} = 1.929 - 0.002 E_t$ , with a coefficient of determination ( $R^2$ ) = 0.734 and a significance level of  $p < 0.05$ . Thus, a production model estimator catches Schaefer model according to the equation (8) is:  $C_t = 1.929 E_t - 0.002 E_t^2$ .

From the results of the regression analysis for Fox Model :

$\ln \frac{C_t}{E_t} = 0.733 - 0.001 E_t$ , with  $R^2 = 0.731$  ( $p < 0.05$ ). Estimates of catches corresponding to the model Fox equation (13) :  $C_t = E_t \cdot e^{(0.733 - 0.001 E_t)}$

For Schnute model according to equation (16), obtained regression equation:

$$\ln\left(\frac{U_{t+1}}{U_t}\right) = 0.055 - 0.337 \left(\frac{U_t + U_{t+1}}{2}\right) + 0.01 \left(\frac{E_t + E_{t+1}}{2}\right)$$

with  $R^2 = 0.457$ , and all the regression coefficient was significant ( $p > 0.05$ ).

Table 1. Total catch, fishing efforts, and CPUE (Catch per Unit of Efforts) of Little tuna in North Bolaang-Mongondow waters 2008-2017

Years	Catch (ton), $C_t$	Effort (trip), $E_t$	CPUE = $\frac{C_t}{E_t}$ (ton/trip)
2008	401.0	240	1.6708
2009	391.0	300	1.3033
2010	457.0	480	0.9521
2011	400.9	400	1.0022
2012	541.6	484	1.1190
2013	531.0	528	1.0057
2014	524.7	527	0.9956
2015	471.0	480	0.9813
2016	509.0	525	0.9695
2017	586.0	550	1.0655
Mean	481.320	451.400	1.1065

Source : Calculated from the Marine and Fisheries Service and Landing Station of Fish in North Bolaang-Mongondow

In Walter-Hilborn Model using equation (17) derived regression equation :

$$\frac{U_{t+1}}{U_t} - 1 = 1.009 - 0.651 U_t - 0.001 E_t$$

With  $R^2 = 0.831$  and not all regression coefficients were significant ( $p < 0.05$ ).

In the regression equation CYP Model, according to equation (19) :

$$\ln(U_{t+1}) = 0.325 + 0.074 \ln(U_t) - 0.000320(E_t + E_{t+1})$$

with  $R^2 = 0.464$ , and the regression coefficient are not significant ( $p > 0.05$ ).

The results of calculations for validation surplus production model of 5 models is presented is summarized in Table 2.

Table 2. Results of the surplus production model validation

	Model Schaefer	Model Fox	Model Schnute	Model Walter-Hilborn	Model CYP
Sign Suitability	Appropriate	Appropriate	Not Appropriate	Appropriate	Appropriate
$R^2$ Value	0.734	0.731	0.457	0.831	0.464
Validation Value	0.1019	0.2258	0.9909	1.0003	0.9999
Significance Coefficient	Significant	Significant	Not Significant	Not all significant	Not Significant

From the results of the

calculations in Table 2, it appears that the most appropriate is Schaefer model with the  $R^2$  value is quite large ( $R^2 = 0.734$ ) and validation (residual value) is smallest. Schaefer model obtained values of  $a = 1.929$

and  $b = 0.002$ , with equation (9) and (10) can be calculated optimum value of Effort ( $E_{opt}$ ) and the maximum sustainable catch ( $C_{MSY}$ ) as follows:

$$E_{opt} = \frac{a}{2b} = \frac{1.929}{2(0.002)} = 482.25 \approx 482 \text{ trips per year.}$$

$$C_{MSY} = \frac{a^2}{4b} = \frac{1.929^2}{4(0.002)} = 465.13 \text{ tons per year.}$$

This means that in order to preserve the bonito fisheries resources technically and biologically, in a year the number of units should not exceed 482 trips. To preserve the Little tuna resources in the waters North Bolaang-Mongondow, the maximum of fish that can be caught at 465.13 tons per year. Furthermore, from the value of  $E_{opt}$  and  $C_{MSY}$  can be calculated fishing effort levels and utilization level of bonito for a particular year for example in 2017, as follows:

$$\begin{aligned} \text{The level of effort in 2017} &= \frac{E_{2017}}{E_{opt}} \times 100\% \\ &= \frac{550}{482} \times 100\% = 114.10\% \end{aligned}$$

$$\begin{aligned} \text{The utilization level in 2017} &= \frac{C_{2017}}{C_{MSY}} \times 100\% \\ &= \frac{586.0}{465.13} \times 100\% = 125.99\% \end{aligned}$$

From the calculation, it turns out Little tuna fishing effort at the North Bolaang-Mongondow waters in 2017, greater than the maximum sustainable level of effort. This shows that fishing effort is not efficient. The utilization level for the year 2017, is more than optimum level, its mean a sign of overfishing (catch-over). The same result of Little tuna fishing effort and utilization level at the Talaud waters shows not efficient and overfishing [11], at Manado waters [12], also at Bitung waters [13].

This study describes the use of some statistical criteria in selecting the best surplus production model. By applying some statistical criteria in selecting a surplus production model, will obtain better results. Researchers in the field of fisheries get guidelines for setting selection criteria for surplus production models, as well as avoiding the direct application of one model in analyzing the surplus production model in a waters.

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## Heuristic Approach for Solving Capacitated Location-Routing Problems

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### INTRODUCTION

The Vehicle Routing Problems (VRP) is a terminology which refers to a problem of searching routes for a fleet of vehicles of known capacities to service a number of customers with known locations and known demands for a certain commodity, given a set of constraints, possibly integrated with production scheduling (Moons *et al.*, 2017). While, Facility Location Problems (FLP) concerns with selecting the placement of a facility (often from a list of integer alternatives) to minimize transportation costs and to best meet the demanded constraints (Drezner and Hamacher, 2002). If VRP and FLP are mutually considered then we have the so-called location-routing problems (LRP). In fact, classical LRP integrates the two kinds of decisions, namely opening a subset of depots, assigning customers to them and determining vehicle routes, to minimize a total cost including the cost of open depots, the fixed costs of vehicles used, and the total cost of the routes (Prodhon and Prins, 2014).

Book chapter by Marinakis (2009) provides the concise reference for the basic notion of LRP that includes the model and its variants as well as the solution method. While, book by Drezner and Hamacher (2002) offers more comprehensive review. Prodhon and Prins (2014) analyzes the recent literatures on the standard LRP and new extensions such as several distribution echelons, multiple objectives or uncertain data, including results of state-of-the-art metaheuristics method. A more recent survey paper on standard LRP is given by Schneider and Drexler (2017) as it provides concise paper excerpts that convey the central ideas of each work, discuss recent developments in the field, provide a numerical comparison of the most successful heuristic algorithms, and list promising topics for further research. Farahani *et al.* (2010) delivers a review on recent efforts and development in multi-criteria location problems in three categories including bi-objective, multi-objective and multi-attribute problems and their solution methods.

### RESULTS AND DISCUSSION

In this work we consider the capacitated location-routing problem (CLRP), the most basic and general variant of LRP by adding capacity constraint on both depots and vehicles. We formulate the problem in term of mixed integer linear programming (MILP) and approaches heuristically by  $k$ -means clustering for grouping customers. Dunn index is measured to determine the optimal number of clusters. Our procedure consists of five stages: optimally clustering customers by  $k$ -means, selecting the best depot, allocating customers to selected depot, and searching the optimal distribution route.

We implement our formulation and algorithm to three different datasets with 32 customers and 5 depot candidates, 21 customers and 5 depot candidates and 20 customers and 5 depot candidates, with different locations and demand level. Figure 1 shows the results of clustering, selecting, allocating and routing processes.

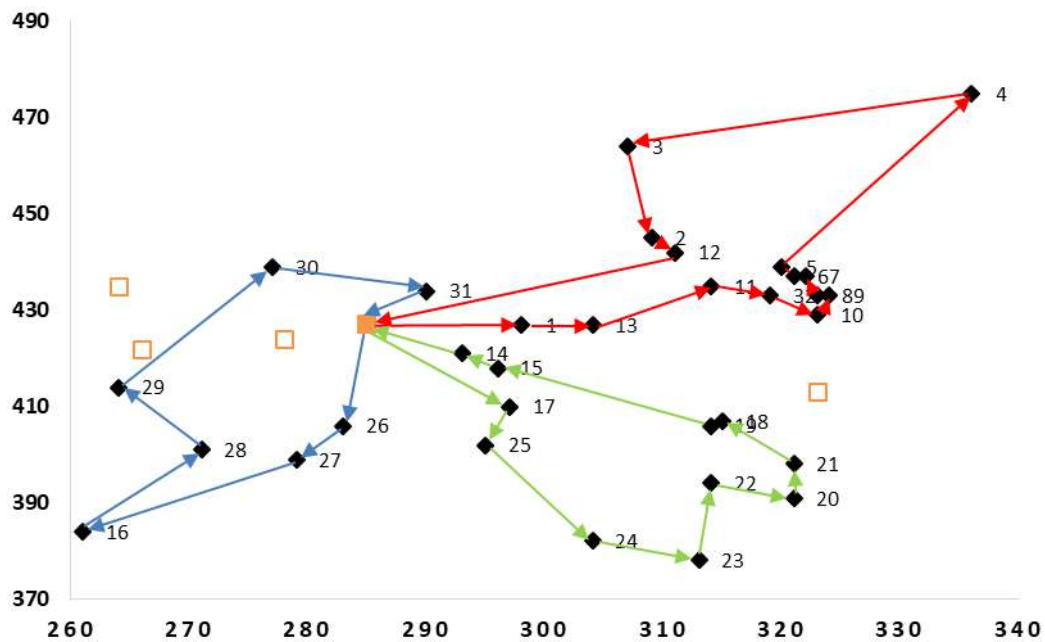


Figure 1. Results of clustering, selecting, allocating and routing.

**Keywords:** *k*-means, location-routing problems, vehicle routing problems.

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## Mixed Integer Formulations for Multiproduct Maritime Inventory Routing Problems

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### INTRODUCTION

It is forecasted by UNCTAD (2017) that world seaborne trade to increase by 2.8 per cent in 2017, with total volumes reaching 10.6 billion tons. It is also projected that expansion continues with volumes growing at an estimated compound annual growth rate of 3.2 per cent between 2017 and 2022. Cargo flows are expected to expand across all segments, with containerized and major dry bulk commodities trades recording the fastest growth. These facts suggest an effective maritime transportation of utmost importance.

In maritime transportation, huge quantities of products are usually loaded and unloaded at production and consumption ports. In this situation, the loading process, inventory and transportation are time consuming and costly (Christiansen *et al.*, 2011). Thus, the routing and scheduling of the ships as well as the inventory management should be planned simultaneously. The resulting problem is called a maritime inventory routing problem (MIRP) (Agra, *et al.*, 2018; Song and Furman, 2013). Optimization in maritime inventory routing is a well-established field of research in transportation planning with growing amount of research in the literature in various applications during the last decade (Christiansen and Fagerholt, 2009).

In this paper, a multiproduct MIRP is proposed and formulated in a mixed integer programming. An optimization model for determining ships travel routes by meeting demand and paying attention to inventory levels at each place so that the company's costs are minimum is considered.

### RESULTS AND DISCUSSION

For an illustrative example, it is considered a simple routing problem of 4 ships connecting 5 production ports and 3 consumption ports and delivering 2 products within 5 days of planning period. A number of parameters are utilized, such as the level of production and consumption in each port, including their initial levels and lower/upper bounds of inventory level, carrying capacity of ship, transportation and demurrage costs.

The problem was numerically solved by using software MiniZinc IDE 2.1.5 with solver COIN-OR CBC (bundled) under Windows 10 Pro operating system, processor intel/(R) core/(TM) i3-4150, CPU 3.50 GHz, RAM 4.00 GB.

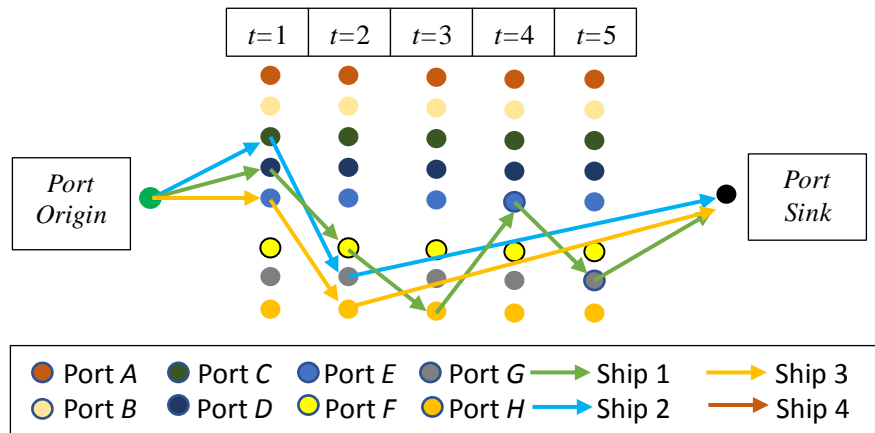


Figure 1. Case of single product.

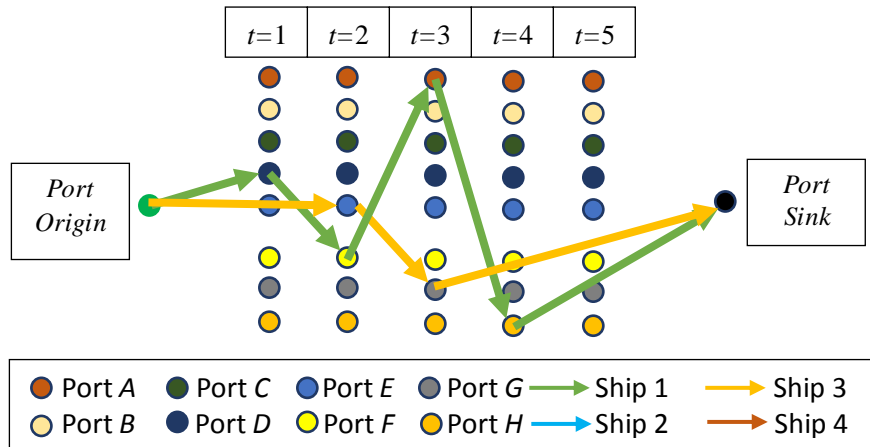


Figure 2. Case of two products.

**Keywords:** maritime inventory, mixed integer formulation, multiproduct, routing problem.

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## Discrete Optimal Capital Investment and Financing Policies in Fishery Resource Harvesting with Reserve Area

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### INTRODUCTION

Let  $S(k)$  denotes the stock of fishery resource at non-reserve area by time  $k$ ,  $V(k)$  represents the stock of fishery resource at reserve area by time  $k$  and  $X(k)$  refers to the stock of equity at time  $k$ . The discrete dynamical model of fishery resource management at reserve area that combine the harvesting effort, capital investment and financing policies can be given as follow:

$$S(k+1) - S(k) = \alpha S(k) \left[ 1 - \frac{S(k)}{M} \right] - r_1 S(k) + r_2 V(k) - qE(k)S(k),$$

$$V(k+1) - V(k) = \beta V(k) \left[ 1 - \frac{V(k)}{L} \right] + r_1 S(k) - r_2 V(k),$$

$$X(k+1) - X(k) = [pqS(k) - c - ma]E(k) - C(B(k)) - D(k).$$

In the above model, we define by  $E(k)$  and  $D(k)$  the harvesting effort rate and dividend payout rate by time  $k$ , respectively. The cost of fund  $C$  is assumed to be a function of the level of debt/lending by time  $k$ ,  $B(k)$ . Thus implicitly we have  $B(k) = mE(k) - X(k)$ , where  $m$  is the unit cost of harvesting effort. The control problem is to find control variables  $E$  and  $D$  such that maximized the present value of dividend payout over an infinite horizon that can further be expressed by

$$J = \sum_{k=0}^{\infty} (1+i)^{-k} [(pqS(k) - c - ma)E(k) - C(B(k)) - iX(k)],$$

where  $i$  is the market interest rate.

### RESULTS AND DISCUSSION

In this work we present an optimal harvesting model of a renewable natural resource. We offer the discrete-time version of Jorgensen and Kort (1997) of optimal investment and finance in renewable resource harvesting and that of Dubey *et al.* (2003) of fishery resource dynamic with reserve area. We take into account two intervention strategies, namely fish harvesting and dividend payment. Three cases were considered relating to the choice of cost of fund function: linear, piecewise linear and quadratic. Pontryagin maximum principle was applied in deriving a set of differential equations which consists of dynamical and adjoint systems as optimality conditions. An illustrative example for the case of piecewise linear cost of fund function was provided in the following figures to demonstrate the effectiveness of the intervention strategies.



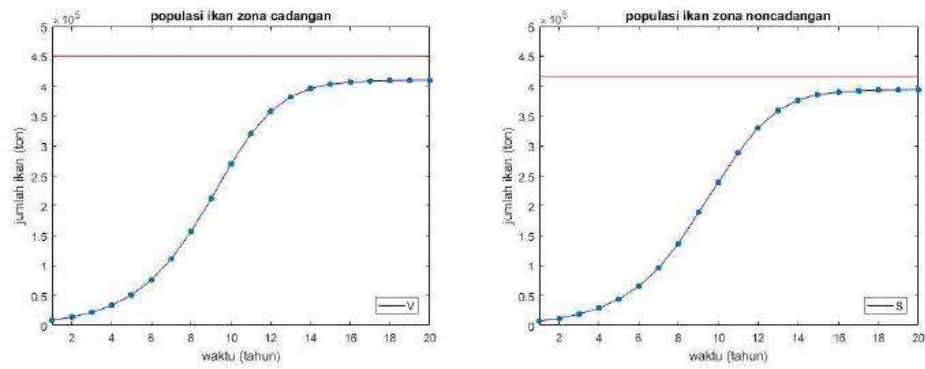


Figure 1. Fish population at reserve and non-reserve areas.

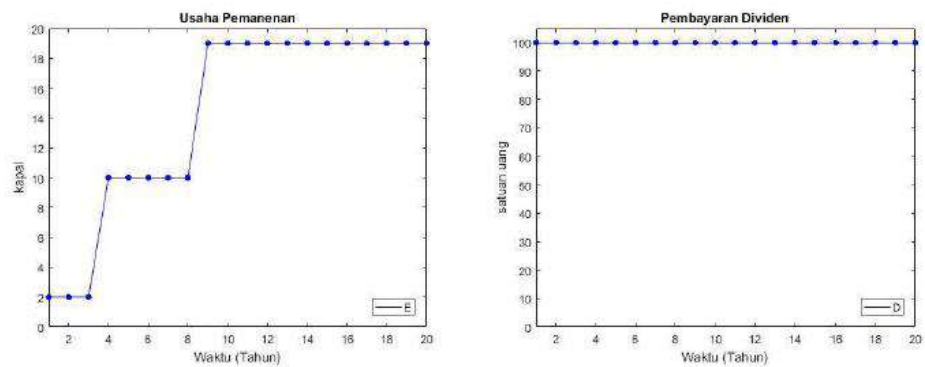


Figure 2. Optimal harvesting and dividend payment.

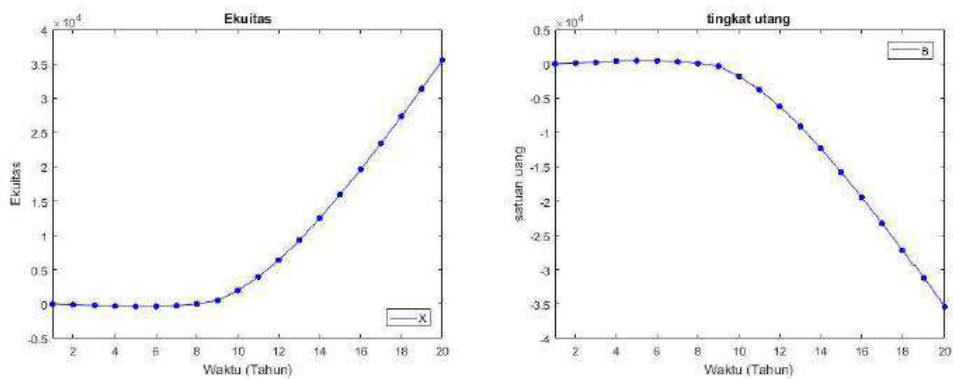


Figure 3. Equity and debt levels.

**Keywords:** dividend payment, Pontryagin maximum principle, optimal harvesting, reserve area.

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# Rainfall Prediction Using Backpropagation Algorithm Optimized by Broyden–Fletcher–Goldfarb–Shanno Algorithm

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## INTRODUCTION

Global warming causes the climate change in almost all parts of the world. An extreme climate change results in a long dry season and an extreme rainfall results the losses in various areas of life. High rainfall can causes floods, disease outbreaks and health problems, transportation problems, landslide, and crop failure, while low rainfall has a negative impact on the agricultural sector, i.e. land drought and crop failure.

The weather or rainfall is influenced by several factors, namely temperature, relative humidity, air pressure, wind speed, total cloud cover, and sun exposure. The weather or rainfall prediction becomes an important thing for planing in many life sectors. Prediction or forecasting methods have been widely proposed, for example Autoregressive Integrated Moving Average (ARIMA) and Artificial Neural Networks (ANN). The ARIMA model works on the assumption of stationary, whereas ANN can work without assumption assumptions. ANN is also able to acquire knowledge even though there is no certainty, generalize and extract from a particular data pattern, create a pattern of knowledge through self-organizing. One of the popular ANN models that has been successfully used is a backpropagation algorithm. It has been successfully used in various fields. However, the performance of backpropagation algorithm depends on the architecture and the optimization method used. The standard backpropagation algorithm uses the gradient descent method for optimizing the error. It is very slow to get small error. The other optimization method is the Broyden–Fletcher–Goldfarb–Shanno Algorithm, it is faster than gradient descent method.

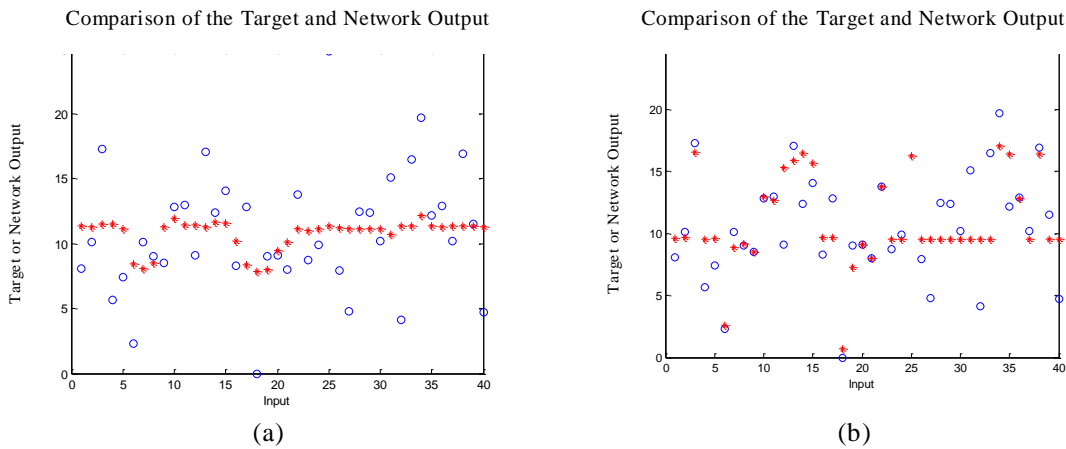
For this reason, this paper proposes rainfall will be predicted using the backpropagation algorithm optimized by Broyden–Fletcher–Goldfarb–Shanno algorithm. This research uses the average temperature, average relative humidity, and average wind speed for predicting rainfall.

## RESULTS AND DISCUSSION

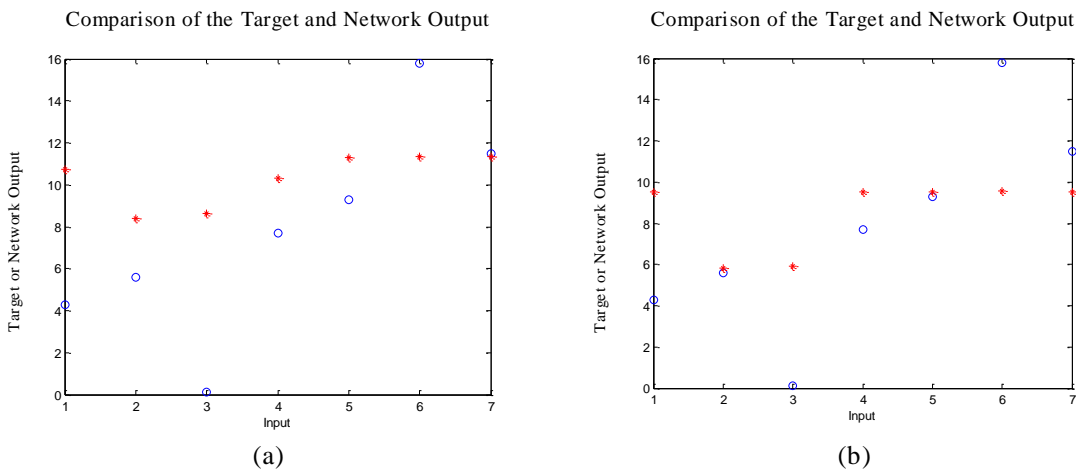
The data used were taken from Karangploso Meteorology Climatology and Geophysics Council Station, Malang Regency. The number of data is 47 data from 2014 until 2017. The data are devided into data training and testing data. The number of data training is 40 data (85% from data total) and the number of data training is 7 data (15% from data total). For implementing the system, the hardware used is Core i5 processor, 1.70 GHz, 2. 4.0 GHz RAM, 500 GB hard drive and the software used is MATLAB R2013a. The input data of the neural networks are the average temperature, the average relative humidity and the average wind speed in the previous month and the output of the neural networks is rainfall this month.

From the experimental results, the backpropagation algorithm optimized by Broyden–Fletcher–Goldfarb–Shanno algorithm results MSE (Mean Square Error) of 9.4049 for training data and 15.3017 for testing data, while the standard backpropagation algorithm results MSE of 19.1718 for training data and 21.7997 for testing data. Figure 1 (a) and (b) show the comparison of the rainfall truth data, and the prediction results by the standard backpropagation algorithm and the backpropagation algorithm optimized by Broyden–Fletcher–Goldfarb–Shanno algorithm for training data, respectively. Figure 2 (a) and (b) show the comparison of the rainfall truth data, and the prediction results by the standard backpropagation algorithm and the backpropagation algorithm optimized by Broyden–Fletcher–Goldfarb–Shanno algorithm for testing data, respectively. From the Figures 1 and 2, it can be seen that

the backpropagation algorithm optimized by Broyden–Fletcher–Goldfarb–Shanno algorithm gives better result compared with the standard backpropagation algorithm.



**Figure 1.** Comparison of the target and network output for training data. (a) the standard backpropagation (b) the backpropagation algorithm optimized by Broyden–Fletcher–Goldfarb–Shanno algorithm.



**Figure 2.** Comparison of the target and network output for testing data. (a) the standard backpropagation (b) the backpropagation algorithm optimized by Broyden–Fletcher–Goldfarb–Shanno algorithm.

**Keywords:** Rainfall Prediction, Backpropagation Algorithm, Neural Networks, Broyden–Fletcher–Goldfarb–Shanno Algorithm.

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## Queuing Model Using Sojourn Time Distribution with *Single Working Vacation and Vacation Interruption*

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### INTRODUCTION

Queueing as a result of delay in service is one of many events which occurs in daily activities. The delay in service is mostly caused by server shortage or slow server. In order to avoid queueing occurrence, best effort to prevent the delay is required. While constant queueing occurrence results in the increase of customer's Sojourn time, it would cost not only the customers but also the owner of the servers. To prevent the loss, queueing occurrence in the system caused by server disruption should be avoided.

According to Hillier and Lieberman (2011), queueing process is a process related to the arrival of customer to a queueing system or server, then waiting in the queue and selecting the server according to its discipline, until departing the queue system after the service is performed. One of the discussion in Queueing Theory is how to determine customer's Sojourn time by determining the suitable Sojourn time distribution model caused by delay in service.

### RESULTS AND DISCUSSION

One of the cause of inoperative server resulting the delay in service is server maintenance or repair. The inoperative server is called vacation, one daily server maintenance is called single working vacation. Long queue which forces the server to terminate the vacation is called vacation interruption.

This paper explains about queueing model with single working vacation and vacation interruption using Sojourn Time distribution. The models of waiting time (W), length of the queue (L), and probability of server occupation ( $\rho$ ) are employed in order to determine the decision for the solution. These models are obtained by determining Sojourn time distribution.

1. Sojourn Time time distribution using random distribution of serving time of one server with *single working vacation* and *vacation interruption* as follow,

$$W^*(\theta) = \frac{P_{0,0}\{\lambda(\theta-\lambda)S_0^*(\theta+v)(\theta+v-vS_1^*(\theta))+\theta S_1^*(\theta)[\lambda^2+v(\theta+\lambda+v)]\}}{\lambda(v+\theta)(\theta-\lambda+\lambda S_1^*(\theta))}$$

2. Model yang didapat dari distribusi *Sojourn Time*, pada waktu pelayanan berdistribusi eksponensial satu *server* dengan *single working vacation* dan *vacation interruption* adalah,
  - Customer's waiting time model in the system

$$W = \frac{\lambda v(1 - \lambda E[S_1])}{\lambda^2 + \lambda + v^2 - \lambda^2(1 + vE[S_1])} \frac{\lambda}{\lambda + v} \frac{2\lambda(2\lambda + s_1) + 2v(2\lambda + s_0)}{(2\lambda + s_0)(2\lambda + s_1)}$$

- Length of the queue model in the system,

$$L = \frac{\lambda^2 v(1 - \lambda E[S_1])}{\lambda^2 + \lambda + v^2 - \lambda^2(1 + vE[S_1])} \frac{\lambda}{\lambda + v} \frac{2\lambda(2\lambda + s_1) + 2v(2\lambda + s_0)}{(2\lambda + s_0)(2\lambda + s_1)}$$

- Probability of server occupation model,  $\rho = \frac{\lambda}{s_1}$ .

The analysis using secondary data by substituting parameter into the model obtains average waiting time of the document in the system is 0,287174 hours, average amount of document in the system is 7,897284 documents  $\approx$  8 documents, and the probability of server occupation is 0,585106. Based on the results we may conclude that the server is not highly occupied.

**Keywords:** Queuing, Sojourn Time, single working vacation, vacation interruption.

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## Optimization of Boat Trip from Java to Karimun Java Island using Design of Experiment

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### ABSTRACT

Today, in modern society the public transportation system is one of most important key in our daily life, as the same to others such as food, telecommunication, energy and water. As a consequence, this effects to the demand of number of transportation for the people. The transportation system is now becoming one of most issues to support people activities. In other hand, even the transportation system become increase, the transportation system cost usually high, leads the people experience problem in order to support their activities. However, usually the fastest and cheapest of transportation system must be the most popular to be chosen. This could a big challenging for institution or decision makers in order to provide a good transportation infrastructure system for mass public transportation. This papers dealt with the transportation system used in marine, which provides for people mover inter island. Authors, focused only on boat trip system from harbors in Java to Karimun Island. For transportation system inter island mode, there some important issues and critical should be considered. First all, the number of traffic which covers all the transportation system users. This means that whole the people can be accommodated to load in the ship. Second, time for the transportation is operating, which must be arranged in such technique to minimize the accident or other related to transportation system. Third, the expense of transportation system such as ticketing, tax, insurance etc. This paper dealt with a propose a new technique related to optimization of boat trip transport between Harbors in Java to Karimun Island, refers to schedule planning and number of boat to be tripped. The number passengers carried by the ship were optimized with optimize the loading for one-day trip, while number of traffic is limited. As a result, the number of passengers to be load could increase, but the number of ship to be sailed between the ship harbor steadily constant. This yields the cost of fuel for the shipping can be reduced, yields the maintenance for the traffic also could be minimized. The effectiveness of schedule technique was then validated using design of experiment. By using design of experiment can be predicted the optimum of traffic number and people to be loaded on the ship effectively.

Keywords: boat, boat trip, ship harbor, design of experiment

## Fishing Yield Forecasting uses Markov Chains and Alternative Markov Chains

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### ABSTRACT

The Indonesian sea has abundant natural resource potential. This potential includes various types of fish and high biodiversity. With the abundance of Indonesian marine fish production, such as large pelagic fish, small pelagic fish, and demersal, has made Indonesia a fish exporting country. In order to always be able to meet export needs, the amount of fish production must be maintained. Therefore, the prediction of the number of fish catches needs to be done so that the right steps can be taken if fish production is predicted to decline. Forecasting have used the Homogeneous Markov Chain, Time-Varying Markov model (where the transition probability matrix is assumed to be not constant), Extended Time-varying Markov model, and Non-Markov Model. In the next five years predicted fish catches tend to be fixed.

**Keywords:** Forecasting, Homogeneous Markov Chain, Time-varying Markov model, Extended Time-varying Markov model, Non-Markov model

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## Characteristic Polynomial and Eigenvalues of The Anti-Adjacency Matrix of Directed Cyclic Prism Graph

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### INTRODUCTION

A prism graph is a graph which corresponds to the skeleton of an  $n$ -prism and therefore it is a cyclic simple graph. It is denoted  $Y_n$  ( $n \geq 3$ ) where  $n$  is half the number of vertices. An  $n$ -prism graph has  $2n$  vertices and  $3n$  edges. In this paper, only regularly-directed prism cyclic graphs are investigated.

The anti-adjacency matrix is observed here as the graph representation. An anti-adjacency matrix of graph representation is a  $0 - 1$  matrix of size  $m \times m$  where  $m$  is the number of vertices. The entry  $b_{ij}$  of an anti-adjacency matrix  $B(G)$  for directed graph  $G$  is 0 if there exists a directed edge from vertex  $v_i$  to vertex  $v_j$  and is 1 otherwise. The determinant and the characteristic polynomial of the anti-adjacency matrix of directed cyclic prism graph  $Y_n$  are obtained. Some properties of the characteristic polynomial and the eigenvalues of the anti-adjacency matrix are studied.

### RESULTS AND DISCUSSION

To give a clearer depiction of the prism graph, the illustrations of directed cyclic prism graph for several values of  $n$  will be shown below.

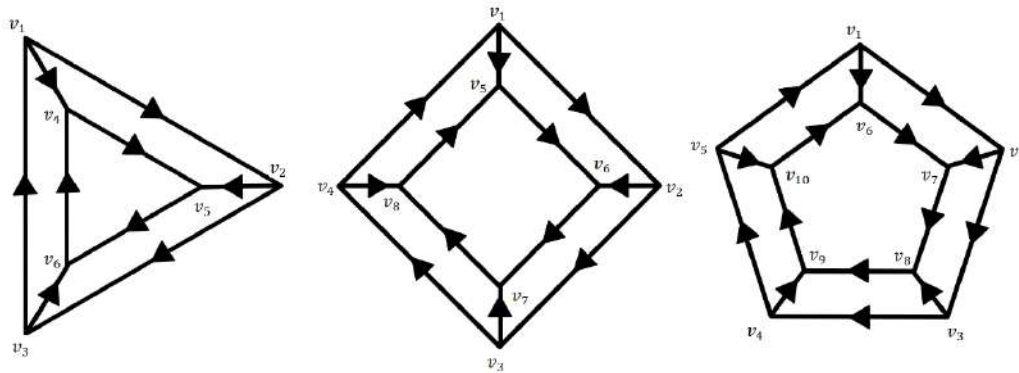


Figure 1. Prism Graphs  $Y_3$ ,  $Y_4$ , and  $Y_5$ .

Hereby, the anti-adjacency matrix of directed cyclic prism graph  $Y_n$  will be:

By

$$B(G) = \begin{matrix} \left[ \begin{array}{cccccccccccc} 1 & 0 & 1 & 1 & \cdots & 0 & 1 & 1 & \cdots & 1 \\ 1 & 1 & 0 & 1 & \cdots & 1 & 0 & 1 & \cdots & 1 \\ 1 & 1 & 1 & 0 & \ddots & 1 & 1 & 0 & \vdots & 1 \\ \vdots & \vdots & \vdots & \ddots & \ddots & \ddots & \vdots & \cdots & \ddots & \vdots \\ 0 & 1 & 1 & 1 & \cdots & 1 & 1 & 1 & \cdots & 0 \\ 1 & 1 & 1 & 1 & \cdots & 1 & 0 & 1 & \cdots & 1 \\ 1 & 1 & 1 & 1 & \cdots & 1 & 1 & 0 & \ddots & 1 \\ \vdots & \vdots & \vdots & \vdots & \ddots & \vdots & \vdots & \ddots & \ddots & \vdots \\ 1 & 1 & 1 & 1 & \cdots & 1 & 1 & 1 & \cdots & 0 \\ 1 & 1 & 1 & 1 & \cdots & 0 & 1 & 1 & \cdots & 1 \end{array} \right] & \begin{matrix} 1 \\ 2 \\ 3 \\ \vdots \\ n \\ n+1 \\ n+2 \\ \vdots \\ 2n-1 \\ 2n \end{matrix} \end{matrix} \tag{1}$$

$\begin{matrix} 1 & 2 & 3 & 4 & \cdots & n+1 & n+2 & n+3 & \cdots & 2n \end{matrix}$

doing row reductions, it will be obtained that the determinant of the anti-adjacency matrix  $B(G)$  of directed cyclic prism graph  $Y_n$  is  $1 - n$  which implies that the determinant is always negative since  $n \geq 3$ .

The characteristic polynomial is obtained by finding the determinant of  $\lambda I - B(G)$  where  $I$  is an identity matrix. By generalization, we get,

$$\begin{aligned}
 P(B(G)) = \lambda^{2n} + \sum_{i=1}^{n-1} (-1)^i (i+1)n\lambda^{2n-i} + (-1)^n (n-1)(n+2)\lambda^n \\
 + \sum_{i=n+1}^{2n-2} (-1)^i (2n-1-i)n\lambda^{2n-i} + 1 - n.
 \end{aligned} \tag{2}$$

Some properties of the characteristic polynomial of the anti-adjacency matrix have been discovered in previous researches. However, for particularly directed cyclic prism graphs, some others are studied in this paper by observing the both cyclic and acyclic induced subgraphs of the directed cyclic prisms graph. The anti-adjacency matrix of directed cyclic prism graph is found to have both real eigenvalues and complex eigenvalues which appear in conjugate pairs. Their properties might be studied as well.

**Keywords:** prism graph, directed cyclic graph, anti-adjacency matrix, characteristic polynomial

**Acknowledgment**

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## Kelly's Strategy Analysis in Optimizing Investment Portfolios in Foreign Exchange

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### INTRODUCTION

Investments in financial markets not only pay attention to promising profits, but also need to consider the risks that follow. Risks can be minimized by establishing an investment portfolio. This research was conducted with the aim of analyzing optimal portfolios on foreign exchange investments, so that investments made provide maximum returns at certain risks, or minimal risk on certain returns [1, 2, 3, 4].

### RESULTS AND DISCUSSION

The data analyzed in this study are foreign exchange traded at Bank Indonesia. Data analysis is carried out quantitatively using the Kelly Strategy model. The steps: (i) Calculation of individual foreign exchange returns, (ii) Determine the average value of individual foreign exchange returns, (iii) Determine the optimal portfolio using the Kelly strategy approach, and (iv) Determine portfolio returns and risks. Based on the results of the analysis obtained the allocation of weights that provide returns and risks to the optimal portfolio. So that it can be used as a consideration for investors, in making investment decisions in the foreign exchange being analyzed.

**Keywords:** Foreign exchange, return, risk, optimal portfolio, Kelly strategy.

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## Prediction of International Tourist Arrival to West Java Indonesia Using Decomposition Method

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### INTRODUCTION

The potential of West Java in tourism sector is undeniable considering its natural and human resources, making tourists feel comfortable to stay longer in West Java. Every year, international tourist arrival to West Java increases, forcing the government to work harder to facilitate accommodation for these international tourists. Data of international tourist arrival prediction facilitate in planning the development of West Java tourism [1, 2, 3].

### RESULTS AND DISCUSSION

Within this paper, forecast analysis using multiplicative decomposition method and its application in predicting the number of international tourists arriving to West Java Province has been done. The analyzed data was the data comprising international tourist arrival during January 2012 – December 2016. Data analysis revealed that the forecasting using the multiplicative yielded MAPE error of 14.18% or accuracy level of 85.82%. Thus, forecasting using multiplicative decomposition method is better and recommended to be used in data analysis on the existing international tourist arrival data. The out sample forecast result using multiplicative decomposition method showed that the international tourist arrival during January 2017-December 2017 was predicted to be 185,862 tourists.

**Keywords:** West Java, international tourist, decomposition method, prediction, MAPE.

### Acknowledgment

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## Comparison Between Multiplicative Holt Winter and Decomposition Method in Predicting the Number of Incoming International Tourists to Indonesia

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### INTRODUCTION

Indonesia has a remarkable potential in tourism sector, hence government should regulate all matters related with tourism and pay more attention to the developments happening in the tourism sector, including policy-making and planning. One way to aid the government in policy making and planning is by conducting a prediction about the number of incoming international tourists to Indonesia. This paper will elaborate the analysis about the comparison between multiplicative Holt-Winter and decomposition method in predicting the number of incoming international tourists to Indonesia. This paper aims to determine the appropriate forecasting method suitable for the available data pattern and provides more accurate forecasting result. Forecasting could be conducted using multiplicative Holt-Winter method and decomposition method. Meanwhile to determine the error level and forecast accuracy, mean absolute percentage error (MAPE) is used [1, 2, 3].

### RESULTS AND DISCUSSION

This paper had analyzed the comparison between multiplicative Holt-Winter method and multiplicative decomposition method and their application in forecasting the number of international tourist arrival to Indonesia. The analyzed data was the international tourist arrival data during the period of July 2013-June 2017. Analysis result showed that the MAPE error using multiplicative Holt-Winter method was 4.7098%, hence forecasting accuracy of 95.2902%. Meanwhile, forecasting using multiplicative decomposition method yielded MAPE error of 3.3254%, hence forecasting accuracy of 96.6746%. Thus, forecasting using multiplicative decomposition method was better and recommended to analyze the current international tourist arrival data. Out sample data forecast result using multiplicative decomposition method revealed that the international tourist arrival during the period of July 2017-June 2018 was approximately 12,466,650 tourists.

**Keywords:** Tourism, Holt-Winter method, decomposition method, forecasting, MAPE.

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## Optimization of the Mean-Standard Deviation Portfolio Investment in Some Banking Stocks Using the Singular Covariance Matrix Method

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### INTRODUCTION

Investing in banking stocks, investors are often faced with risk issues. Usually to minimize risk, it is done by forming an investment portfolio. This paper aims to discuss the optimization of investment portfolios. The data analyzed were some banking stocks traded on the capital market in Indonesia. Optimization is done using the mean-absolute deviation model to determine the optimum weight. Where optimization is done using a singular covariant matrix.

### RESULTS AND DISCUSSION

Based on the results of the optimization carried out can be obtained the composition of the allocation of weights that provide the optimum portfolio. In addition, we also predict the magnitude of expectation returns and risks in the optimal portfolio formed. So that this optimum weight composition can be used as consideration for investors in investing their capital in several banking stocks analyzed.

**Keywords:** Banking stocks, return, portfolio, optimization, mean-standard deviation.

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## Determination of Capital Allocation for Insurance Companies by Using Activity and Incremental Methods Based on Solvency II

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### INTRODUCTION

The insurance world is currently developing very rapidly and competing fiercely, thus requiring every insurance company to have a good planning and capital allocation strategy. Because it is necessary to stay alive in the world of insurance and reduce the chances of loss. This paper aims to determine the allocation of capital in several investment portfolios in order to avoid the risk of loss. To measure the magnitude of the worst risk that might occur there is an insurance company carried out using the Value-at-Risk model. Whereas to determine the amount of capital allocation is done by using Activity and Incremental Methods based on Solvent II. The portfolio formation is carried out on three alternatives, namely portfolio 1, portfolio 2, and portfolio 3 [1, 2, 3].

### RESULTS AND DISCUSSION

The results of the analysis show that the estimated magnitude of the worst risk is IDR 15,270,980.70. Based on the worst risk value, from the calculation, the capital allocation in portfolio 1 was IDR 4,929,411.88; portfolio 2 of IDR 5,541,156.95; and portfolio 3 of IDR 4,929,411.88. So that based on the results of this calculation can be taken into consideration in making capital allocation decisions by insurance companies.

**Keywords:** Capital allocation, investment portfolio, Value-at-Risk, Activity Method, Incremental Method, Basel II.

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## Expansion of the Investment Portfolio Performance Assessment Model Based on Value-at-Risk Using a Time Series Approach

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### INTRODUCTION

Portfolio performance assessment needs to be carried out before or after the investment decision is taken, in order to minimize the possibility of risk loss. This paper discusses the expansion of the investment portfolio performance appraisal model based on Value-at-Risk, where the analyzed stock returns on mean and volatility is non-constant. The aim is to increase the likelihood of achieving investment objectives by investors. In this paper the mean is estimated using autoregressive moving average models, while the non-constant volatility is estimated using generally autoregressive conditional heteroscedastic models. The estimators of mean and non-constant volatility are then used for the analysis of investment portfolio optimization. Portfolio optimization issues are followed based on the basic framework of the Mean-Value-at-Risk model. The solution to the investment portfolio optimization problem is done by using the Lagrange multiplier technique and the Kuhn-Tucker method. Assessment of investment portfolio performance is based on Reward to Value-at-Risk, which is then used to compare the two investment portfolios A and B are analyzed [1, 2].

### RESULTS AND DISCUSSION

Based on the identification of the long memory effect shows that stock returns  $S_1$ ,  $S_7$  and  $S_{10}$  there is an element of long memory. Average modeling and non-constant volatility indicate that stocks return  $S_1$ ,  $S_7$  and  $S_{10}$  following the ARFIMA-GARCH model;  $S_2$  ARMA-ARCH-M model;  $S_4$ ,  $S_4$  and  $S_5$  ARMA-GARCH model;  $S_6$  ARMA-FIGARCH model;  $S_8$  ARMA-EGARCH model; and  $S_9$  ARMA-TGARCH model. The average model and volatility are used to estimate the average values and variances of each stock. The portfolio A is composed of  $S_1$  up to  $S_5$ , whereas portfolio B consists of  $S_6$  up to  $S_{10}$ . Portfolio optimization is formed based on the Mean - Value-at-Risk model. Portfolio performance appraisal has been carried out based on the Reward to Value-at-Risk approach, and the results show that portfolio A has better performance than portfolio B. Based on the analysis of investment portfolios which include stocks  $S_1$  up to  $S_{10}$ , investors are recommended to choose portfolio A.

**Keywords:** ARMA-GARCH, VaR, Lagrange Multiplier, Kuhn-Tucker, RVaR.

### Acknowledgment

Acknowledgments are conveyed to the Rector, Director of Directorate of Research, Community Involvement and Innovation, and the Dean of Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran, with whom the Internal Grant Program of Universitas Padjadjaran was made possible to fund this research. The grant is a means of enhancing research and publication activities for researchers at Universitas Padjadjaran.

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## Convergence of Solution Function Sequence of Riccati Fractional Model

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### INTRODUCTION

The fractional model or fractional differential equation model is an equation that contains the derivative of a fractional order. Similar to the differential equation of natural number order, the type of this equation is divided into linear and nonlinear fractional differential equations. One of the nonlinear fractional equation is Riccati fractional differential equation. This paper discusses the method of finding solutions, which is continued by analyzing the convergence of the sequence of solution functions, as the basis for making the lubricant oil viscosity mode. The result show that the order sequence of Riccati's fractional differential equation which converge to a number causes the solution function sequence will converge to the solution function of Riccati's fractional differential equation with the order of these number.

### RESULTS AND DISCUSSION

Bentuk umum dari model persamaan diferensial fraksional Riccati orde  $\alpha$  adalah

$$\frac{d^\alpha y}{dt^\alpha} + u(t) + u^2(t) = A(t):$$

with  $0 < \alpha \leq 1$ ,  $t > 0$ , and initial conditions  $u(0) = 0$

To find solution of this fractional differential equation, we used Modified Homotopy Perturbation Method.

Let  $u(t) = g_i(t)$  is solution function of fractional differential equation with fractional order  $\alpha_i$  so that  $(g_n)(t)$  formed a solution function sequence, if fractional order sequence  $(\alpha_n)$  converge to  $\alpha$  then  $(g_n)(t)$  will converge to a solution function of fractional differential equation with fractional order  $\alpha$ . This illustration can be seen in Figure-1 and Figure 2 below:

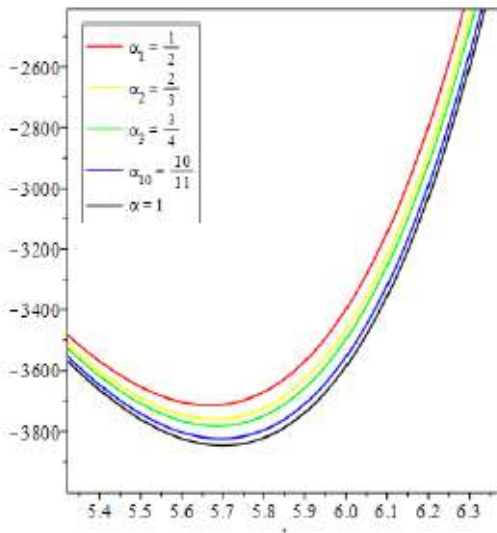


Fig-1 Graphs of Solution Function F of RFDE

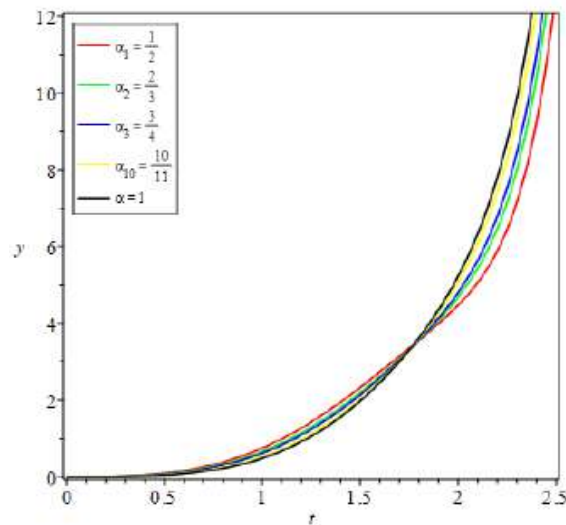


Fig-2 Graphs of Solution Function F of RFDE

$$\text{with } (\alpha_n) = \left(\frac{n}{n+1}\right) \quad A(t) = t$$

$$\text{with } (\alpha_n) = \left(\frac{n}{n+1}\right) \quad A(t) = t^2$$

From Figure-1 and Figure 2 above, it can be seen that the solution functions sequence moves according to the sequence of fractional orders, starting from red graph to black graph as a convergence function.

**Keywords:** differential equation, fractional, modified homotopy, riccati, sequence.

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## Fractional Differential Equation Models for Relaxation Problem of Lubricating Oil

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### INTRODUCTION

Two of the many problems of relaxation in fluids are surface tension and viscosity. Surface tension is a fluid tendency to stretch, so that the surface of fluids is covered by a membrane caused by cohesion. Surface tension is the surface force of each unit of length with the unit  $N/m$ . Viscosity is a measure that states the magnitude of friction between molecules in a fluid. The viscous the fluid the greater the friction in the fluid, so the more difficult the liquid to flow and an object increasingly difficult to move in viscous fluid. In the liquid, viscosity occurs is due to the force of cohesion while in the gas is the result of collisions between molecules. The measure of the viscosity of a fluid is called the viscosity coefficient with notation  $\eta$  and the unit is  $Nsm$  or Pascal seconds. This paper discusses the relationship between surface tension and viscosity of a fluid, especially lubricating oil.

### RESULTS AND DISCUSSION

The results of measurements of surface tension and viscosity of 25 lubricating oil samples are as follows.

Table-1 Viscosity and Surface-Tension on Room Temperature 20°C

No.	Brand	Type	Viscosity	Surface-Tension	No.	Brand	Type	Viscosity	Surface-Tension
1	Mesran	SAE 40	296	19,22	14	WIN 7005	15 W - 40	225	18,77
2	Mesran	SAE 90	406	19,00	15	WIN 8001	10 W - 40	184	18,80
3	Mesran	B 40	342	19,25	16	WIN F	20 W - 50	336	19,29
4	Mesran	40	260	18,98	17	WIN Diesel	40	350	19,25
5	Mesran Super	20 W - 50	339	19,12	18	WIN Ext Diesel	15 W - 40	230	19,01
6	Prima XP	10 W - 40	193	18,68	19	Mobil SPR 2000	10 W - 40	183	18,74
7	Prima XP	15 W - 40	257	18,94	20	Mobil SPR 2000	15 W - 40	207	18,95
8	Prima XP	20 W - 50	367	19,13	21	Meditran SX	15 W - 40	234	18,88
9	Fastron	0 W - 20	50	18,14	22	Meditran S	40	361	19,19
10	Fastron	15 W - 50	277	18,68	23	Meditran SC	15 W - 40	229	18,97
11	Fastron Tech	10 W - 40	189	18,58	24	Federal Diesel	15 W - 40	205	18,58
12	Shell HX3	20 W - 50	363	19,03	25	Refsol Elite Spr	20 W - 50	269	18,74
13	Shell HX3	15 W - 40	246	18,68					

The fractional differential equation model can be predicted as follows:

$$\gamma^{(\alpha)} + a\gamma = b \cdot e^{k\eta}.$$

with  $0 < \alpha < 1$  and initial conditions  $\gamma(0) = 0$

Solution of this fractional differential equation is.

$$\gamma(\eta) = \sum_{i=0}^{\infty} \sum_{n=0}^{\infty} b k^n \eta^{\alpha+n} \frac{(-a \eta^\alpha)^i}{(\alpha i + \alpha + n + 1)!}$$



Based on the data in Table-1, can be shown some possible solutions as seen in Fig.1 below.

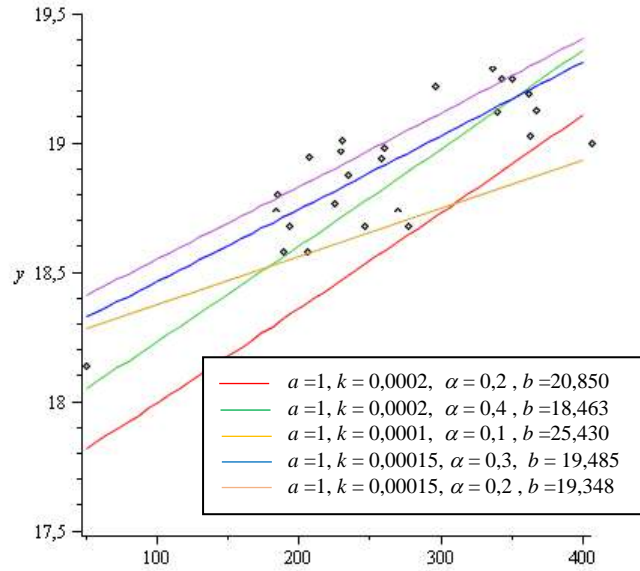


Fig-1: Graphs of Fractional Differential Equation Model

Thus, based on the result of observation of solution function in Fig.1 and matching with Table-1, the most optimum model is the blue graph with the fractional differential equation model:

$$\gamma^{(0.3)} + \gamma = 19.485 e^{0.00015\eta} .$$

**Keywords:** differential, fractional, relationship, relaxation, surface-tension, viscosity.

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## Return Prediction and Risk of Telecommunication Stock in IDX Using the Capital Asset Pricing Model (CAPM) Method

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### INTRODUCTION

Investment is a form of profit-seeking business by investing in a company that opens its shares for sale. Investments provide benefits to the company and also the investors, but sometimes also give a loss to both parties. Therefore, an investor will do various ways to prevent himself making adverse investments. One of them is Capital Asset Pricing model (CAPM). CAPM is used as a basis for consideration in making an investment decision on a securities by looking at the correlation between return and systematic risk. This essay will discuss calculation of expected return and risk by using CAPM method.

### RESULTS AND DISCUSSION

The result of this essay is the comparison of return and risk of some telecommunication companies that listed in IDX as consideration in investment decision.

**Keywords:** Return stock, investment, capital asset pricing model, risk.

### Acknowledgment

Acknowledgments are conveyed to the Rector, Director of Directorate of Research, Community Involvement and Innovation, and the Dean of Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran, with whom the Internal Grant Program of Universitas Padjadjaran was made possible to fund this research. The grant is a means of enhancing research and publication activities for researchers at Universitas Padjadjaran.

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## Technical Efficiency of Islamic Banking in Indonesia: The Study was Conducted on Eight Islamic

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### INTRODUCTION

This paper discusses the calculation of technical efficiency of Islamic banking in Indonesia. The study was conducted on eight Islamic banks belonging to both Islamic Bank (BUS) and Islamic Window (UUS) during the period 2007-2011 through the intermediation approach. The method used is the Data Envelopment Analysis (DEA) model of Constant Return to Scale (CRS). Variables used consists of input variables (deposit, labor cost, and fixed asset) and output variables (financing and operational income).

### RESULTS AND DISCUSSION

The calculations show that there are several Islamic banks that showed inefficient performance during the study period. BUS that showed inefficient performance are Bank Syariah Mandiri in 2007-2010 and Bank Syariah Mega Indonesia in 2008. UUS that showed inefficient performance are BNI Syariah in 2007-2009, BTN Syariah in 2007, and Bank CIMB Niaga Syariah in 2010 and 2011.

**Keywords:** Islamic banking, BUS, UUS, technical efficiency, DEA, CRS

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## Generalized Space Time Autoregressive (GSTAR) Model and The Application On Wind Speed and High Wave Prediction

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### INTRODUCTION

Time series models involving time-location are often called time-space models. For example weather data, besides depending on time also depending on location. Cliff and Ord [2] developed a space-time model called the Space Time Autoregressive (STAR) model. Furthermore Ruchjana [5] and Borovkova [1] developed the STAR model becomes a Generalization STAR model (GSTAR), by assuming that the autoregressive parameter and time space parameter is different for each location, the model applies to heterogeneous locations. In the STAR and GSTAR models it is assumed that the error variance is constant which is called homoskedastic. But the homoskedastic assumption is rarely found in real situation. So, a time series model has developed with heteroscedastic assumptions [3]. This paper describes the GSTAR model with heteroskedastic assumption and application on wind speed and high wave prediction.

### RESULTS AND DISCUSSION

Time series modeling involving time-location includes the Generalization of Space Time Autoregressive (GSTAR) model [5]. In the GSTAR model, autoregression parameters and space time parameters are different for each location, so that the GSTAR model appropriate for the heterogeneous location characteristics. The GSTAR model can be expressed in forms

$$\mathbf{Z}_t = \sum_{k=1}^p \sum_{l=0}^{\lambda_k} \Phi_{kl} \mathbf{W}^{(l)} \mathbf{Z}_{t-k} + \boldsymbol{\varepsilon}_t \quad (1)$$

where  $\Phi_{kl}$  is autoregressive parameters at time lag  $k$  and spatial lag  $l$ . The fields that use this model include petroleum production models [5]. In the GSTAR model it is assumed that the error is white noise with a zero mean and has a constant variance.

Suppose that  $\mathbf{Z}(t) = (Z_1(t), \dots, Z_N(t))'$  is a time series vector with zero mean vector, namely  $E[\mathbf{Z}(t)] = \mathbf{0}$ . The general form of the one order GSTAR-ARCH model [4], can be stated as

$$\mathbf{Z}(t) = \Phi_{10} \mathbf{Z}(t-1) + \Phi_{11} \mathbf{W} \mathbf{Z}(t-1) + \boldsymbol{\varepsilon}(t)$$

$$\boldsymbol{\varepsilon}(t) = \mathbf{D}_t \boldsymbol{\eta}_t$$

$$(\boldsymbol{\varepsilon}_t | F_{t-1}) \sim N(\mathbf{0}, \boldsymbol{\Sigma}_t)$$

Parameters  $\Phi_{10}$  dan  $\Phi_{11}$  can be written as:

$$\Phi_{10} = \text{diag}(\phi_{01}, \dots, \phi_{0N}) \quad \text{dan} \quad \Phi_{11} = \text{diag}(\phi_{11}, \dots, \phi_{1N}).$$

In the calculation of parameter estimation, (1) is expressed in the form:  $\mathbf{Y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}$ . Parameter  $\boldsymbol{\beta}$  is estimated using computer software [6] with the formula:

$$\hat{\boldsymbol{\beta}} = (\mathbf{X}' \mathbf{X})^{-1} \mathbf{X}' \mathbf{Y}.$$

Suppose  $Y_1$  and  $Y_2$  are the wind speed in sea of Manado and Bitung respectively. So the application of the GSTAR(1.1) model to two locations for wind speed in the sea of Manado and Bitung is

$$Y_1(t) = 0,5942 Y_1(t-1) + 0,1721 Y_2(t-1)$$

$$Y_2(t) = 0,7638 Y_2(t-1) - 0,0097 Y_1(t-1)$$

Suppose that  $Z_1$  and  $Z_2$  are respectively ocean wave heights in the sea of Manado and Bitung respectively.

So the application of the GSTAR(1.1) model to two locations for sea wave height in the sea of Manado and Bitung is

$$Z_1(t) = 0,7418 Z_1(t - 1) + 0,1721 Z_2(t - 1)$$

$$Z_2(t) = 0,8998 Z_2(t - 1) + 0,0328 Z_1(t - 1)$$

Wind speed and sea wave height in the sea of Manado and Bitung are affected by wind speed and sea wave height one time previously at the same location and from the surrounding location.

**Keywords:**GSTAR model, wind speed, wave high.

### Acknowledgment

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## Book Embedding of 3-crossing-critical Graphs with Rational Average Degree Between 3.5 and 4.

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### INTRODUCTION

A graph  $G$  is  $k$ -crossing critical if the crossing number of  $G$  is  $k$  and deleting an edge of  $G$  decreases the crossing number of  $G$  to less than  $k$ . A *book* consists of half-planes called *pages*, all having the same boundary called the *spine*. A *book embedding* of a graph  $G$  is an embedding of  $G$  into a book such that the vertices of  $G$  are put on the spine and each edge of  $G$  is on a single page. The *pagenumber* of graph  $G$  is the minimal number of pages needed to embed  $G$  into book. The pagenumber problem was introduced by Kainen [2] and is an NP-complete problems [1].

We look at the infinite family  $P(r)$  of 3-crossing-critical graphs with rational average degree  $r \in (3.5, 4)$ , which are modifications of the  $\binom{2h+3}{2}$ -crossing-critical graphs introduced by Pinontoan and Richter [3]. We embed  $P(r)$  into a book and determine their pagenumbers.

### RESULTS AND DISCUSSION

We embed the graphs  $P(r)$  for  $r \in (3.5, 4)$  and show that the pagenumbers of  $P(r)$  are 3.

**Keywords:** *book embedding, pagenumber, crossing-critical graph*

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## An Orbit on Julia Set with Trigonometric Function

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### Introduction

Batik Minahasa is batik with traditional motif from minahasa land, North Sulawesi Indonesia. [1]Batik Minahasa is influenced by the values of Minahasa culture and life's philosophies. Waruga is Minahasa ethnic's tomb which made of stone where the upper part is triangular and the bottom part is shaped box with column. There are reliefs on the top of waruga which shaped a man. This relief is called of waruga motif. In mathematics, a fractal is an abstract object used to describe and simulate naturally occurring objects. Julia sets can be simple (like a circle) or extremely complicated like a fractal. Julia sets are defined by iterating a function of a complex number. Pick a point in the complex plane (i.e., a complex number; these can be represented as a point  $z = (x,y)$  in the plane). Iterate the function starting at this point. Having had a look at the fun that can be had with fractals based on  $z \dots z^2 + c$ , and  $z \dots z^n + c$ . What happens when we start with functions borrowed from trigonometry? The two obvious functions to investigate in this research are sine and cosine function. Research by Riskika and Julia is to produce a combination of Batik Minahasa based on Julia set of  $z = \dots$  [2]. The key feature of this paper is to show that the trigonometric functions, which falls under category of transcendental function is an example, where Julia set is all of  $C$ .

The study of dynamical behaviour of transcendental functions were initiated by Fatou [3]. For transcendental function, points with unbounded orbits are not in Fatou sets but they must lie in Julia sets. Attractive points of a function have a basin of attraction, which may be disconnected.

A Julia set thus, satisfies the following properties:

- (i) Closed
- (ii) Nonempty
- (iii) Forward invariant (If  $z \in J(F)$ , then  $F(z) \in J(F)$ ), where  $F$  is the function)
- (iv) Backward invariant
- (v) Equal to the closure of the set of repelling cycles of  $F$

Thus, the iteration of complex analytic function  $F$  decompose the complex plane into two disjoint sets.

1. Stable Fatou sets in which iterates are well behaved.
2. Julia sets on which the map is chaotic

In trigonometric functions,  $G(z) = \sin z$ , 0 is defined as fixed point for  $G$ . If  $x_0 \in R$ , then either  $G(x_0) = 0$  or  $G^n(x_0) \rightarrow 0$ . Also, we have the points lying on the imaginary axis have their orbits that tend to infinity since

On the other orbits which escapes for cosine function, if  $[C_\gamma^n(z)] \rightarrow \infty$  as  $n \rightarrow \infty$ , then orbit which escapes do so, with the increase in the imaginary part. Sine and cosine functions are thus declared as Topologically complete [4].

The fixed point in topology,  $z = z_0$  is declared as

- Attracting if  $0 < |F'(z_0)| < 1$
- Superattracting if  $F'(z_0) = 0$

- Repelling if  $|F'(z_0)| > 1$
- Neutral if  $F'(z_0) = e^{i2\pi\theta_0}$

If  $\theta_0$  is rational, then  $z_0$  is rationally indifferent or parabolic, otherwise  $z_0$  is irrationally indifferent.

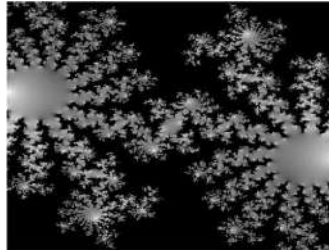
We are introducing in this paper trigonometric functions of the type  $\{\sin(z^n) + c\}$  and  $\{\cos(z^n) + c\}$  and applied iterated function system to develop an entirely new class of Julia set. And then we combine new class of Julia set (fractal images) with Batik Minahasa motifs to produce a new motif for Batik Minahasa.

## Results and Discussion

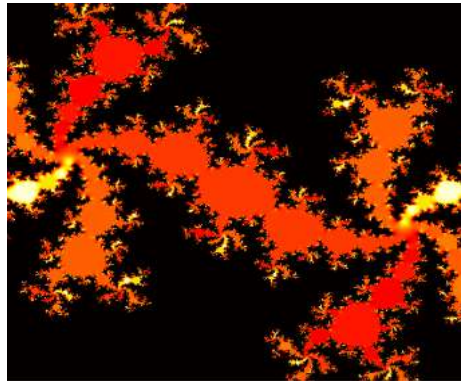
### Generating the fractal motifs

The fractal generated from equation  $z \rightarrow \cos(z^n) + c$  possesses symmetry along the real axis.

- In case of a quadratic polynomial, the central body is divided into two parts.



- In case of a cubic polynomial, the central body is divided into two equal parts, each part containing one major secondary lobe and many minor secondary lobes



Fixed Points of cosine function

(i) Quadratic polynomial

Table 1. Orbit of  $F(z)$  for  $z_0 = 0.000+0.000i$

Number of Iteration i	F(z)	Number of Iteration i	F(z)
1	0.5+0.5i	11	0.509+0.314i
2	0.489+0.250i	12	0.416+0.344i
3	0.406+0.379i	13	0.469+0.358
4	0.485+0.346i	14	....
5	0.438+0.335i	15	....

6	$0.456+0.355i$	73	$0.427+0.314i$
7	$0.454+0.340i$	74	$0.427+0.314i$
8	$0.499+0.51i$	75	$0.427+0.314i$
9	$0.494+0.245i$	76	$0.427+0.314i$
10	$0.434+0.121i$	77	$0.427+0.314i$

Here we observe that the value converges to a fixed point after 73 iterations

**Keywords** : Julia Set, an orbits, trigonometry function

### Acknowledgments

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## A Novel 3-D Chaotic System with Line Equilibrium: Dynamical Analysis, Coexisting Attractors, Offset Boosting Control and Circuit Design

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### Introduction

Chaotic systems are characterized by their high sensitivity to small changes in initial conditions [1-2] and they have many applications in science and engineering such as weather systems [3-4], ecology [5], neurons [6-7], biology [8-10], cellular neural networks [11-12], chemical reactors [13-14], oscillators [15-20], robotics [21-24], encryption [25-30], finance systems [31-32], circuits [33-45], etc.

In the chaos literature, there is good interest in finding chaotic systems with infinite number of equilibrium points such as line equilibrium [46-50], square equilibrium [51], ellipse equilibrium [52], conch equilibrium [53], circle equilibrium [54], heart-shaped equilibrium [55], etc.

In this research paper, we report the finding of a new chaotic system with equilibrium points on the  $z$  – axis (line equilibrium) as well as two equilibrium points on the  $(x, y)$  – plane. We describe the phase plots of the chaotic system and do a rigorous dynamic analysis by finding bifurcation diagrams, Lyapunov exponents, equilibrium points, etc. Bifurcation analysis gives valuable information about the chaotic systems [56-61].

Section 2 describes the new chaotic system, its phase plots and equilibrium points. Section 3 describes the dynamic analysis of the new chaotic system. Section 4 depicts an electronic circuit realization of the new chaotic system. Section 5 draws the main conclusions.

### A new chaotic system with line equilibrium

In this work, we report a new 3-D system given by the dynamics

$$\begin{cases} \dot{x} = z \operatorname{sign}(y) \\ \dot{y} = x|x| - y|y| \\ \dot{z} = a|x| - bxy \end{cases} \quad (1)$$

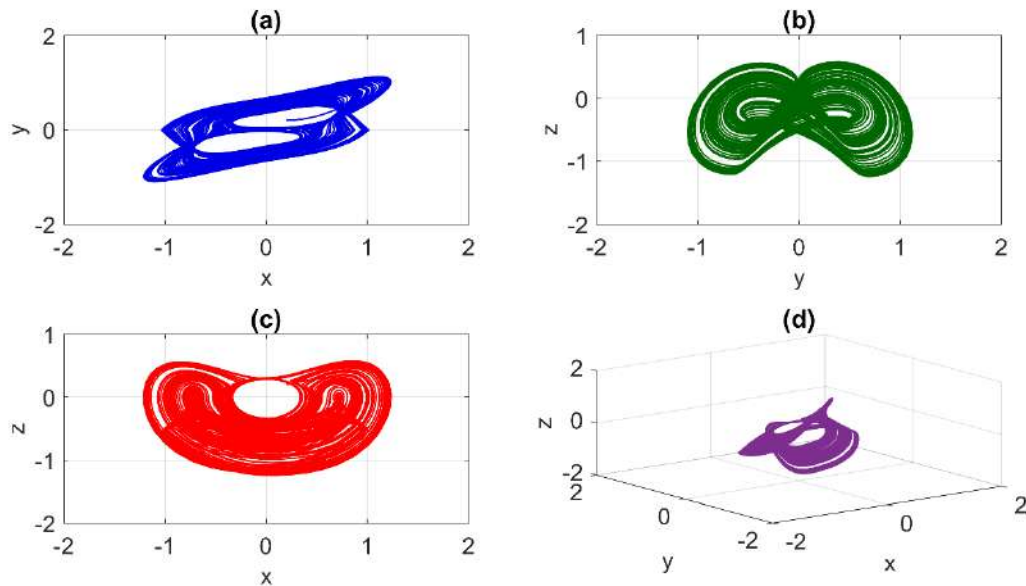
Where  $x, y, z$  are state variables and  $a, b$  are positive constants.

In this paper, we show that the dynamical system (1) is *chaotic* for the parameter values

$$a = 0.6, b = 1.6 \quad (2)$$

For numerical simulations, we take the initial values of the system (4) as  $X(0) = (0.2, 0.2, 0.2)$ .

Figure 1 shows the phase portrait of the new system (4) for  $(a, b) = (0.6, 1.6)$  and initial conditions  $X(0) = (0.2, 0.2, 0.2)$ . Figures 1 (a)-(c) show the 2-D phase plots of the new chaotic system (1) in  $(x, y)$ ,  $(y, z)$ ,  $(x, z)$  coordinate planes, while Figure 1 (d) shows the 3-D phase plot of the new chaotic system (1).



**Figure 1.** Plots of the new chaotic system (1) for  $(a, b) = (0.6, 1.6)$  and  $X(0) = (0.2, 0.2, 0.2)$

We take the parameters  $a$  and  $b$  as in the chaotic case (2), *i.e.*  $(a, b) = (0.6, 1.6)$ .

The equilibrium points of the new chaotic system (1) are obtained by solving the system of equations

$$z \operatorname{sign}(y) = 0 \quad (3a)$$

$$x|x| - y|y| = 0 \quad (3b)$$

$$a|x| - bxy = 0 \quad (3c)$$

Solving the equations (3), we obtain the set of equilibrium points

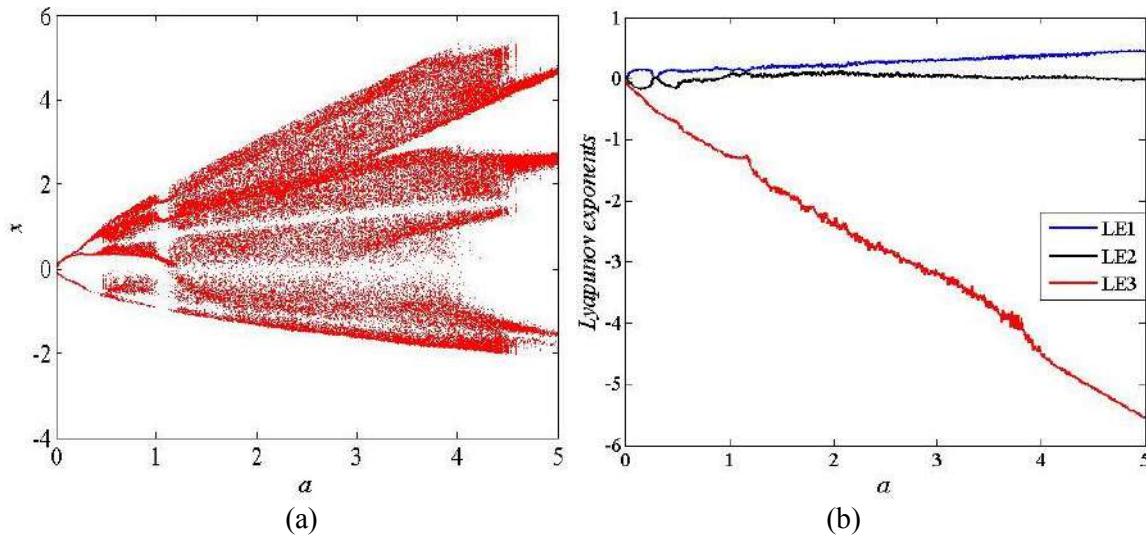
$$S = \{(x, y, z) \in \mathbb{R}^3 : x = 0, y = 0\} \cup \{(0.3750, 0.3750, 0), (-0.3750, -0.3750, 0)\}.$$

Thus, the new chaotic system (1) has the whole of  $z$ -axis as its equilibrium points as well as the two points  $(0.3750, 0.3750, 0)$  and  $(-0.3750, -0.3750, 0)$  on the  $(x, y)$ -plane.

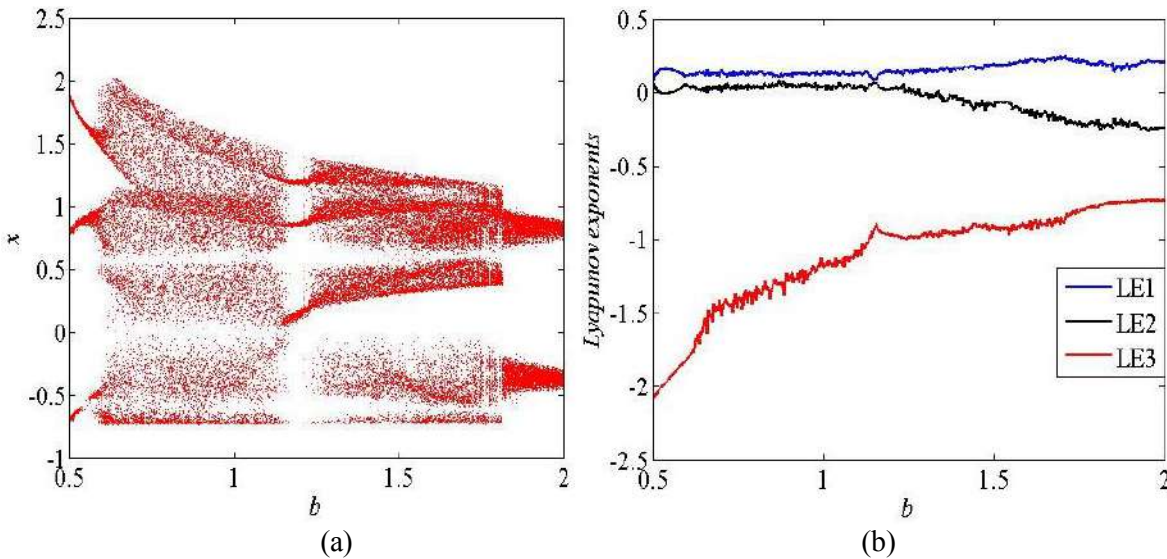
## Numerical Study

### 3.1 Bifurcation and Chaos

We fix  $b = 0.6$  and vary  $a$  in the range of  $[0, 5]$ . The bifurcation diagram for varying  $a$  and the related graphs of Lyapunov exponents are provided in Figure 2 (a), (b). Obviously, from the bifurcation diagram, one can get that the system is in periodic state in the beginning, then goes into chaos. In addition, there is a big periodic window. Similarly, from Figure 3 (a), one can see that the system changes from period to chaos in the whole region except for a large period-3 window in the region of  $[1.1, 1.3]$ . Note that the bifurcation diagram and the Lyapunov exponents match well with each other.



**Figure 2 (a)** Bifurcation diagram of system (1) versus the parameter  $a$  for  $b = 0.6$  and initial conditions  $(x(0), y(0), z(0)) = (0.2, 0.2, 0.2)$ ; **(b)** Lyapunov spectrum of system (1) when varying the parameter  $a$  for  $b = 0.6$ , and initial conditions  $(x(0), y(0), z(0)) = (0.2, 0.2, 0.2)$ .

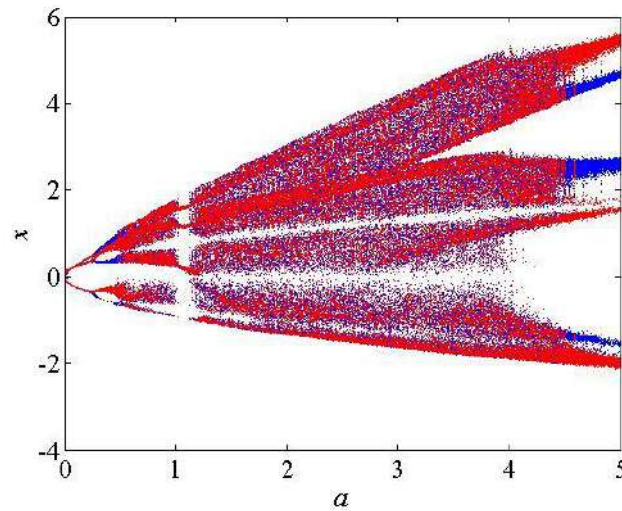


**Figure 3 (a)** Bifurcation diagram of the system (1) versus the parameter  $b$  for  $a = 1.6$  and initial conditions  $(x(0), y(0), z(0)) = (0.2, 0.2, 0.2)$ ; **(b)** Lyapunov spectrum of the system (1) when varying the parameter  $b$  for  $a = 1.6$ , and initial conditions  $(x(0), y(0), z(0)) = (0.2, 0.2, 0.2)$ .

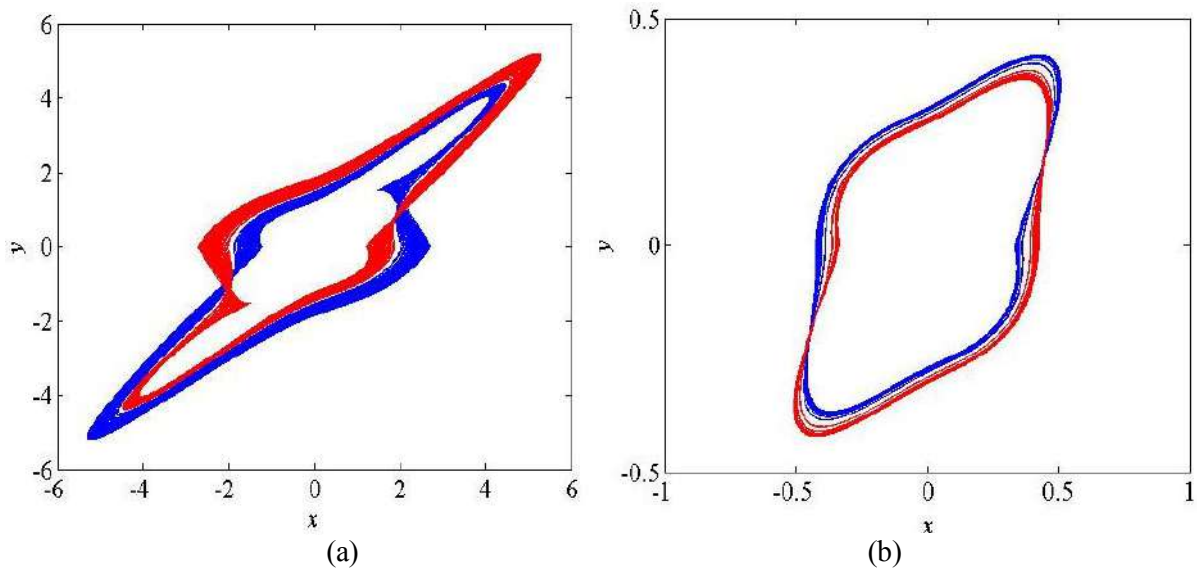
### 3.2 Coexisting attractor

In this work, the bifurcation diagrams of the system (1) versus  $a$   $[0, 5]$  are shown in Figure 4, where the blue color starts from the initial conditions  $(0.2, 0.2, 0.2)$  and the red color starts from the initial conditions  $(-0.2, -0.2, 0.2)$ , respectively. As can be seen from the bifurcation diagram, there exists coexisting attractors in the very narrow regions of  $[0.25, 0.5]$  and  $[4.5, 5]$ . The coexisting chaotic attractors can be seen in Fig. 5a, when  $a = 4.5$  and the coexisting periodic attractors can be seen in Fig. 5b, when  $a = 0.25$ .





**Figure 4** The bifurcation diagrams of the system (1) with  $a$  from 0 to 5 for  $b = 1.6$ . condition:  $(x(0), y(0), z(0)) = (0.2, 0.2, 0.2)$  (blue),  $(x(0), y(0), z(0)) = (-0.2, -0.2, 0.2)$ , (red)



**Figure 5** Phase portraits of the system (1) displayed in the  $x$ - $y$  plane when changing the value of parameter  $a$ : (a) the coexisting chaotic attractors for  $a = 4.5$   
 (b) the coexisting periodic attractors for  $a = 0.25$ .

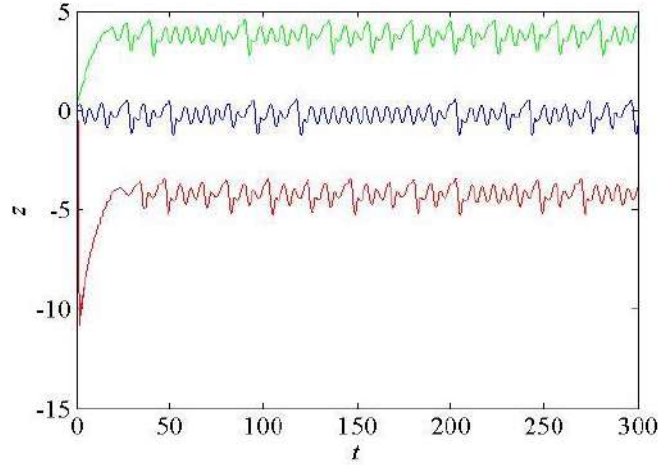
### 3.3 Offset boosting control

Clearly, the state variable  $z$  appears only once in the first equation of the system. Therefore, we can control the state variable  $z$  conveniently. The state variable  $z$  is offset-boosted by replacing  $z$  with  $z + k$ , in which  $k$  is a constant. The system can be rewritten as

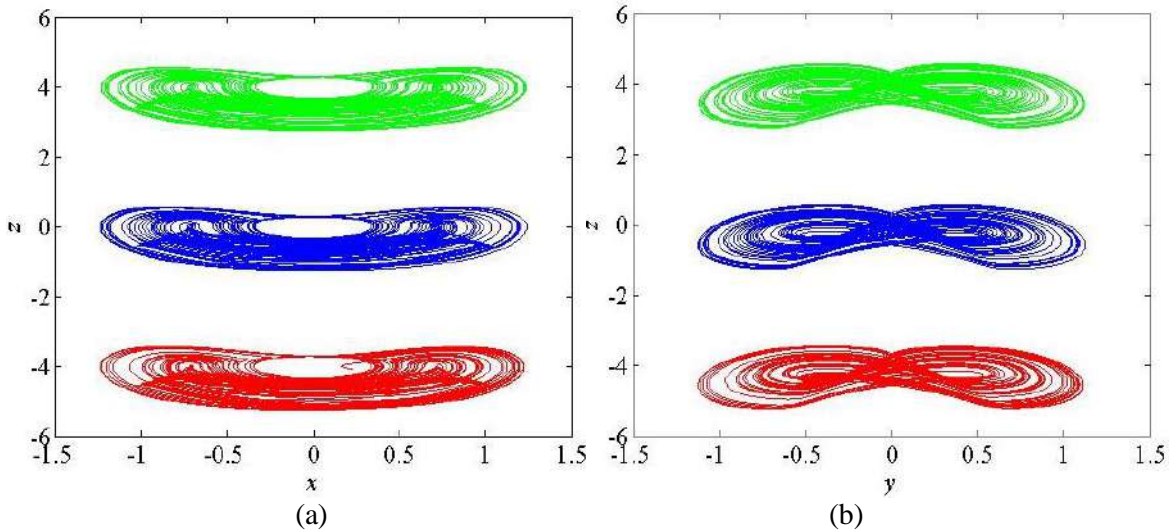
$$\begin{cases} \dot{x} = \text{sign}(y)(z + k) \\ \dot{y} = x|x| - y|y| \\ \dot{z} = a|x| - bxy \end{cases} \quad (4)$$



Consequently, the chaotic signal  $z$  can be transformed from a bipolar signal to a unipolar signal when varying the control parameter  $k$ . When increasing the boosting controller  $k$ , the chaotic signal  $z$  is boosted from a bipolar signal to a unipolar one as illustrated in Figure 6. Phase portraits of system (1) are adjusted according to the boosting controller as illustrated in Figure 7.



**Figure 6** The signal  $z$  with different values of the offset boosting controller  $k$ :  $k = 0$  (blue colour);  $k = 4$  (red colour);  $n = -4$  (green colour).



**Figure 7** Phase portraits in different planes and different values of the offset boosting controller  $k$ : (a)  $x - z$  plane, (b)  $y - z$  plane for  $k = 0$  (blue colour),  $k = 4$  (red colour),  $k = -4$  (green colour).

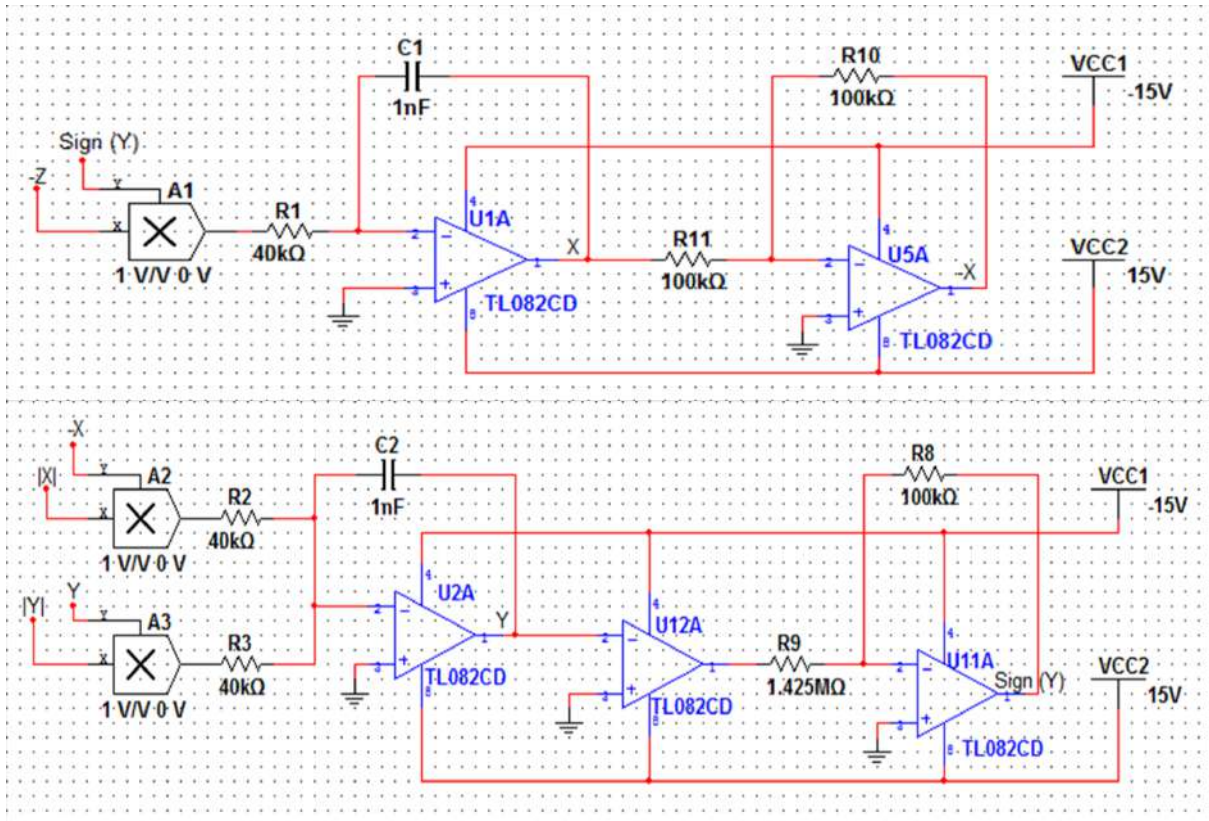
### Circuit implementation of the new chaotic system

In this work, the electronic circuit design of signum nonlinearity (1) is presented. The electronic circuit is designed in MultiSIM platform. The signum nonlinearity which detailed electronic circuit is depicted in Figure 8 consists of two resistors and two operational amplifiers. A detailed analysis of the signum circuit can be found in [62-64].

The circuital equations of the designed new chaotic system are given by

$$\begin{cases} \dot{x} = \frac{1}{10C_1R_1} z \text{sign}(y) \\ \dot{y} = \frac{1}{10C_2R_2} x|x| - \frac{1}{10C_2R_3} y|y| \\ \dot{z} = -\frac{1}{C_3R_4} |x| - \frac{1}{10C_3R_5} xy \end{cases} \quad (5)$$

Where  $x$ ,  $y$ , and  $z$  are the voltages across the capacitors  $C_1$ ,  $C_2$  and  $C_3$ , respectively. The circuit has been implemented by using MultiSIM  $R_1 = R_2 = R_3 = 40 \text{ k}\Omega$ ,  $R_4 = 66.67 \text{ k}\Omega$ ,  $R_9 = 1.425 \text{ M}\Omega$ ,  $R_5 = 25 \text{ k}\Omega$ ,  $R_6 = R_7 = R_8 = R_{10} = R_{11} = R_{12} = R_{13} = R_{14} = R_5 = R_{16} = R_{17} = R_{18} = R_{19} = R_{20} = R_{21} = 100 \text{ k}\Omega$ ,  $C_1 = C_2 = C_3 = 1 \text{ nF}$ . Obtained MultiSIM results in Figure 9 indicate that the circuit exhibits chaotic attractors. The MultiSIM results (see Figure 9) based simulations are carried out to confirm the results of theoretical analysis (see Figure 1).



(continued)

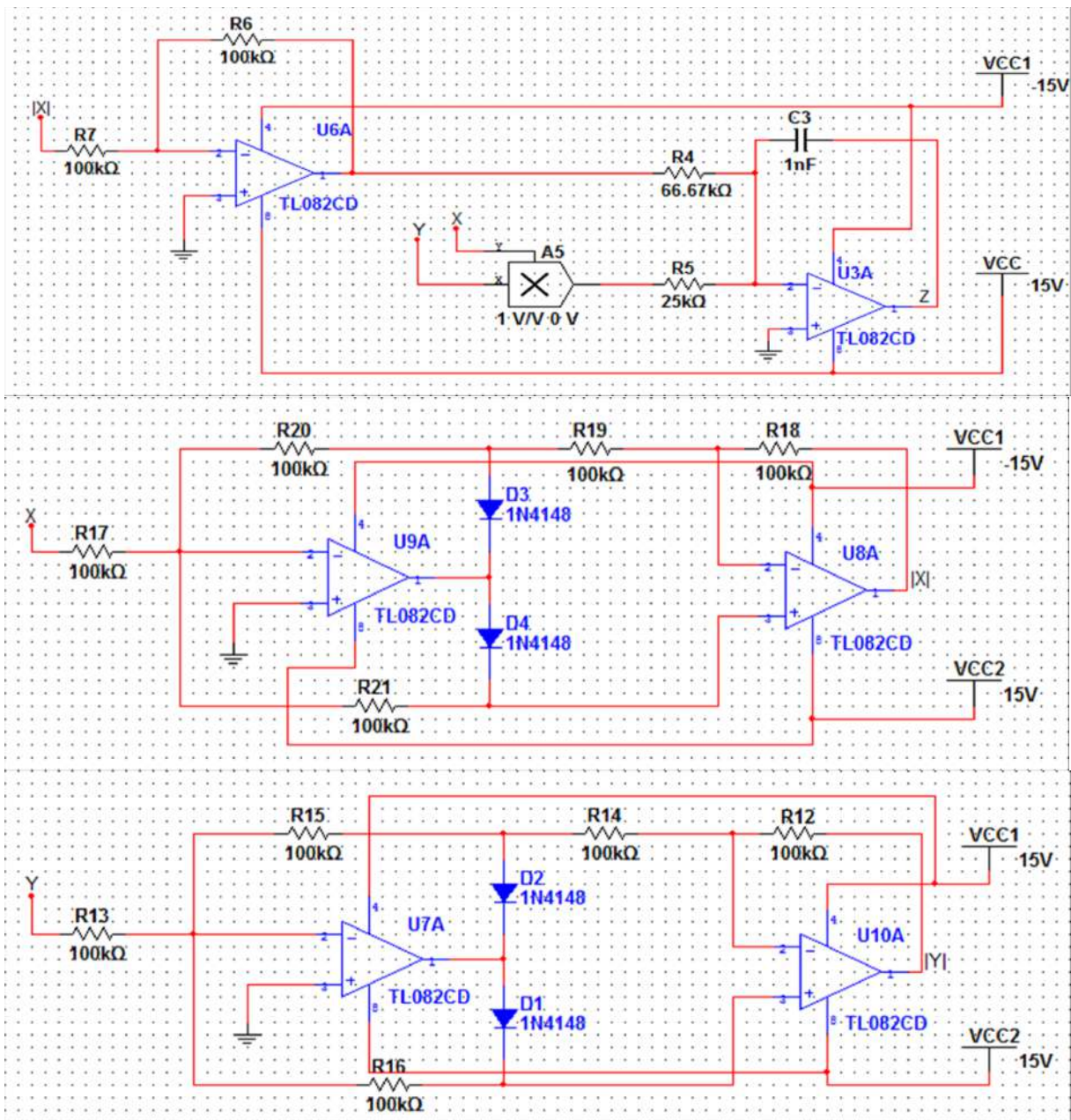
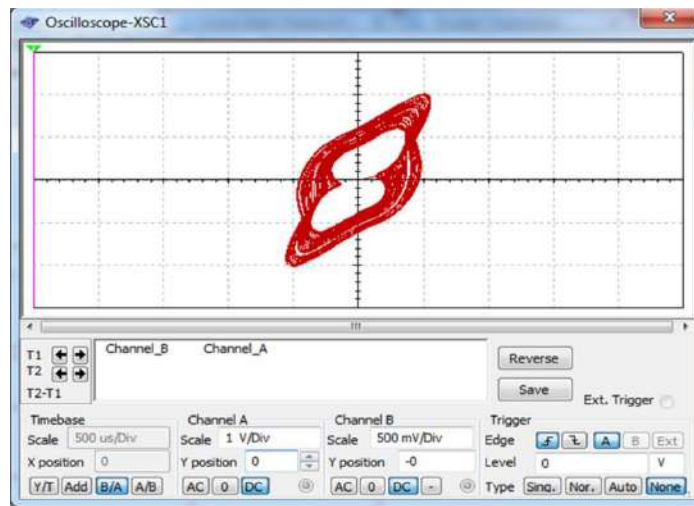
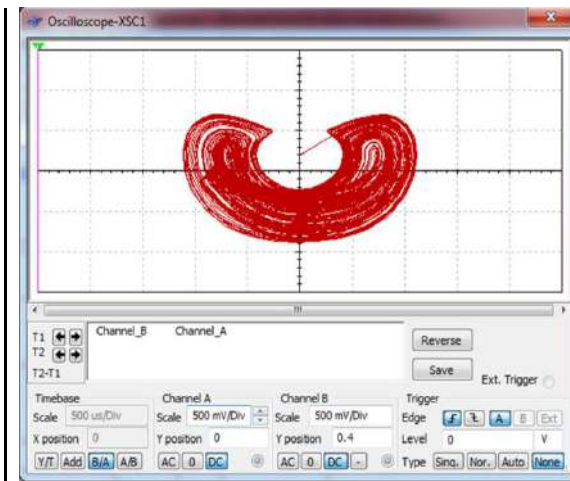


Figure 8 The electronic circuit schematic of new chaotic system (1)

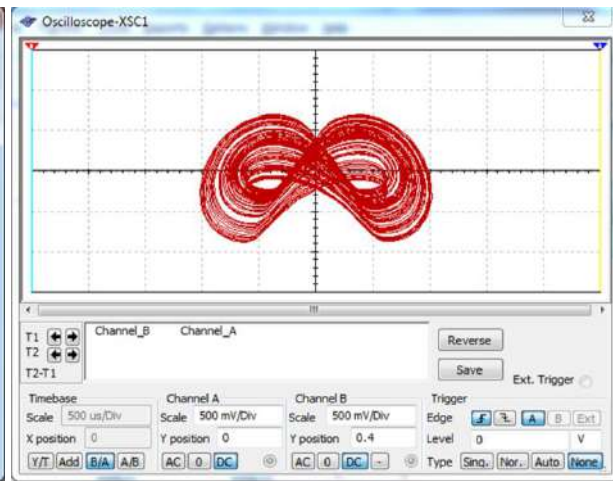




(a)



(b)



(c)

**Figure 9** MultiSIM chaotic attractors of the new chaotic system (1)  
 (a)  $x_1$ -  $x_2$  plane (b)  $x_2$ -  $x_3$  plane and (c)  $x_1$ - $x_3$  plane.

## Conclusions

A new chaotic system with five nonlinearities was announced in this paper. Our proposed chaotic system has a novel feature that there is no linear term in it. We also showed that the chaotic system has equilibrium points on the z-axis (line equilibrium) as well as two equilibrium points on the (x, y)-plane. The dynamical properties of the new chaotic system were analyzed in terms of phase portraits, bifurcation diagram, etc. Finally, an electronic circuit realization of the new chaotic system was displayed in detail to confirm the feasibility of the theoretical chaotic model.

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## A Hyperchaotic Hyperjerk System with Four Nonlinearities, its Dynamical Analysis and Circuit Realization

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### Introduction

Hyperjerk systems are special types of mechanical chaotic systems arising in chaos literature [1-2]. Chaotic systems are very useful in many applications in science and engineering such as weather systems [3-4], ecology [5], neurons [6-7], biology [8-10], cellular neural networks [11-12], chemical reactors [13-14], oscillators [15-20], robotics [21-24], encryption [25-30], finance systems [31-32], circuits [33-45], secure communication [46-50], etc.

In physics, a hyperjerk ODE can be written as the high-order dynamics

$$\frac{d^n x}{dt^n} = \varphi \left( x, \frac{dx}{dt}, \dots, \frac{d^{n-1}x}{dt^{n-1}} \right), \quad (n \geq 4) \quad (1)$$

In (1),  $x(t)$  stands for the *displacement*,  $\frac{dx}{dt}$  the *velocity*,  $\frac{d^2x}{dt^2}$  the *acceleration*,  $\frac{d^3x}{dt^3}$  the *jerk* and higher-order derivatives are called as *hyperjerk* terms.

Thus, we call the ODE (1) as the hyperjerk differential equation.

For qualitative analysis, it is convenient to express the hyperjerk ODE (1) in a system form.

Using phase variables, we can express the hyperjerk differential equation (1) as follows:

$$\begin{cases} \dot{x}_1 = & x_2 \\ \dot{x}_2 = & x_3 \\ \vdots & \vdots \\ \dot{x}_n = & \varphi(x_1, x_2, \dots, x_n) \end{cases} \quad (3)$$

Jerk systems are special cases of hyperjerk systems when  $n = 3$ . Thus, jerk systems can be described by the following general system of differential equations.

$$\begin{cases} \dot{x}_1 = x_2 \\ \dot{x}_2 = x_3 \\ \dot{x}_3 = \varphi(x_1, x_2, x_3) \end{cases} \quad (4)$$

Many jerk systems have been reported in the chaos literature [51-58]. Jerk systems have important applications in mechanical engineering [1-2]. Some famous jerk systems can be cited as Sprott systems [51], Li system [52], Elsonbaty system [53], Couillet system [54], Kengne system [55], Vaidyanathan systems [56-60], etc.



In the literature, many hyperjerk systems have been reported by many scientists [61-68]. Some popular hyperjerk systems are Chlouverakis system [61], Munmuangsaen system [62], Daltzis system [63], Wang system [64], Pham system [65], Vaidyanathan systems [66-70], etc.

In this research paper, we report the finding of a new hyperchaotic hyperjerk system with four nonlinearities. We describe the phase plots of the hyperjerk system and do a rigorous dynamic analysis by finding bifurcation diagrams, Lyapunov exponents, etc. Bifurcation analysis is very useful to understand the special properties of chaotic and hyperchaotic systems [71-76].

Section 2 describes the new hyperchaotic hyperjerk system, its phase plots and Lyapunov exponents. Section 3 describes the dynamic analysis of the new hyperchaotic hyperjerk system. Furthermore, an electronic circuit realization of the new chaotic system is presented in detail in Section 4. The circuit experimental results of the new hyperjerk system in Section 4 agreement with its numerical simulations via MATLAB obtained in Section 2. Section 5 draws the main conclusions.

### A new hyperchaotic hyperjerk system

In this work, we report a new 4-D hyperjerk system given by the dynamics

$$\begin{cases} \dot{x}_1 = x_2 \\ \dot{x}_2 = x_3 \\ \dot{x}_3 = x_4 \\ \dot{x}_4 = -x_1 - x_2 - ax_3 + b(|x_2| + |x_3|) - cx_1^4 x_4 - dx_2^2 \end{cases} \quad (5)$$

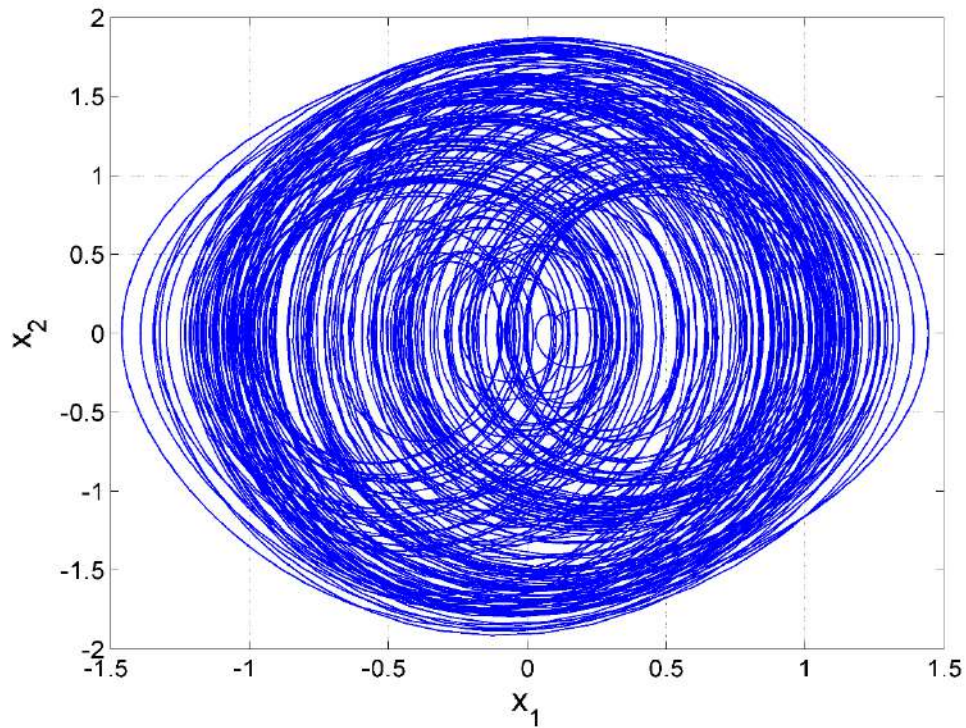
where  $x_1, x_2, x_3, x_4$  are state variables and  $a, b, c, d$  are positive constants.

In this paper, we show that the hyperjerk system (1) is *hyperchaotic* for the parameter values

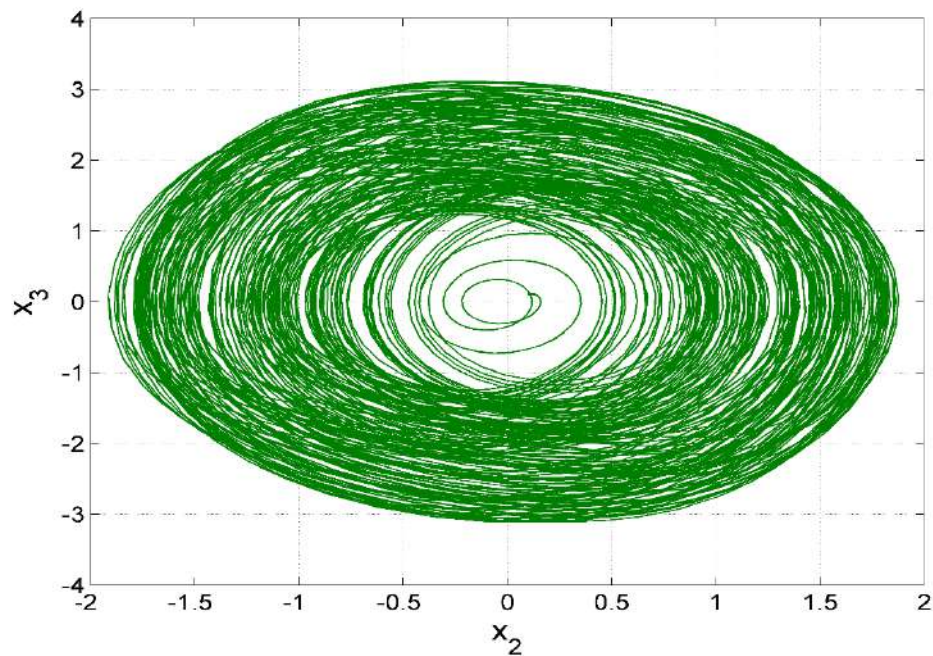
$$a = 3.6, \quad b = 0.02, \quad c = 3, \quad d = 0.05 \quad (6)$$

For numerical simulations, we take the initial values of the hyperjerk system (5) as  $X(0) = (0.1, 0.1, 0.1, 0.1)$ .

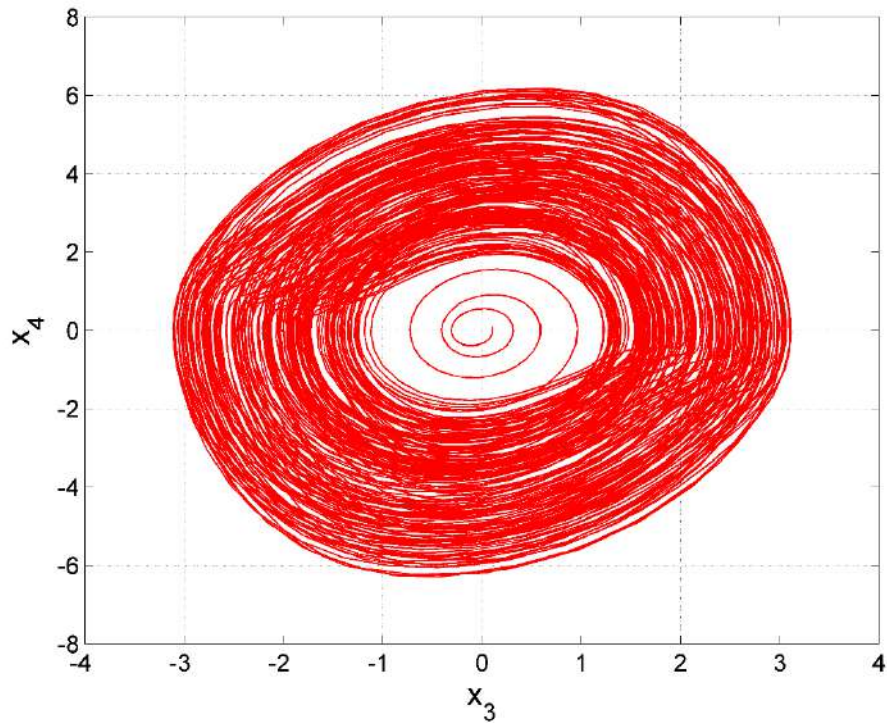
Figures 1-4 show the 2-D projections of the new hyperjerk system (5) in  $(x_1, x_2)$ ,  $(x_2, x_3)$ ,  $(x_3, x_4)$  and  $(x_1, x_4)$  coordinate planes, respectively.



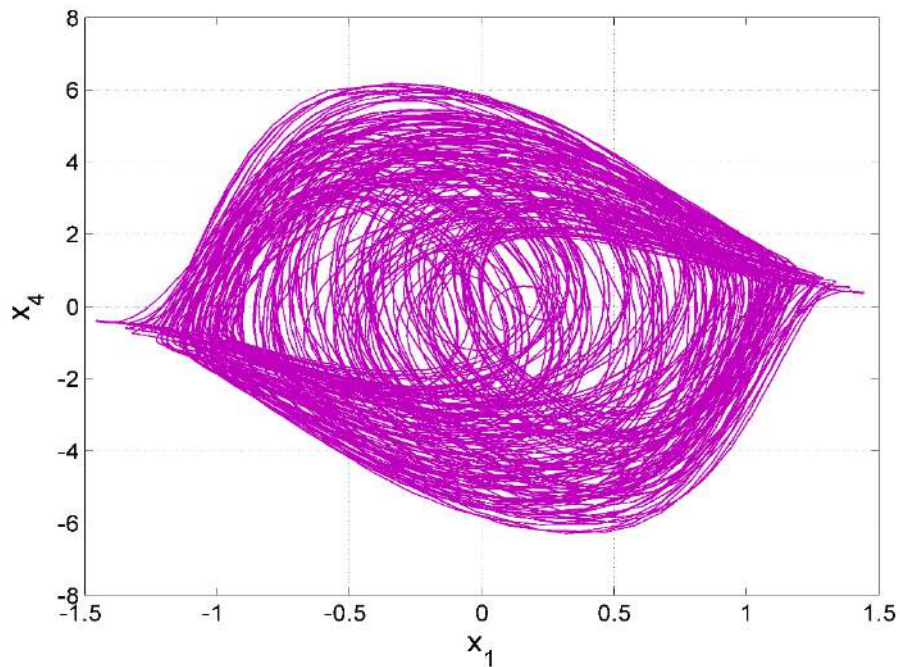
**Figure 1.** 2-D plot of the hyperchaotic hyperjerk system (5) in the  $(x_1, x_2)$  plane for  $X_0 = (0.1, 0.1, 0.1, 0.1)$  and  $(a, b, c, d) = (3.6, 0.02, 3, 0.05)$



**Figure 2.** 2-D plot of the hyperchaotic hyperjerk system (5) in the  $(x_2, x_3)$  plane for  $X_0 = (0.1, 0.1, 0.1, 0.1)$  and  $(a, b, c, d) = (3.6, 0.02, 3, 0.05)$



**Figure 3.** 2-D plot of the hyperchaotic hyperjerk system (5) in the  $(x_3, x_4)$  plane for  $X_0 = (0.1, 0.1, 0.1, 0.1)$  and  $(a, b, c, d) = (3.6, 0.02, 3, 0.05)$



**Figure 4.** 2-D plot of the hyperchaotic hyperjerk system (5) in the  $(x_1, x_4)$  plane for  $X_0 = (0.1, 0.1, 0.1, 0.1)$  and  $(a, b, c, d) = (3.6, 0.02, 3, 0.05)$

For the rest of this section, we take the values of the parameters as in the hyperchaotic case (6), *i.e.*  $(a, b, c, d) = (3.6, 0.02, 3, 0.05)$ .

The equilibrium points of the new hyperchaotic hyperjerk system (5) are obtained by solving the system of equations

$$x_2 = 0 \tag{7a}$$

$$x_3 = 0 \tag{7b}$$

$$x_4 = 0 \tag{7c}$$

$$-x_1 - x_2 - ax_3 + b(|x_2| + |x_3|) - cx_1^4 x_4 - dx_2^2 = 0 \tag{7d}$$

From (7a), (7b) and (7c), we deduce that  $x_2 = x_3 = x_4 = 0$ .

Substituting these in (7d), we obtain  $-x_1 = 0$ . This gives  $x_1 = 0$ .

Hence,  $E_0 = (0, 0, 0, 0)$  is the unique equilibrium of the chaotic jerk system (4).

The Jacobian matrix of the new hyperjerk system (5) at  $E_0 = (0, 0, 0, 0)$  is obtained as

$$J = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ -1 & -1 & -3.6 & 0 \end{bmatrix} \tag{8}$$

The Jacobian  $J$  has the spectral values  $\lambda_{1,2} = 0.1604 \pm 1.8395j$ ,  $\lambda_{3,4} = -0.1604 \pm 0.5172j$

This shows that the equilibrium point  $E_0$  is a saddle-focus and unstable.

For the parameter values as in the hyperchaotic case (6) and the initial state  $X_0 = (0.1, 0.1, 0.1, 0.1)$ , the Lyapunov exponents of the new jerk system (4) are determined using Wolf's algorithm as

$$LE_1 = 0.1344, \quad LE_2 = 0.0411, \quad LE_3 = 0, \quad LE_4 = -1.2929 \tag{9}$$

The hyperjerk system (5) is hyperchaotic since it has 2 positive Lyapunov exponents. Thus, the system (5) exhibits a self-excited strange hyperchaotic attractor. Also, we note that the sum of the Lyapunov exponents in (9) is negative. This shows that the hyperjerk system (5) is dissipative.

The Kaplan-Yorke dimension of the hyperjerk system (5) is determined as

$$D_{KY} = 3 + \frac{LE_1 + LE_2 + LE_3}{|LE_4|} = 3.1357, \tag{10}$$

which indicates the high complexity of the hyperchaotic hyperjerk system (4).

### **Bifurcation Analysis for the New Hyperchaotic Hyperjerk System**

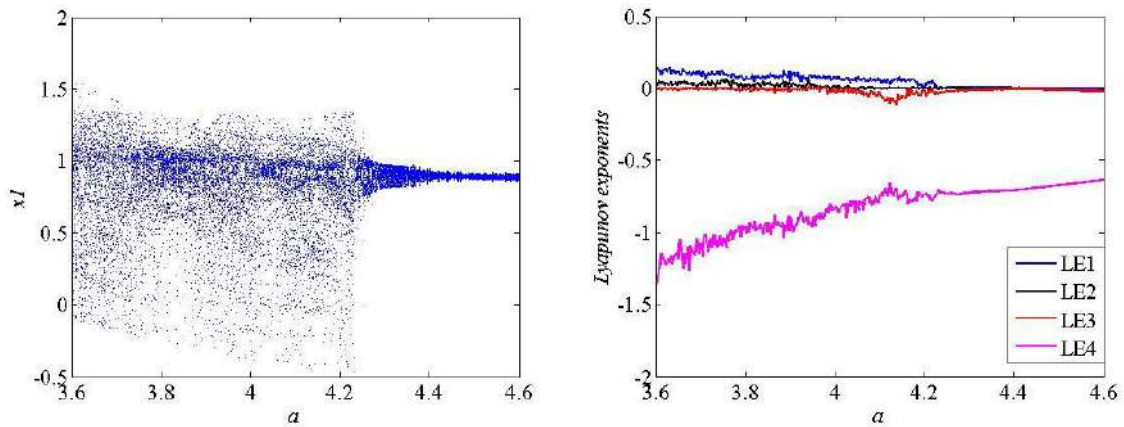
In this section, we describe a bifurcation analysis for the new hyperjerk system (5) introduced in Section 2. Bifurcation analysis is an important topic for studying chaotic systems [71-76].

Here, we select  $a$  and  $c$  as the control parameters and fix others.

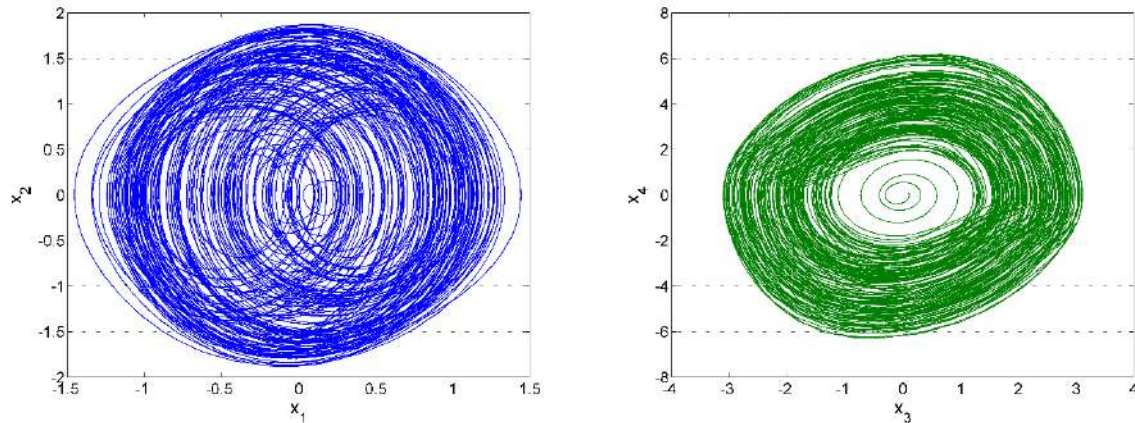
We fix  $b = 0.02$ ,  $c = 3$ ,  $d = 0.05$ , the initial condition  $X_0 = (0.1, 0.1, 0.1, 0.1)$  and vary  $a$  in the region of [3.6, 4.6].

Obviously, from the bifurcation diagram and the Lyapunov exponents shown in Figure 5, one can get that the hyperjerk system (5) depicts hyperchaos in the region of [3.6, 3.95]; then the system gets into chaos and finally converts into periodic orbits. In addition, there is quasi-periodic behavior in the parameter range. Some sample results are shown in Figures 6-9.

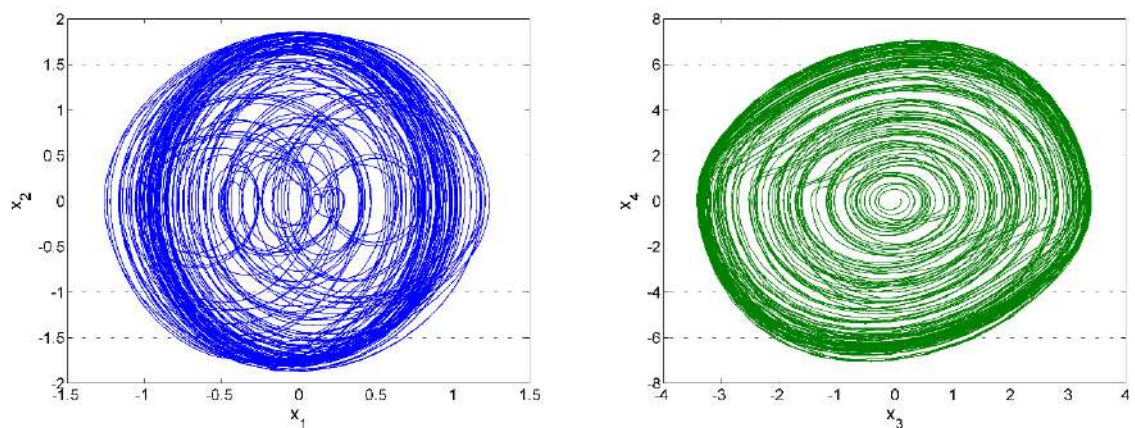




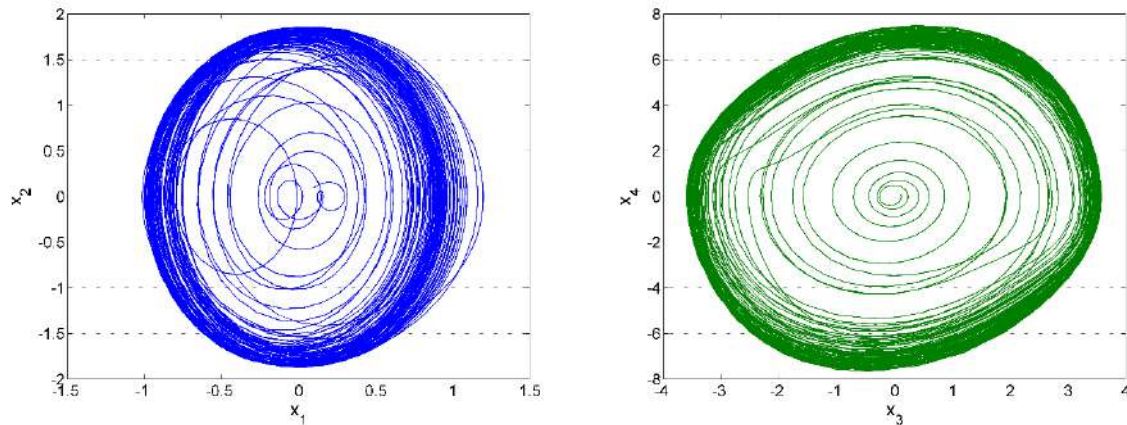
**Figure 5.** Bifurcation diagram and Lyapunov exponents of the new hyperjerk system (5), where we fix  $b = 0.02$ ,  $c = 3$ ,  $d = 0.05$  and the initial conditions  $(0.1, 0.1, 0.1, 0.1)$



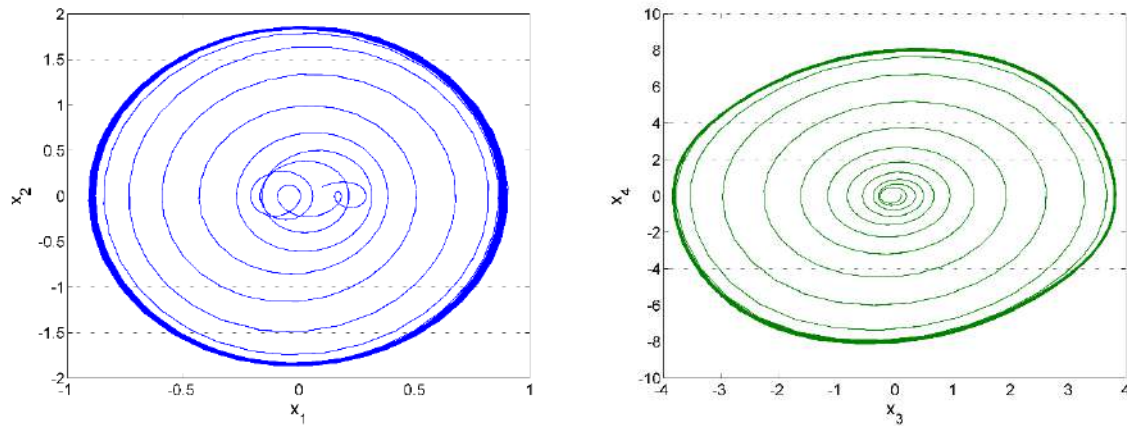
**Figure 6.** Phase plots of the new hyperjerk system (5), where we fix  $b = 0.02$ ,  $c = 3$ ,  $d = 0.05$  and the initial conditions  $(0.1, 0.1, 0.1, 0.1)$ . When  $a = 3.6$ , the system (5) depicts hyperchaos.



**Figure 7.** Phase plots of the new hyperjerk system (5), where we fix  $b = 0.02$ ,  $c = 3$ ,  $d = 0.05$  and the initial conditions  $(0.1, 0.1, 0.1, 0.1)$ . When  $a = 4$ , the system (5) depicts chaos.

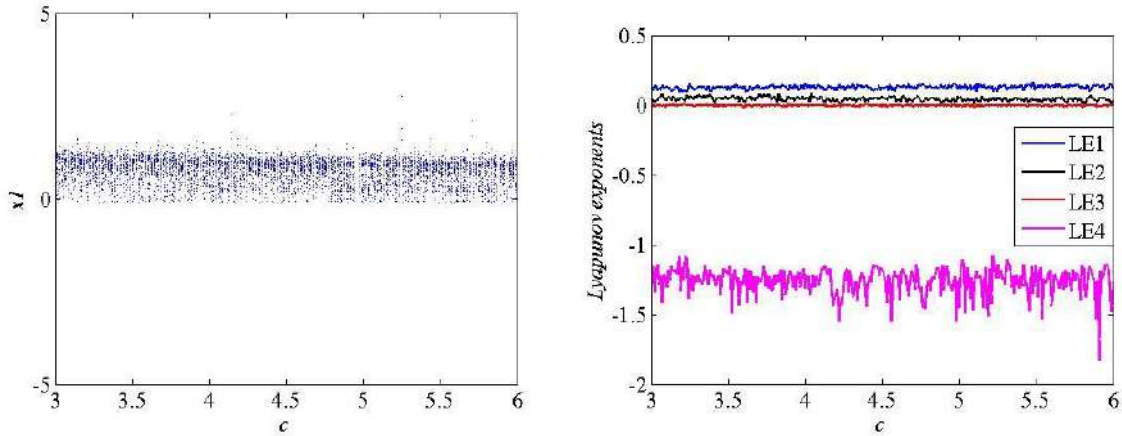


**Figure 8.** Phase plots of the new hyperjerk system (5), where we fix  $b = 0.02$ ,  $c = 3$ ,  $d = 0.05$  and the initial conditions  $(0.1, 0.1, 0.1, 0.1)$ . When  $a = 4.25$ , the system (5) depicts quasi-period motion.



**Figure 9.** Phase plots of the new hyperjerk system (5), where we fix  $b = 0.02$ ,  $c = 3$ ,  $d = 0.05$  and the initial conditions  $(0.1, 0.1, 0.1, 0.1)$ . When  $a = 4.6$ , the system (5) depicts periodic orbit.

We fix  $a = 3.6$ ,  $b = 0.02$ ,  $d = 0.05$ , the initial conditions  $(0.1, 0.1, 0.1, 0.1)$  and vary  $c$  in the region of  $[3, 6]$ . The constant Lyapunov exponent behavior, meaning the values of the Lyapunov exponents keep invariable when the parameters vary in a certain range, has been reported in some chaotic systems [76]. From the Lyapunov exponent spectrum shown in Figure 10, one can see that the hyperjerk system (5) displays that all the values of the Lyapunov exponents are unchanged and moreover, the value of the maximum Lyapunov exponent keeps invariable and positive when the control parameter  $c$  increases in the region of  $[3, 6]$ . That means the system exhibits robust chaos behavior, which is very important for real-world applications.



**Figure 10.** Bifurcation diagram and Lyapunov exponents of the new hyperjerk system (5), where we fix  $a = 3.6$ ,  $b = 0.02$ ,  $d = 0.05$  and the initial conditions  $(0.1, 0.1, 0.1, 0.1)$

### Circuit Implementation of the New Hyperchaotic Hyperjerk System

In this section, we design an electronic circuit based on the hyperjerk system (5) in MultiSIM software. A circuit design containing three channels with respect to the variables  $x_1, x_2, x_3, x_4$  of system (5) is given in Figure 11. The circuit includes simple electronic elements such as resistors, multipliers, capacitors, op-amps and diodes.

In this study, a linear scaling is considered as follows:

$$\begin{cases} \dot{x}_1 = x_2 \\ \dot{x}_2 = x_3 \\ \dot{x}_3 = \frac{x_4}{2} \\ \dot{x}_4 = -2x_1 - 2x_2 - 2ax_3 + 2b(|x_2| + |x_3|) - 16cx_1^4x_4 - dx_2^2 \end{cases} \quad (11)$$

By applying Kirchoff's laws to this circuit, its dynamics are presented by the following circuital equations:

$$\begin{cases} \dot{x}_1 = \frac{1}{C_1R_1}x_2 \\ \dot{x}_2 = \frac{1}{C_2R_2}x_3 \\ \dot{x}_3 = \frac{1}{C_3R_3}x_4 \\ \dot{x}_4 = -\frac{1}{C_4R_4}x_1 - \frac{1}{C_4R_5}x_2 - \frac{1}{C_4R_6}x_3 + \frac{1}{C_4R_7}|x_2| + \frac{1}{C_4R_8}|x_3| - \frac{1}{C_4R_9}x_1^4x_4 - \frac{1}{C_4R_{10}}x_2^2 \end{cases} \quad (12)$$

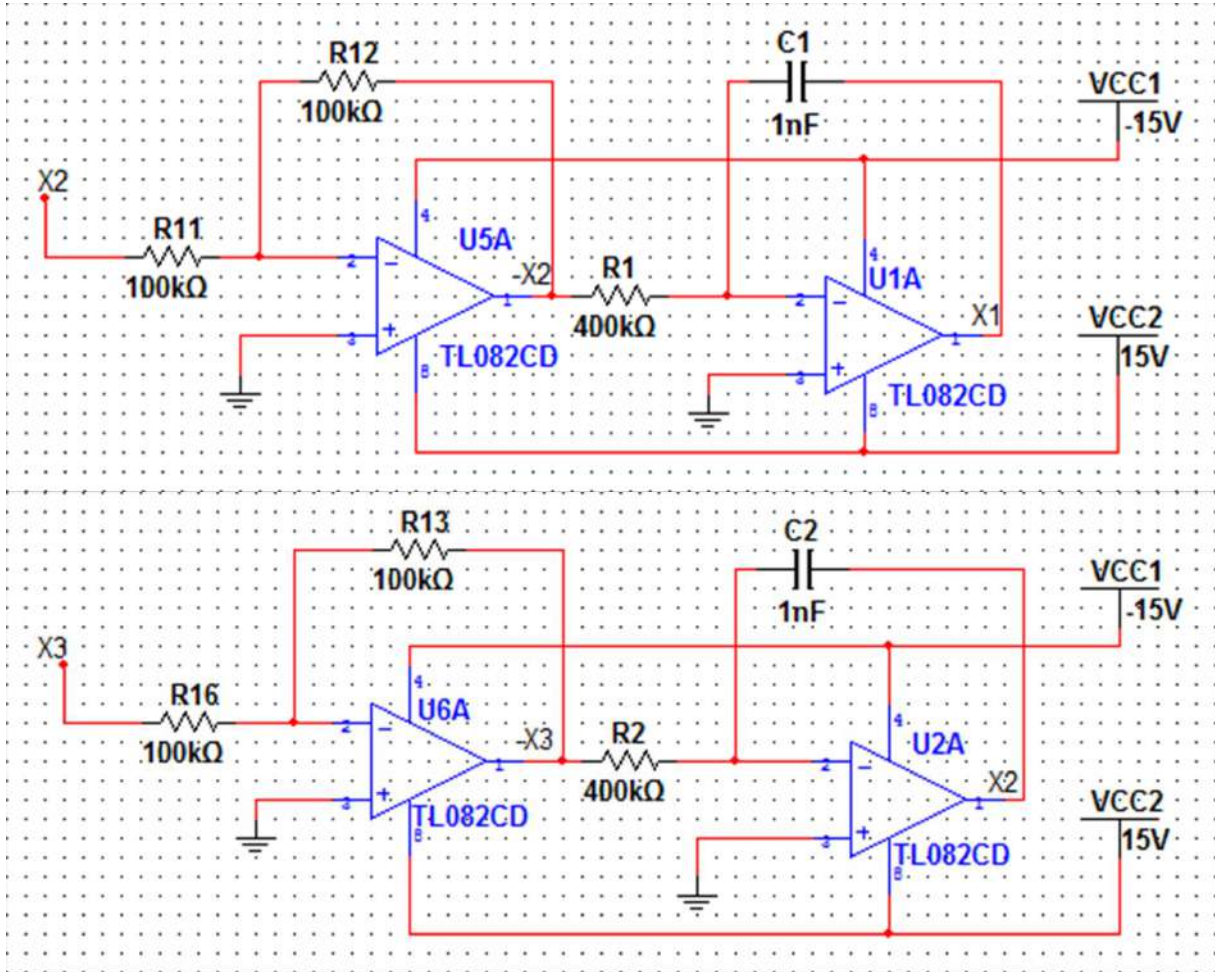
The values of components in Figure 11 are chosen to match the parameters of new hyperjerk system (5) as follows:  $R_1 = R_2 = 400 \text{ k}\Omega$ ,  $R_3 = 800 \text{ k}\Omega$ ,  $R_4 = R_5 = 200 \text{ k}\Omega$ ,  $R_6 = 55.55 \text{ k}\Omega$ ,  $R_7 = R_8 = 10 \text{ M}\Omega$ ,  $R_9 = 8.33 \text{ k}\Omega$ ,  $R_{10} = 8 \text{ M}\Omega$ ,  $R_{11} = R_{12} = R_{13} = R_{14} = R_{15} = R_{16} = R_{17} = R_{18} = R_{19} = R_{20} = R_{21} = R_{22} = R_{23} = R_{24} = R_{25} = R_{26} = R_{27} = R_{28} = R_{29} = R_{30} = 100 \text{ k}\Omega$ ,  $C_1 = C_2 = C_3 = C_4 = 1\text{nF}$ . The circuit simulations of the phase plots are displayed in Figs 12 (a)-(d), which show the chaotic attractors in  $x_1$ -  $x_2$  plane,  $x_2$ -  $x_3$  plane,  $x_3$ -  $x_4$  plane and  $x_1$ -  $x_4$  plane, respectively. respectively. As can be seen from the

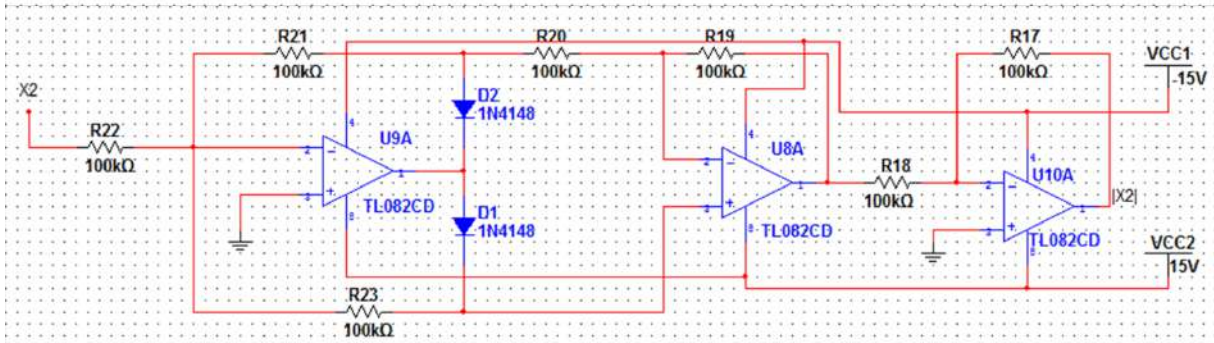
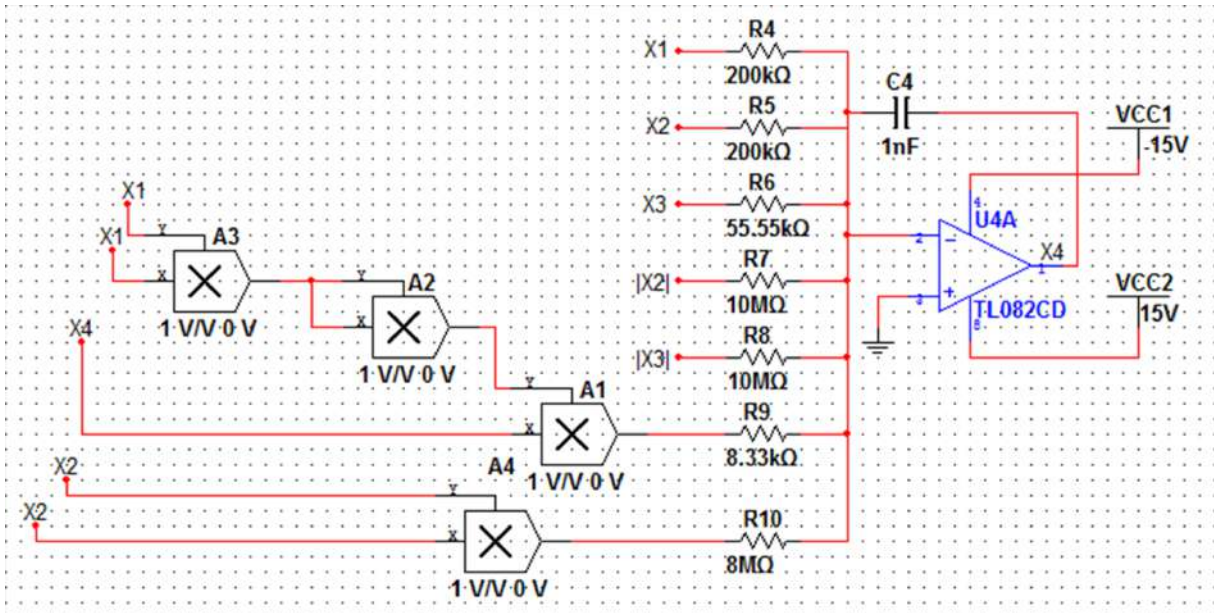
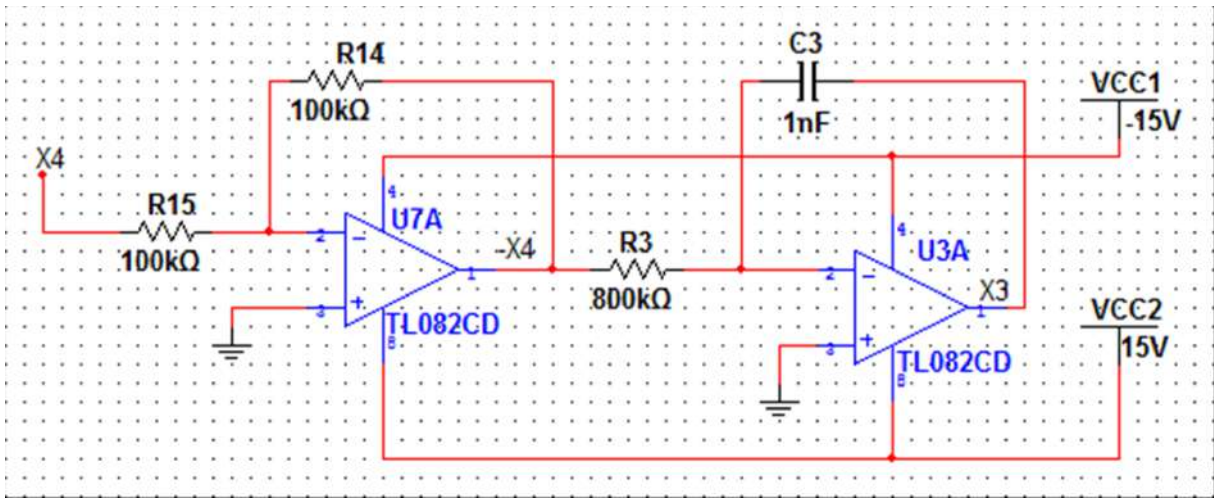


MultiSIM outputs in Figure 12 and numerical simulation in Figures 1-4, the results are similar.

### Conclusions

A new four-dimensional hyperchaotic hyperjerk system with four nonlinearities was announced in this paper. The dynamical properties of the new hyperjerk system are described in terms of phase portraits, Lyapunov exponents, Kaplan-Yorke dimension, dissipativity, etc. Also, a detailed dynamical analysis of the new hyperjerk system was done with bifurcation diagram and Lyapunov exponents. Furthermore, an electronic circuit realization of the new hyperchaotic hyperjerk system was carried out via MultiSIM to confirm the feasibility of the theoretical hyperchaotic hyperjerk model.







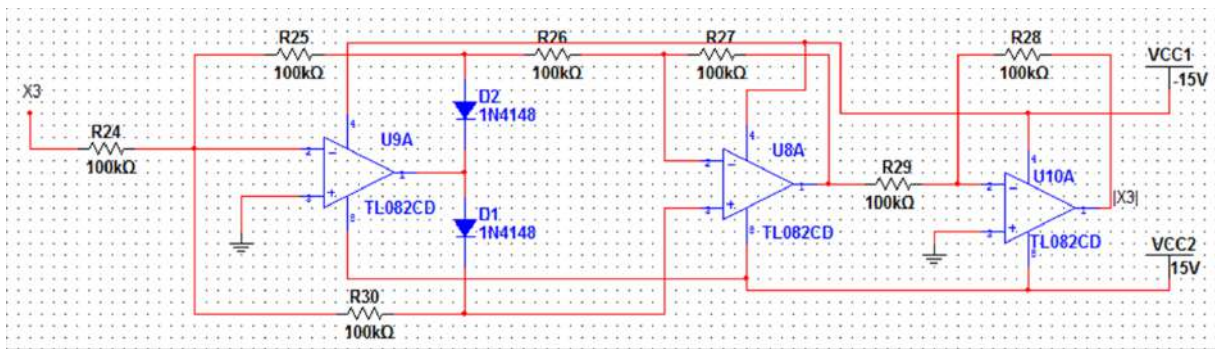


Fig. 11 Circuit design for the proposed new four-dimensional hyperchaotic hyperjerk system (5)

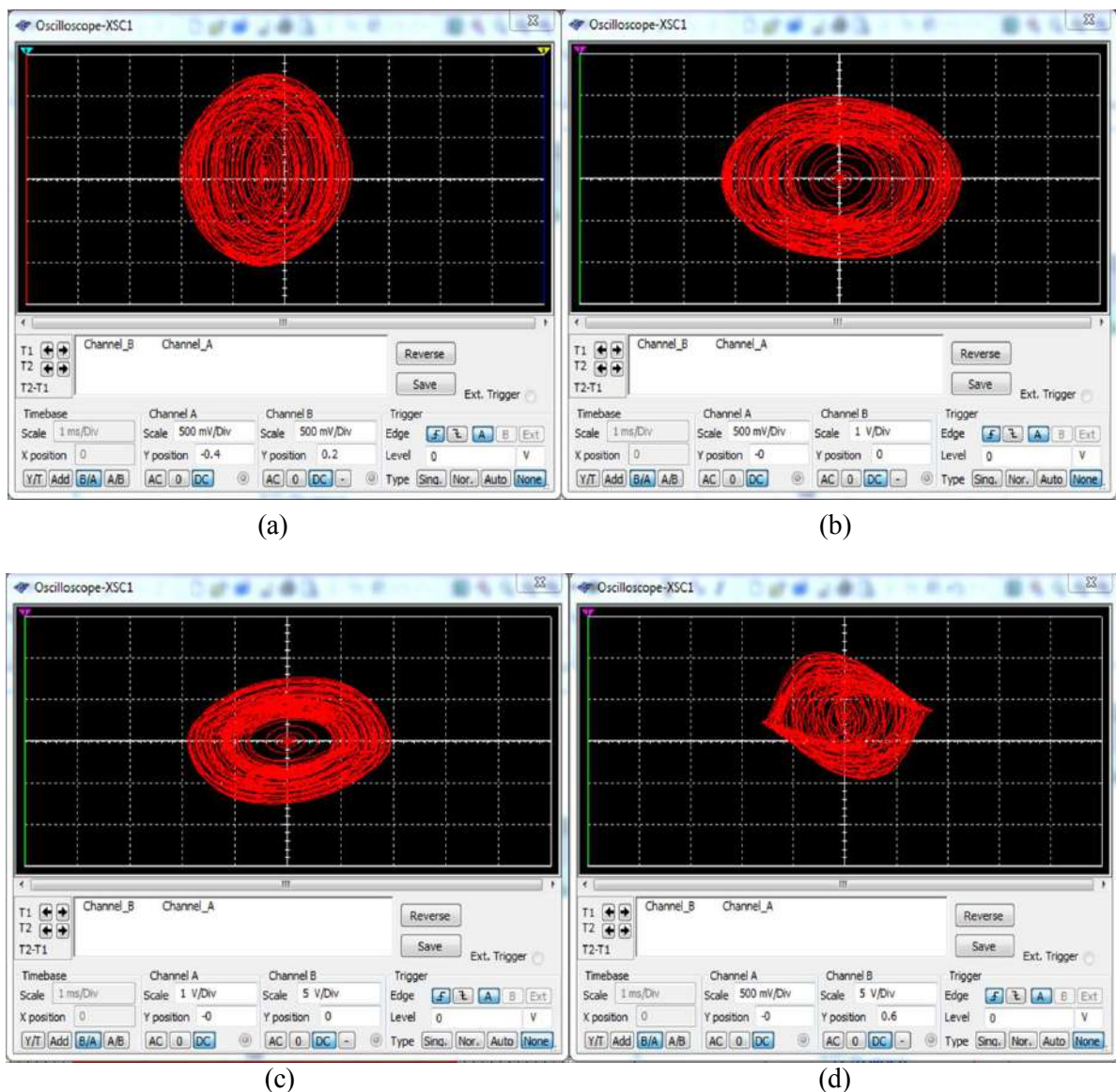


Fig. 12 MultiSIM chaotic attractors of the new four-dimensional hyperchaotic hyperjerk system (5)  
 (a)  $x_1$ -  $x_2$  plane, (b)  $x_2$ -  $x_3$  plane, (c)  $x_3$ -  $x_4$  plane and (d)  $x_1$ -  $x_4$  plane.

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## Optimization of Coral Reef Conservation Based on Coral Larval Dispersion Using Hamiltonian Path (Case Study: Bunaken National Park)

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### INTRODUCTION

Bunaken National Park is measured to have an area about 75.265 ha. There are five big islands in this location in which three neighboring islands are chosen in this research, i.e. Bunaken island, Manado Tua island, and Siladen island. Bunaken sea has become one of fisheries sources for people in Manado and around. Sadly, some studies have shown that coral reefs, which are the habitat of various species of fish, in some parts of Bunaken sea have been deteriorating. In order to preserve coral reefs, healthy reefs that can produce coral larval to help recovery process of the deteriorated reefs can be observed. This research is stressed on coral larval dispersion from the healthy reefs spots and their paths to reach the deteriorated ones. If the larval can reach the deteriorated spots, then there are possibilities that they can help the recovery process of the declined reefs. Coral larval dispersion will be modeled using Graph Theory. Reefs spots are represented by vertices and dispersion paths are represented by edges. Data used in this paper are secondary data obtained from <http://tides.big.go.id> and <http://reefgis.reefbase.org>.

### RESULTS AND DISCUSSION

Based on ocean current data from Badan Informasi Geospasial (BIG) and coral reefs data from <http://reefgis.org>, a graph which represents reefs locations as vertices and coral larval dispersal paths as edges can be constructed. Coral reef location on each square on the map (Figure 1) is represented as a vertex so there are 49 vertices formed in the graph. Light red represents high threat condition and dark red represents very high threat condition.

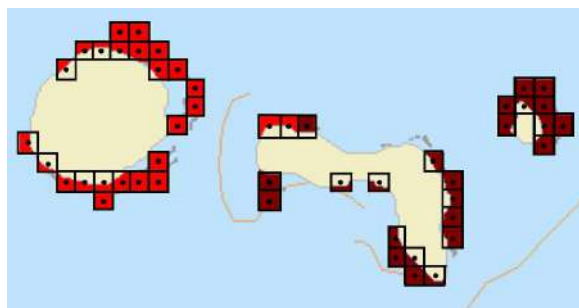
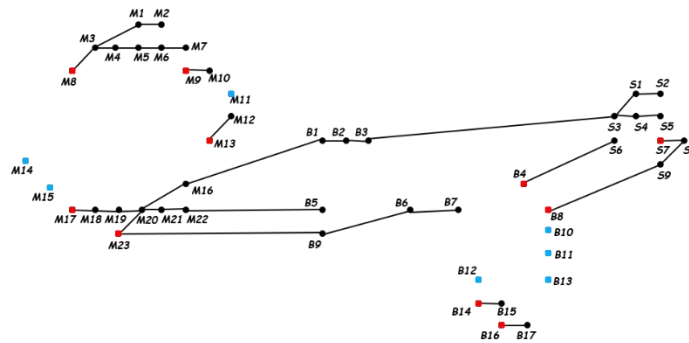


Figure 1. Coral reefs locations which were represented as vertices

From the graph formed (Figure 2), 10 vertices were chosen as sources, i.e. spots for the first act for conservation locations. Once the reefs in these locations restored, they can produce healthy larval and release them to use the ocean currents as transportation and reach other reefs in their paths. When they reach the damaged reefs, they will help restore the reefs in sexual reproduction. The reefs in the larval paths that absorb larval were then set as Sinks. From Figure 2, it can be seen that there are 33 sinks indicated in the graph modeled.





**Figure 2.** Reef Conservation Path

● : Source      ● : Sink      ● : Isolated Vertex

From the graph modeled with 10 sources, 15 hamiltonian path can be plotted. The paths are 15 dispersal paths of the larval that were assumed can help the restoration process of the 33 sinks. There are some spots that although the reefs have been restored would not significantly affect other locations because it is highly unlikely that the ocean currents will connect them directly. Reefs spots which are not affected or affect other spots were then identified as Isolated Vertices.

**Keywords:** Graph Theory, Coral Dispersal, Hamiltonian Path, Conservation, Bunaken National Park, Deteriorated Reef

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## Forecasting Intermittent Demand: A Case of Forecasting Passbook Printer in An Indonesian Company

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### INTRODUCTION

Information and communication technology industry plays a significant role in the Indonesian economy and contributes about 2.7% to the country's GDP [1]. In terms of hardware, the sales volume is expected to increase continuously for the next five years [1]. Regarding the banking industry, Indonesia has more than 120 banks with 4 major players, namely, Bank Mandiri, Bank Central Asia, Bank Rakyat Indonesia, and Bank Negara Indonesia with a 5% of net interest margin, and their credit loans are expected to grow [1]. The growth in the banking industry will cause an increase in the demand for ICT services and hardware in the industry and becomes a challenge for companies in the ICT industry to provide products and service with competitive prices.

ITWare (the name of the company is not disclosed for confidentiality reason), is a company in the ICT industry, a system integrator, that provides software development services and the related hardware. ITWare has a business line that provides passbook printer for the banking industry since 2012. The demand for the product has increased significantly in the year 2014, and the company starts to experience delay in its procurement process. The demand for passbook printer is highly uncertain, and intermittent in nature. The current practice at ITWare is conducted qualitatively using sales force composite [2], whereby sales manager forecasts the future demand based on his/her judgment and experience in the previous periods. Therefore, sudden peak demand causes stockout problem in the company.

The main objective of this research is to select the best forecasting method to predict passbook printer demand at ITWare to avoid or minimize inventory stockout. We specifically compare three forecasting methods for this purpose, namely simple exponential smoothing (SES), Croston (1972) [3], and Syntetos-Boylan Approximation or SBA from Syntetos and Boylan (2005) [4]. The three methods are chosen as they are very popular in forecasting intermittent demand. This research contributes to provide insights regarding intermittent demand of ICT hardware in banking industry, and the most suitable forecasting method for this kind of demand in the industry.

### RESULTS AND DISCUSSION

As previously mentioned, the objective of the research is to forecast the demand for passbook printer for the period of two years. We compare three forecasting methods that are popular for intermittent demand, namely SES, Croston (1972), and SBA. As the demand at ITWare starts to become significant in 2014 (see Figure 1), we use the data of 2014-2015 to forecast demand in 2016. The forecasting is conducted using the three methods with optimum smoothing parameter alpha determined using Excel Solver as in Kaya and Demirel (2015)[5], and then the comparison is performed based on mean square error (MSE).

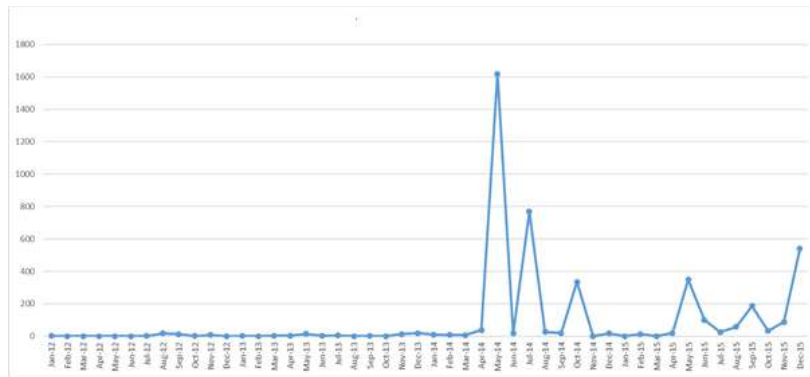


Figure 1. Demand of passbook printer at ITWare in the periods of 2012-2015

The results show that based on the MSE, SES has the best performance, followed by Croston's method and an SBA. The results are different from previous research, such as by [4] and [5], probably because actual demand in some periods of 2014-2015 are small but not zero (there are only three periods with zero demand), and thus, SES performs the best in this case.

**Keywords:** Electronic Industry, Forecasting, Indonesia, Intermittent Demand.

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## Development Data Reconciliation System for Billing Process at PT. Perusahaan Gas Negara

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### INTRODUCTION

PT. Perusahaan Gas Negara (abbreviated as PGN) is the largest national company in the natural gas transportation and distribution segment. This company has pipeline networks in North Sumatera, Southern part of Sumatera, Riau Islands, and Java Sea to connect the natural gas sources location with the natural gas end user location through the transmission pipelines mode. PGN plays a significant role in meeting domestic natural gas needs, serves natural gas to 196,221 residential, commercial and industrial customers in Indonesia's main population centers (in the end of 2017). For the past 50 years, PGN has strengthened its energy business by investing in upstream oil and gas, mid-stream transmission and downstream distribution. Today, PGN has transformed from a natural gas transmission and distribution company into a provider of integrated energy solutions. By integrating the assets and expertise bound within its subsidiaries, PGN is unlocking new synergies across its enterprise, enabling it to develop effective solutions for customers' specific energy needs.

In the competitive market situation, PGN needs to focus on value-added services and service options that can differentiate PGN from competitors. The customer measurement system is now fully digitized, ensuring greater efficiency and transparency. Customers can also access their accounts, support services, and other products through PGN mobile applications(see [5]). All innovations are strived in order to enhance current PGN level of service.

An effort in ensuring greater efficiency, accuracy and transparency is performed by developing data reconciliation system for billing process. Industrial customers' gas consumptions are measured by combining measurement results from turbine meter, temperature measurement device and pressure measurement device. All measurement results are converted to base condition with Electronic Volume Converter. Normally, customers' bills can be obtained directly from volume metered by volume measurement device. But this device, also the other two devices as well, can be defect although happen rarely. Statistically, less than 1% of volume measurement devices are break down in a month. But if it happens to the volume meters of industrial customers which consume large volume of gas, the unmetered consumption during the defective meter problem unresolved may lead to a massive revenue loss for PGN. Due to the large number of on-site meters which located in very wide area in Sumatera and Java islands, sometimes defective meter problems are already resolved after several days since the problem was reported/indicated. No one knew when the meter start to failure so that it is difficult to estimate gas volume delivered to the customers during the meter failure. Briefly, there are two data validation problems to be solved due to meter failure: 1. how to determine the beginning of the period where a volume meter is fail, 2. how to estimate gas volume delivered to the customers during the meter failure.

The solutions of the two problems will be used for calculating bills for those customers which experience meter defective in the billing month. Without any scientific methods for solving the problems, PGN is

always difficult to convince customers the gas volume receipt by customers. A collaborative research<sup>1</sup> is then performed to solve the problems, and to develop an application based on these data reconciliation.

## **RESULTS AND DISCUSSION**

The first problem is solved by analyzing historical volume, temperature, and pressure data of each customer. The analysis results, in line with Spitzglass (Energy) Equation, that gas flow is linear to the pressure drop between the pressure at distribution pipe and the pressure at the customer's pipe. We derive a procedure for detecting anomaly in gas volume data based on this phenomenon. We perform a validation to historical data, and we can say that our procedure work effectively in determining the period of anomaly data which indicate the period during the meter failure. As soon as the period during the meter failure is determined, we then need to estimate the gas volume delivered during this period. We apply some forecasting methods for time series data such as AR(p) and Holt Winters models, and we choose the estimation from the forecasting model with the smallest error.

We develop a graphical user interface based on the anomaly detection method and the forecasting method describe above. This system has been implemented, tested, and used by Energy Management Division of PGN.

**Keywords:** data reconciliation, anomaly detection, forecasting.

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## Linear Regression Model as an Approach to Analyze Spatio Temporal Data to Know the Influence Factors of Number of Crimes in North Sumatera

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### ABSTRACT

Crimes in Indonesia tends increase every year, both in variation and in number. Crimes in this study include murder, torture, rape, theft, fraud, and other cases that make people feel insecure. This study aims to know what factors affect the number of criminal acts in the Province of North Sumatera and know how the influence of time and location in 33 districts/ cities in North Sumatra. This study uses secondary data collected by POLRI, BPS and Dinsos in North Sumatera Province in 2013, 2014, 2015 and 2016. The independent variables used are the number of unemployed ( $X_1$ ), the number of poor ( $X_2$ ), population density ( $X_3$ ), human development index ( $X_4$ ), number of places of worship ( $X_5$ ), economic growth rate ( $X_6$ ) and number of families with psychological social problem ( $X_7$ ). The linear regression model is used as an approach to analyze spatio temporal data. The results of this study show that the independent variables of unemployment ( $X_1$ ), the number of poor ( $X_2$ ), population density ( $X_3$ ), and human development index ( $X_4$ ) significantly influence the number of criminal acts in North Sumatera Province, there is a significant location influence on the occurrence of the number of criminal acts in 33 districts/cities of North Sumatera Province.

**Key word:** *Crime, Regression linear, Spatio temporal*



# Simulating Humanitarian Logistics: A Case Study of Indonesia’s Red Cross Society’s Water Distribution Operation in Response to the 2017 Mount Agung Eruptions

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## INTRODUCTION

The performance of humanitarian logistics is a crucial factor in disaster mitigation. It’s been estimated that 80% of all disaster response operations are made up of logistical activities (Van Wassenhove, 2006). In Indonesia especially, the 2004 Aceh Tsunami has garnered more public and government attention on the importance of improving humanitarian logistics, as the role of humanitarian non-governmental organizations, such as the Indonesian Red Cross (Palang Merah Indonesia, PMI), *Aksi Cepat Tanggap* (ACT), and Care Indonesia become more evident.

This study aims to determine the activities and processes that were involved in Indonesia’s Red Cross Society’s (PMI) water aid distribution operation in response to the 2017 Mount Agung Eruptions (in Bali), translate those activities and processes into a discrete-event simulation using Arena simulation software. Simulation modelling is very suitable in addressing the randomness, demand dynamics, and the required need for real-time solutions of humanitarian operations (Altay and Green, 2006). Through a simulation, an investigation on the problems of efficient distribution, transportation, and fulfilment of demand can be conducted. Finally, the study aims to propose possible solutions that may improve the performance of the operation, through proposing alternative scenarios.

Primary data for the study is collected through in-depth interviews with representatives of PMI at the PMI headquarters, while the historical records of the operations, which include order times, amount of distributed water, destinations and transporters, are obtained from the organization. The simulation model is developed using Arena, and the study focuses on the two locations with the highest demand, namely Buleleng and Karangasem areas, during the first 14 days of relief operations. We focused on the 14 days to reflect the relief and response stage of disaster operations management.

## RESULTS AND DISCUSSION

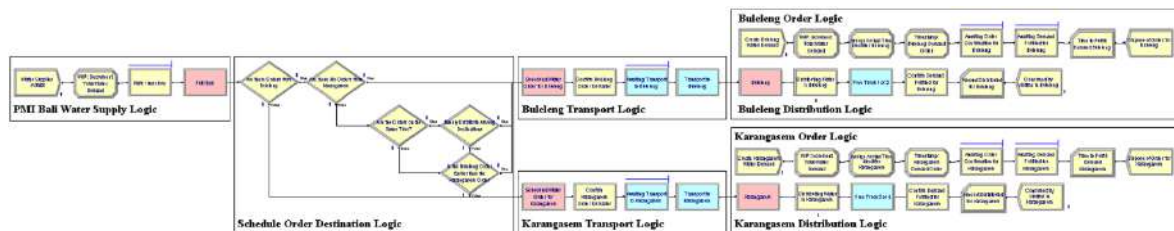


Figure 1. Base Case Simulation Model

The developed model (as shown in Figure 1) highlights the eight main processes that make the water aid distribution system, namely the water supply process, the scheduling water process to Buleleng/Karangasem, two transport processes, two order processes, and two distribution processes.

The most relevant parameter to be observed in the model is the time needed to fulfill the water demands for both locations. Three different scenarios were developed to reduce the time needed to fulfill the demands. The scenarios are to increase the number of available transporters (Scenario 1), share the transportation

resource usage among Buleleng and Karangasem (Scenario 2), and to maintain inventory levels at 25,000 liters of water, the assumed inventory maximum capacity (Scenario 3). Using a Welch confidence interval (Law, 2015) all scenarios are significantly different.

**Table 1.** Summary of Base Case Scenario and Other Scenarios Output Results

Days to fulfill demand	Model	1	2	3
Buleleng	0.3967	0.3569	0.3579	0.0284
Karangasem	0.4131	0.3765	0.3821	0.1261

Scenario 3 had the most significant reduction of time required to fulfill demand, with a 97% and 70% reduction rate for Buleleng and Karangasem respectively. Scenario 1 resulted into a reduction rate of 10% and 8% while Scenario 2 resulted into a reduction rate of 10% and 7.5% for Buleleng and Karangasem respectively. Scenario 1 and 2 are tested to be similar.

**Conclusions**

The creation of the Arena model revealed the eight processes involved in PMI’s water distribution operation. More detailed activities include inventories, decides, and recording relevant orders, distribution amounts, and time. These activities are like conventional logistics. We identify that the main problem is long time to fulfill demand, requiring approximately nine hours for both Buleleng and Karangasem, which is still unideal because for disaster relief. This problem is because the operation still implements a very basic logistic plan, with no attempt to strategize the use of limited resources or implement more comprehensive inventory policy.

We test three scenarios, aiming to lower time required to fulfill demand. All three scenarios are promising because they reduce the time to fulfill demand significantly. The first scenario reveals that currently the base model’s transportation system is still overwhelmed and that adding transportation resources can alleviate the burden. However, this option can be costly because it requires additional expenses but since Scenario 2 has similar results, it can be used as an alternative strategy when spending on new transporters is infeasible. Scenario 3 has the most significant positive effect, it reduces the occurrence of water shortages.

**Keywords:** Discrete-Event Simulation, Humanitarian Logistics, Water Distribution, Indonesia

**Acknowledgment:**

The authors want to thank Directorate of Research and Community Engagement, Universitas Indonesia, and Palang Merah Indonesia for their support in this research.

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## Robust Lagrange Multiplier Test (RLM) In Determining Spatial Regression Model

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### INTRODUCTION

In modeling data that includes spatial elements in it is called a spatial econometrics model. This spatial effect is also called a spatial effect, which consists of two types, namely the effect of spatial dependence and the effect of spatial heterogeneity. Spatial dependence means that an observation in a location is interdependent with observations in other locations. While spatial heterogeneity (spatial heterogeneity) is a condition where the occurrence of diversity between locations results in each location having different relationship structures and parameters.

Testing the effect of spatial dependencies in the model is very important because if ignored will cause the conclusions that are right. There are several models that are formed in data modeling that contain the effects of spatial dependencies, namely Spatial Autoregressive (SAR), and Spatial Error Model (SEM). Tests to determine the model can use the Lagrange Multiplier (LM) Test, but these tests often experience discrepancies in concluding the type of model, especially if there is a misspecification model. Therefore in the study using the Robust Lagrange Multiplier (RLM) test to determine the model used.

### RESULTS AND DISCUSSION

Based on the results of the Lagrange Multiplier (LM) test there is no model yet, but by using the Robust Lagrange Multiplier (RLM) test the model that can be formed is the Spatial Autoregressive (SAR) model, with the model being formed:

$$\hat{y}_i = 13,3051 + 0,3418 \sum_{j=1; j \neq i}^{27} W_{ij} \hat{y}_j - 0,0324X_{i1} - 0,8695X_{i2} - 0,0051X_{i4} \quad (1)$$
$$i = 1, 2, \dots, 27$$

The results obtained from the spatial autoregressive (SAR) model produce equation (11) with significant explanatory variables are  $X_1$  (Average duration of Exclusive ASI),  $X_2$  (Average length of schooling), and  $X_4$  (Number of medical personnel (midwifery) ) Variable  $X_1$  (Average duration of exclusive breastfeeding),  $X_2$  (average length of schooling), and  $X_4$  (number of medical personnel (midwifery)) has a negative effect on the Infant Mortality Rate (IMR). This means that if there is an increase in each variable by one unit there will be a decrease in the Infant Mortality Rate (IMR).

**.Keywords:** Spatial Dependency, Robust Lagrange Multiplier Test, Spatial Autoregressive Model (SAR)

### Acknowledgment

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## Prediction of Foreign Tourist Visits to Indonesia using Moving Average and Exponential Smoothing Methods and Acceptance of Admission Analysis

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### INTRODUCTION

This paper discusses the prediction of foreign tourist visits to Indonesia using Moving Average method and Exponential Smoothing. In this paper will also be presented an analysis of the length of stay of foreign tourists and foreign exchange earnings based on daily expenditure and the country of origin of tourists concerned. The national tourism sector is now a new prima donna for national development. Foreign exchange contributions and employment in this sector are very significant for foreign exchange. In fact, it is estimated that in 2019 it has outperformed foreign exchange earnings from the palm oil industry (CPO). Foreign exchange from the tourism sector in 2016 amounting to US \$ 13.568 billion was in second place after CPO of US \$ 15.965 billion. In 2015, foreign exchange from the tourism sector amounted to US \$ 12.225 billion or was in the fourth position under Oil and Gas at US \$ 18.574 billion, CPO at US \$ 16.427 billion, and coal at US \$ 14.717 billion. The acquisition of state foreign exchange from the tourism sector since 2016 has outperformed revenues from oil and gas and is below the income from CPO. Based on the results of World Bank research, the tourism sector is the easiest contributor to foreign exchange and gross domestic income (GDP) of a country. The reason is that the derivative impact of investment in the tourism sector on GDP is indeed very large. [BPS, 2017]

The research methodology used in this paper uses descriptive quantitative methods. This paper describes systematically the facts and characteristics of data on tourist visits from the state maca viewed from country of origin, length of stay and foreign exchange receipts. To predict foreign tourist arrivals, the moving average method and exponential smoothing are used.

The moving average method uses all the data that has been observed as a basis for determining the average value which is then used as a prediction of future conditions. The mathematical models used are as follows: [Makridakis, 1983]

$$F_{t+1} = \frac{\sum_{i=1}^T X_i}{T} \quad (1)$$

The mathematical model used to predict future conditions with the Single exponential smoothing method is as follows: [Makridakis, 1983]

$$F_{t+1} = \alpha X_t + (1 - \alpha) F_t \quad (2)$$

### RESULTS AND DISCUSSION

The calculation results show that the country's foreign exchange (revenue) from the tourism sector compared with the 11 largest export commodities ranked the highest in the period of 2011 to 2015 with an average of 10,224.89 in millions of USD. Based on the calculation of foreign tourist arrivals to Indonesia for the period 2002 to 2016 an average of 7,041,315 people per year and an average growth rate of 9% per year for the last five years.

**Keyword :** foreign exchange, commodity, tourists, moving average and exponential smoothing

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# Probability-based Structural Assessment of Existing Concrete Buildings Using The First Order Reliability Method

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## INTRODUCTION

There are several parameters affecting the performance and service life of reinforced concrete (RC) structures among others strength, quality of concrete, concrete cover, age, and environmental exposure. The assessment of existing RC structures become more and more demanding as the number of aging structures increases over time. There can be numerous reasons of conducting structural assessment namely different use of existing structures other than specified from its previous design, the need of higher load application, and degradation indication of the structures. Degradation is by far the main reason for the assessment.

It is hard to simulate degradation process since it relates to various chemical and physical phenomena (1). Probabilistic approach is so far give better and reliable service life prediction model. Monitored field data together with probabilistic evaluation offer reliable results in predicting the probabilities of degradation. Probability function, reliability based models, Monte Carlo simulation, Markov chain method, and fuzzy logic are the promising probability or statistical model based concepts (2).

## RESULTS AND DISCUSSION

The probability based structural assessment of existing concrete buildings using the first order reliability method has been discussed.

The CDF of x with distribution  $N(\mu, \sigma)$  is given by

$$F_x(x) = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{\infty} \exp\left[-\frac{1}{2}\left(\frac{X-\mu}{\sigma}\right)^2\right] dx \quad (1)$$

The results of non-destructive test on concrete can be seen in table 1.

**Table 1.** Results of non-destructive test on concrete

No	Location	Rebound Hammer Readings	Average Rebound	Compressive strength (kg/cm <sup>2</sup> )
1	Stair 1	44	46.6	240.80
2	Stair 1	44	42.2	205.31

**Keywords:** existing buildings, probability, reliability method, structural assessment

## Acknowledgment

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## Probability Of Failure Model In Mechanical Component Because Of Fatigue

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### INTRODUCTION

Fatigue is one of the most common mode in failure of mechanical component. Fatigue experiment shows that coefficient of variation of fatigue life data is ranging from 30% until 40%. High deviation of the data means deterministic prediction of fatigue life may not be valid anymore, hence probability based method to calculate the probability of failure due to fatigue damaged is conducted. The probability of failure prediction methodology is based on damage fraction concept. As the usage cycles increase, the damage fraction increase until it reaches critical damage point where component fails. Damage fraction is a function of ultimate strength and fatigue limit, in which both are modeled as random variables with normal distribution. The validation is done by varying standart deviation of each random variables. The validation result shows that increasing standart deviation of both ultimate strength and fatigue limit will increase the probability of failure.

### RESULTS AND DISCUSSION

In this model, failure condition of mechanical component because of fatigue  $Z(n)$  is defined when damage accumulation  $D_n$  greater than or equal to critical damage  $D_{cr}$ . Damage accumulation  $D_n$  is a function of two random variables that are ultimate strength  $S_u$  and fatigue limit  $S_e$ , while critical damage  $D_{cr}$  is assumed to be constant with value one. Failure condition according to definition above can be written as

$$Z(n) = D_{cr} - D_n \leq 0 \quad (1)$$

One of the most widely used damage accumulation model is the linear damage accumulation, also known as Palmgren-Miner rule

$$D_n = \frac{n}{N_f} \quad (2)$$

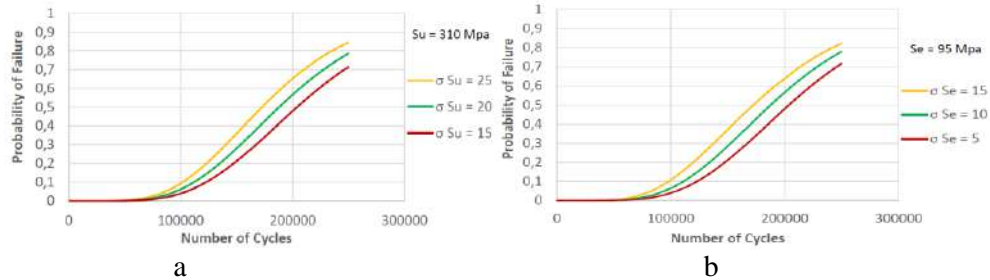
where  $n$  is the number of applied cycles and  $N_f$  is the number of cycles to failure. To obtain the value of  $N_f$ , Basquin proposed mathematical equation that is

$$N_f = \left(\frac{S_{nf}}{a}\right)^{\frac{1}{b}} \quad (3)$$
$$a = \frac{(f \times S_u)^2}{S_e}$$
$$b = -\frac{1}{3} \log_{10} \left(\frac{f \times S_u}{S_e}\right)$$

where  $S_{nf}$  is corrected alternating stress,  $S_u$  is ultimate strength,  $S_e$  is fatigue limit and  $f$  is fatigue strength fraction. Subtitute equation (2) and (3) to (1) to obtain

$$Z(n) = D_{cr} - \frac{n}{\left(\frac{S_{nf}}{a}\right)^{\frac{1}{b}}} \quad (4)$$

Model which has been developed is applied to calculate the probability of failure 6061-T6 Aluminium with different standart deviation of  $S_u$  and  $S_e$ . The results are given in the Figure 1a and Figure 1b.



**Figure 1.** Probability of failure 6061-T6 Aluminium with different standart deviation of  $S_u$  (1a) and  $S_e$  (1b).

**Keywords:** Fatigue. Probability of failure, Stochastic process

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## Quality Analysis of Chips Products Using Multivariate Statistical Process Control (MSPC)

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### INTRODUCTION

PT Indorama Synthetics Tbk. is manufacture company that engaged in textile field with one of its production that is chips. Chips quality characteristics is measured using 6 variables where on that product experienced downgrade because of chips quality product that is not suitable with quality that has been determined by company. Analytical tool used is Multivariate Statistical Process Control (MSPC) with Free Distribution  $T^2$  Hotelling Control Chart because the used is not fulfill Multivariat Normality assumption. If there is a point that out of control, search for its cause using  $T^2$  Hotelling decomposition method. The purpose of the Multivariate Statistical Process is to monitor the production process with control charts [1, 2].

### RESULTS AND DISCUSSION

The results showed that the quality of chips still uncontrollable statistically because there are still 5 different points out of control limits caused by variables *Intinsic Viscosity* ( $X_1$ ), COOH ( $X_2$ ), color b ( $X_3$ ), and chips/gram ( $X_5$ ) variables. Some data that is out of control is caused by electrical factor that give the influence of machine used in production process. Because there is a point that is out of control then formed a revision control chart. The second revision control chart shows that the quality of the chips is in control so that it can be calculated the process capability. Based on capability process shows that there are 1 variables that is not suitable with company specification.

**Keywords:** Downgrade, chips, multivariate statistical process control, free distribution  $T^2$  Hotelling control chart.

### Acknowledgment

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## Negative Binomial Regression to Overcome Overdispersion in Poisson Regression

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### INTRODUCTION

Partially Oriented Yarn (POY) or semi-finished yarn is a kind of yarn that is produced in the POY Department in PT. Indorama Synthetics Tbk. Prior to running the production activities, the company needs to do the planning and controlling of the production process on the POY yarn properly, considering that the production process is continuous. If at the time of production process defective POY yarn products are found, it can lead to losses for PT. Indorama Synthetics Tbk. Product defect or break is a discrete response variable in the form of data count. The model that can be used when the response is the data count is Poisson regression model [1, 2, 3].

### RESULTS AND DISCUSSION

In exploration of data it is known that discrete data overdispersion means the variance of discrete data is greater than average so to handle the problem Negative Binomial Regression can be used. In this study, there are three predictor variables that are suspected to have effect on the product defect, which are carboxyl acid (COOH), intrinsic viscosity (IV) and beam temperature. Based on AIC value, the suitable model to be used is the Negative Binomial regression model because it has smaller AIC value Poisson regression model so that in this case the use of Negative Binomial regression can be applied. From the Negative Binomial regression model it is known that carboxylic acid (COOH) has an effect on product defect on POY yarn.

**Keywords:** Poisson Regression, count data, overdispersion, Negative Binomial Regression.

### Acknowledgment

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## Long Memory in the Indonesian Stock Market

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### ABSTRACT

The stationary long memory process can be characterized by an autocorrelation function that decays at a hyperbolic level. One way to detect the time series process is a long memory by looking at a plot of an autocorrelation function (ACF) and a partial autocorrelation function (PACF). However, the use of ACF and PACF only sees the existence of long memory in time series data and cannot determine Hurst parameters in the fractional Brownian motion. This paper will determine the Hurst parameter value from the return of stock price traded in Indonesia using the resale range (R/S) method and the Geweke and Porter Hudak (GPH) methods. In addition, empirical results indicate that the long memory behavior observed in some Indonesian stock prices is the correct behavior.

## Model Averaging in Block-Correlated Data

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### INTRODUCTION

High dimensional data is a kind of the big data characterized by the number of variables far exceeding of observations available. In this kind of data, multicollinearity, where two or more covariates are correlated linearly each other by a functional relationship is inevitable. Employing ordinary least squares as an estimation method will produce a misleading prediction model.

Model averaging (MA) is an alternative approach to model selection that combines all their estimates by weighted averaging instead selects one of them based on certain criteria. There are three main steps which determine the prediction performance of MA, namely construction and estimation of candidate model and weight criteria.

This research aims at investigating how the prediction performance produced by MA behaves when it is applied in high dimensional data containing block correlation. This data are common to be found in genomic data in particular a groups of genes that work in the commonly biological function.

### RESULTS AND DISCUSSION

In order to better understand the prediction performance of MA in high dimensional data containing block correlation, several generated datasets are used as illustrations.

In block-correlated data, the covariance value between covariates that belong to the same block is set to 0.95 and to those that of the different block to 0. The error terms generated from normal with mean 0 and variance 0.1, while the number of blocks is set to 10.

In this simulation we utilize three weight criterion namely AIC, Mallows and Jackknife where subsequently produce model averaging called AIC MA (AMA), Mallows MA (MMA) and Jackknife MA (JMA) respectively.

Root mean squared error prediction is used to quantify the prediction performance of the three kinds of MA as shown in Figure 1. The picture shows that weight criterion and number of covariates involved in a candidate model, significantly determine the prediction performance of MA in block-correlated data.

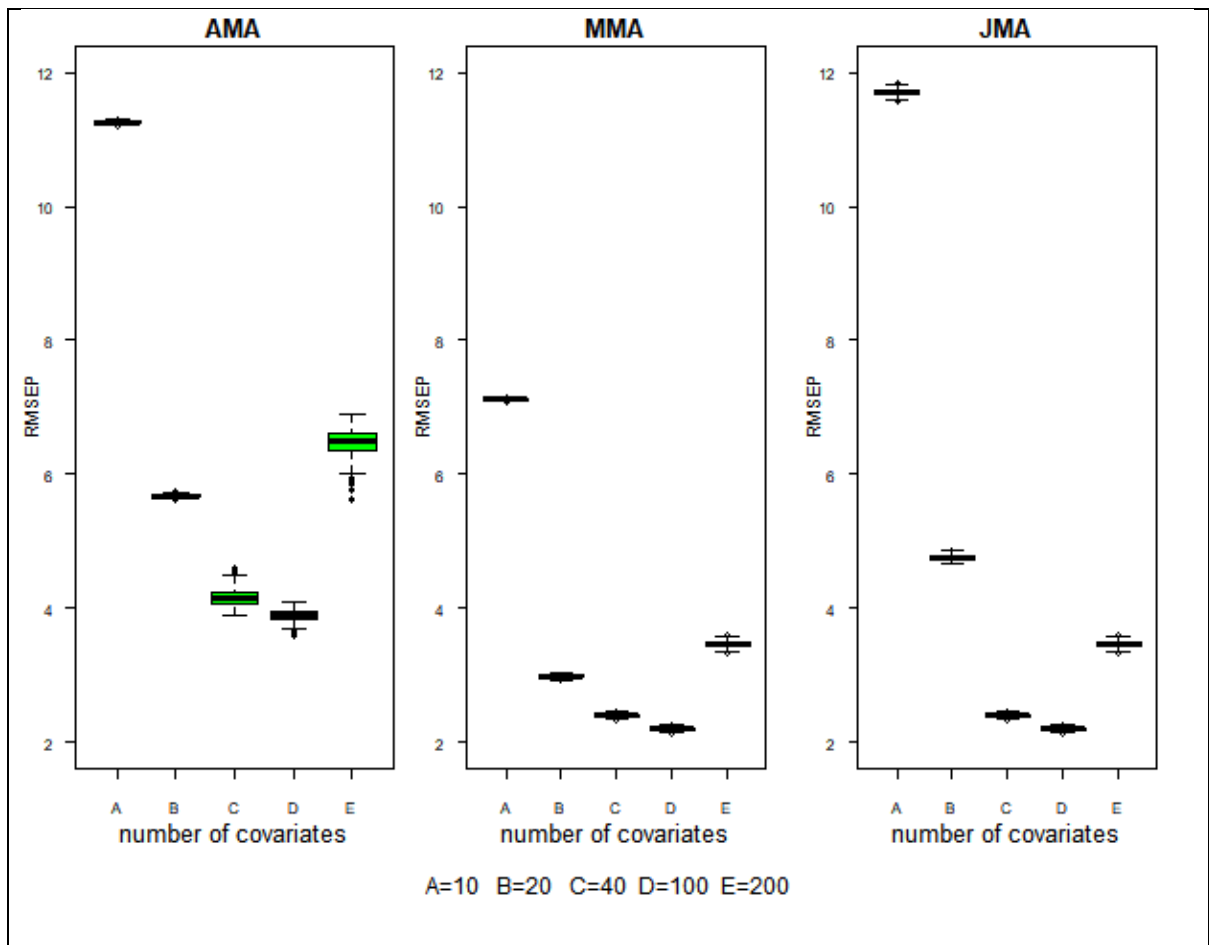


Figure 1. Plots of RMSEPs result from AMA, MMA and JMA

**Keywords:** AIC, genomic data, jackknife, least squares, mallows

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## Grouping of Subjects in Physics Department, Faculty of Mathematics and Natural Sciences, Sam Ratulangi University Based on the Learning Process with Cluster Analysis

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### INTRODUCTION

Reliability, responsiveness, assurance, empathy and direct evidence are determinants of service quality. The Physics Study Program of the Faculty of Mathematics and Natural Sciences of Sam Ratulangi University is an educational service institution. The measurement of the quality of the lecturers' performance is based on the student's assessment of the quality of service based on the determinants of service quality in the learning process. The more variables that are assessed, it is necessary to see which variables must be considered in the learning process so that they can be used as a basis for self-evaluation. Cluster analysis is a statistical technique that is useful for grouping objects or variables into certain groups where each object or variable that is formed has properties and characteristics that are close together. The purpose of this study is to classify subjects in the Physics Study Program based on the learning process. The study was conducted at the Physics Study Program in June 2018. The study was conducted with a survey using the Multistage random sampling method. The data is in the form of learning process taught in Even Semester 2017/2018.

### RESULTS AND DISCUSSION

The results showed that of the 32 subjects taught in the even semester 2017/2018 in the Physics study program Sam Ratulangi University, consisting of 8 groups. The first group consisted of 21 subjects, the second to seventh group consisted of 1 subject, and the eighth group consisted of 2 subjects

**Keywords:** Cluster Analysis, Physics Study Program, Reliability

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## Niche Theory within Video Platform Competition: Traditional vs. Modern

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### INTRODUCTION

Service providers including video platform providers need to pay attention to customer feedback to better provide service [1], [2] and must rely more on customers' need and value in service processes [3]. The video platform providers have to organize around the customer in order to be a successful firm. They are forced to change and also to innovate their service activities from a provider's point of view towards a customer's point of view [4]. Customer delight has to be created during the process of service delivery in order to really outperform competitors and win the hearts of customers [1], [2], [5]. While a good quality of service has been considered a competitive advantage, many researchers have now pointed out that a quality service aiming to satisfy expectations can no longer win the hearts of customers. How to provide high quality experience and value for customers is more critical now [3]. A memorable service experience and value could improve customer satisfaction and loyalty of service providers leading to greater profit [5].

Penetration of internet users in Indonesia in 2016 increased to 51.8% or reaches 132.7 million people. Users often use the internet as entertainment (96.8%). Of the various types of entertainment that can be accessed by the internet, entertainment content that is most frequently visited by users is watching online movies with a percentage of 41% or about 54.4 million people [6]. Nevertheless, television is still at the top of the peak as the main medium. The result of the Nielsen Consumer Media View survey of more than 17,000 people over the age of 10 in 11 major cities in Indonesia shows that television is still ranked first (96%), followed by outdoor media (53%), and internet (44%) [7]. IPTV (Internet Protocol Television) is an interactive (two-way) television, subscribers can rewind or pause the broadcast, where data is transmitted over an IP network [8]. While, OTT (Over The Top) according to U. S. Federal Communication Commission, is defined as an online video distributor that sends video content to customers via the internet [9].

Nielsen Cross-Platform 2017 survey found that watching via traditional television (cable television and satellite television) is still the top choice (77%) in Indonesia. Satellite television transmits television signals from satellites which will then be received by a television antenna. While, cable television delivers its programming through radio waves transmitted into coaxial cables. On the other hand, the modern platform for accessing video through the internet also has a high penetration, streaming sites such as YouTube, Vimeo, and so on (51%), online television portals (44%), and subscription internet television such as Netflix, Iflix, HOOQ, VIU, and so on (28%). If users penetration of those modern platform are combined, they can threaten traditional platforms. Nielsen Cross-Platform is an annual study of digital content in the Asia Pacific region using an online survey methodology [10]. Based on research conducted by Ericsson ConsumerLab on future technology trends conducted in 2011 to 2014 in nine countries (Brazil, China, Germany, South Korea, Spain, Sweden, Taiwan, United Kingdom, United States), it was found that from year to year the use of television has decreased. Based on the research, President of Ericsson Indonesia, Thomas Jul, predicts that the same will happen to other countries including Indonesia [11].

Theory of the niche is originated from an ecological study of competing living populations and it is adapted to explain competition in the mass media with the same consumer resources as in a video platform between traditional platforms and modern platforms that live together. Analysis of niche theory is done by applying the three measurement concepts namely niche breath, niche overlap, and competitive superiority. Li's study [12] also adapted from Dimmick's niche theory by using gratification obtained and gratification opportunities to test the competitive relationship between three television media -OTT, IPTV, and digital cable. Among the three media, OTT is the most competitive medium [12]. Therefore, in this study, niche

theory will be applied to test dynamic competition relationships among video platforms - satellite television, cable television, IPTV, and OTT in Indonesia.

## RESULT AND DISCUSSION

### 1.1. Profile of respondents

The questionnaire was distributed to 582 people, there were 502 respondents matching the criteria (405 online and 97 offline). For ages, 16.53% of respondents were under 18 years old, 73.90% were between 18-38 years old, 8.77% were between 39-58 years old, and 0.80% were older than 58 years. The percentage of men from 502 respondents was 45.82%. Focus group discussions were conducted in two groups. The first group consisted of 6 participants, 4 aged 21 and 2 aged 22, all women. The second group consisted of 6 participants, where 1 was 20 years old, 3 were 21 years old, 1 was 28 years old, and 1 was 29 years old, of which 3 were male.

### 1.2. Niche breadth

Niche breadth of each platform is shown in Table 1. OTT has the ability to provide the highest gratification among other platforms on all macrodimension. This shows that OTT has a dependency relationship with various resources. Meanwhile, the relationship of satellite television depends only on a few resources. Satellite television gratuities are the lowest on any macrodimension except in financial benefit. IPTV provides the lowest gratification on that macrodimension.

**Table 1.** Niche breadth on each video platform

Platform	Ease of Use	Financial Benefit	Easy Interactivity	Convenience	Content	System Quality
Televisi Satelit	0.635	0.698	0.485	0.451	0.485	0.583
Televisi Kabel	0.741	0.629	0.683	0.584	0.693	0.721
IPTV	0.702	0.623	0.694	0.666	0.705	0.71
OTT	0.758	0.723	0.745	0.81	0.831	0.733

Niche breadth moves from 0 to 1. If divided into 4 categories, specialists, tend to be specialists, tend to generalists, and generalists, then the range of each interval is 0.25. Niche breadth categorization can be seen in Table 2.

### 1.3. Niche overlap

Niche overlap of each pair of video platforms can be seen in Table 3. The niche overlap moves from 0 to 4 where, the nearer to the zero the higher overlap between two platforms, the stronger the competition or substitution relationship the two platforms have. Cable television and IPTV have the most intense competition relationships among other platform pairs in the six macro dimensions. The most likely explanations are 1) The operation of the television is similar from the remote as well as the appearance and arrangement of the television channel, 2) Both require a subscription fee with similar price range, 3) The ease of finding the desired program is not much different, although the advertising interference on IPTV is less, 4) Both of them are less portable than OTTs, 5) Both have national television channels and foreign television channels, and 6) Providers of both platforms are almost certainly have copyrights of their program and provide good image quality, although how to transmit data is different, cable television via coaxial cable and IPTV over IP network.

While, the weakest overlap indicated by the large niche overlap value occurs in satellite television pairings and OTT, except for the financial benefit macrodimension. The most likely causes are 1) The arrangement of the OTT program is much more modern than the satellite television; 2) The satellite television contains a national television channel that has a lot of advertising disruption compared to the foreign television channel (cable television and IPTV), moreover with OTT, there are paid/subscription OTT which is free from



advertisement; 3) OTT is portable and easy to save favorite programs; satellite television is not; 4) There are types of programs that only exist in OTT, OTT even includes programs that exist in other platforms; variations of satellite television programs are very narrow; and 5) Sometimes it is difficult to find the position of satellite television antenna where all channels have good picture quality. Meanwhile, OTT system quality is better overall, many OTT have HD resolution picture quality even 4K resolution. In the financial benefit macrodimension, the weakest overlap occurs in satellite television and IPTV (0.999), followed by satellite television and cable television (0.986). Satellite television does not require a subscription fee, whereas IPTV and cable television have similar and relatively high subscription fees, while the OTT has two services, paid OTT services and free OTT services.

1.4. *Competitive superiority*

Calculated competitive superiority and t-test results of each pair of video platforms can be seen in Table 5. Satellite television is inferior in all macrodimensions with each of other platforms. Satellite television is only superior in financial benefit macrodimension to cable television and IPTV. It means satellitetelevision provides a greater gratification to consumers related to finance compared to cable television and IPTV. The ability of IPTV and cable television to provide gratification is no different from financial benefit, easy interactivity, content, and system quality macrodimensions. Cable television is superior to IPTV in the macrodimension of ease of use; IPTV is superior to cable television in the convenience macrodimension. The ability of OTT and cable television to provide gratification is no different in the macrodimensions of ease of use and system quality. However, OTT is able to provide greater gratification on the macrodimensions of financial benefits, easy interactivity, convenience, and content. OTT is also superior to IPTV in all macro dimensions.

1.5. *Media life cycle*

Satellite television is on a defensive resistance lifecycle. Sooner or later, old media will be threatened by new media. New media (cable television, IPTV, and OTT) offer facilities that satellite television does not have, for example international television programs and better video resolution. Speed of old media response is economical: the greater the investment in infrastructure, the higher the reluctance of the old media to change or adapt – “network lock-in” [18], as published by Lehman-Wilzig and Cohen-Avigdor [15]. Infrastructure investment is carried out in the form of satellite television service launches such as Telkom 2 in November 2005, Indostar 11 in May 2009 and Telkom 3S in February 2017. Therefore, satellite television is still reluctant to change from the current video delivery system.

**Table 2.** Niche breadth on each video platform

Platform	Ease of Use	Financial	Interactivity	Convenience	Content	System Quality	Notes
Satellite Television	Tend to be Generalist	Tend to be Generalist	Tend to be Specialist	Tend to be Specialist	Tend to be Specialist	Tend to be Generalist	Many ads, limited program variations, limited image quality, cheap, easy to use
Cable Television	Tend to be Generalist	Tend to be Generalist	Tend to be Generalist	Tend to be Generalist	Tend to be Generalist	Tend to be Generalist	Subscription required, wide program variations, smooth program
IPTV	Tend to be Generalist	Tend to be Generalist	Tend to be Generalist	Tend to be Generalist	Tend to be Generalist	Tend to be Generalist	Subscription required, broad program variations, minimal ads, free enough to select videos
OTT	Generalist	Tend to be Generalist	Tend to be Specialist	Generalist	Generalist	Tend to be Generalist	Subscriptions based on preferences, exclusive content, a wide variety of programs, portable, free to choose videos

**Table 3.** Niche breadth on each video platform

Macrodimension	Satellite TV-Cable TV	Satellite TV-	Satellite TV-	Cable TV-	Cable TV-	IPTV-
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		IPTV	OTT	IPTV	OTT	OTT
Ease of Use	0.83	0.892	0.99	0.557	0.67	0.654
Financial Benefit	0.986	0.999	0.808	0.457	0.89	0.768
Easy Interactivity	1.101	1.172	1.412	0.546	0.852	0.737
Convenience	0.867	1.246	1.76	0.737	1.315	0.919
Content	1.017	1.081	1.546	0.464	0.779	0.687
System Quality	0.799	0.821	1.065	0.343	0.613	0.525

**Table 4.** Niche breadth on each video platform

		Satellite TV-Cable TV		Satellite TV-IPTV		Satellite TV-OTT		Cable TV-IPTV		Cable TV-OTT		IPTV-OTT	
		S	t-Value	S	t-Value	S	t-Value	S	t-Value	S	t-Value	S	t-Value
Ease of Use	S <sub>Ij</sub>	1.434	-9.815*	2.321	-5.966*	1.622	-10.837*	2.996	3.730*	2.169	-1.572	1.41	-5.066*
	S <sub>Ji</sub>	5.131		4.45		5.797		1.528		3.297		3.751	
Financial Benefit	S <sub>Ij</sub>	5.151	6.073*	5.291	6.691*	2.651	-2.215*	1.894	0.558	1.578	-8.532*	0.98	-9.203*
	S <sub>Ji</sub>	2.317		2.375		3.263		1.504		5.018		4.725	
Easy Interactivity	S <sub>Ij</sub>	0.735	-16.352*	0.845	-17.545*	0.811	-22.419*	1.966	-0.978	1.841	-5.743*	4.002	-4.837*
	S <sub>Ji</sub>	6.47		6.791		8.199		2.185		4.426		4.725	
Convenience	S <sub>Ij</sub>	0.741	-10.226*	0.932	-17.178*	0.552	-29.837*	1.223	-7.037*	0.972	-20.263*	0.769	-13.564*
	S <sub>Ji</sub>	4.639		6.488		9.327		3.464		7.4		5.837	
Content	S <sub>Ij</sub>	0.291	-16.412*	0.388	-17.536*	0.277	-27.911*	1.155	-1.068	0.446	-12.284*	0.339	-11.333*
	S <sub>Ji</sub>	4.604		4.791		6.809		1.4		4.141		3.833	
System Quality	S <sub>Ij</sub>	0.518	-12.246*	0.863	-11.414*	1.375	-13.239*	1.54	1.022	2.084	-1.071	1.472	-2.104*
	S <sub>Ji</sub>	5.221		5.09		6.058		1.096		2.643		2.57	

Cable television is ongoing two cycles at once, defensive resistance and the sixth stage, adaptation. The decline of cable television can be seen in the performance of the two largest cable television providers in Indonesia, First Media and MNC Sky Vision, each experienced a loss of 279.05 billion rupiahs and 293.80 billion rupiahs in the first half of 2015 [19]. The decline was caused by the threat of IPTV and OTT. Supported by FGD participants' statement that IPTV is better because the ads can be accelerated, OTT is more up to date and cheaper than cable television. The adaptation made by cable television is they begin to migrate to IPTV technology, based on news articles from industri.bisnis.com [20]. This method does not guarantee the survival of the old media, but allows the survival of media organizations when the old media (cable television) disappears.

The birth of IPTV in 2011 with a similar display to cable television gives IPTV an advantage because users do not need to take long to get to know and understand the use of IPTV. IPTV can offer facilities that did not exist in cable television, it can rewind and pause the broadcast, also watch the programs that have passed. IPTV is in the third phase, growth, IPTV has not entered the stage of maturation because until now IPTV has not passed more than half of the video media market.

OTT is a video services provider through the internet. The Nielsen Cross-Platform 2017 survey in Indonesia shows the penetration users of streaming site such as YouTube, Vimeo (51%), online television portals (44%), subscription platforms such as Netflix, Iflix, HOOQ (28%). It is not known to the number of users who use more than one OTT platform such as one user using YouTube and Netflix in the same time. However, it can be ascertained that overall OTT penetration is more than 50%. This clearly indicates that OTT is already in the fourth stage, maturation. Corporate Secretary Division General Manager of PT Indosat Mega Media, Syachrial Syarif, suggests that from the research he knows only 40% of consumers who want to subscribe to internet television, the rest are not. Paid television is solely the home internet addition [21]. Internet-television package is one of the reasons users subscribe to paid television. This is supported by FGD participants' statement, "Cable TV is usually bundling with home internet. So, it feels more profitable." and on one of the reasons participants chose IPTV, "the price is already one package with my home internet."

## CONCLUSION AND SUGGESTION

The conclusions of this research are: 1) Based on the obtained niche breadth, satellite television is a specialist platform, cable television and IPTV are classified as tend to be generalist, and OTT is a generalist platform; 2) Based on the niche overlap acquired, the strongest competition occurs between cable television and IPTV compared to other platform pairs; 3) Among the four video platforms, OTT is the most competitive platform and satellite television is the least competitive in all macrodimension. Cable television is superior to IPTV in ease of use macro dimension, whereas IPTV is more competitive in convenience macrodimension; the other macro dimensions show no difference in providing gratification to users between cable television and IPTV; 4) Satellite television is in a defensive resistance cycle (fifth cycle), while cable television is in two cycles at once - defensive resistance and adaptation (sixth cycle). IPTV is in the growth cycle (third cycle), whereas OTT is already in the maturation cycle (fourth cycle).

Suggestions for each platform in order to survive or extend the period of its success include: 1) Satellite television focuses its target consumers on areas with minimal communications services in Indonesia (countryside or remote area), 2) Cable television switches technology using IP networks and privileges by products (internet and OTT ) to attract and retain users, 3) IPTV providers extend fiber networks to a wider range of users than before, collaborate with local authorities in its realization, and 4) Each OTT markets itself massively and continuously through internet networks such as social media and pop-up ad, in order to last longer in the maturation cycle. Suggestions for future research based on the limitations of this study are to distinguish the OTT platform into paid OTT and free OTT services.

**Keywords:** niche theory, competition, video platform

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## The Relationship Between Internet Use For Information Search And Academic Performance Of Civil Engineering Students In Sariputra Indonesia University

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### INTRODUCTION

The purpose of this research is to determine to what extent is the relationship between internet use for information search and the academic performance of civil engineering students in Sariputra Indonesia University. This is a qualitative descriptive research with 25 civil engineering students as the sample. The data were collected using questionnaires about internet use for information search to civil engineering students. This research consists of two variables, which are independent and dependent variables. The independent variable is internet use and the dependent variable is academic performance of civil engineering students in form of students' Grade Point Average.

The data analysis method used in this research was descriptive method, in which it can give a clear description to the researcher about the observed variables. It can also picture the analysis test required in order to know the data distribution and the variables of the population itself. Analysis tests used were normality and linearity test. Hypothesis test was also used to find out the relationship between internet use variable and students' academic performance variable. The results were then used to determine whether the hypothesis was rejected or accepted.

### RESULTS AND DISCUSSION

The questionnaires used in this research has passed the validity and reliability tests with result of cronbach's alpha value of 0,689 with 18 instruments, which was larger than the table value of 0,368. It meant that the questionnaires were valid and reliable to be used in this research. The data obtained from the questionnaires were then analysed. The analysis process started with normality test, then linearity test, and the last was hypothesis test.

Normality test table shown Asymp. Sig. value of 0,409 for internet use variable and 0,965 for academic performance variable. Both significance values were larger than 0,05 which meant that the distribution of the data of both variables formed a normal distribution. See table (1).

**Table 1.** Normality Test

	Internet Use	Academic Performance
N	25	25
Asymp. Sig. (2-tailed)	.409	.965

Linearity test aims to determine the relationship between internet use variable and academic performance variable is linear or not. The decision making process in the linearity test is if the significance value (linearity) < 0,05, then the relationship between the independent and dependent variables is linear, while if the significance value (linearity) > 0,05, then the relationship is not linear. The linearity test of this research shown a significance value (linearity) of 0,249 which was larger than 0,05. Therefore, it can be concluded that the relationship is not linear. See table (2).

**Table 2. Linearity Test**

			Sum of Square	Df	Mean Square	F	Sig
Academic Perfromace *	Between groups	Linearity	27.991	1	27.991	1.580	.249
Internet Use							

The hypothesis test conducted in this research aimed to determine whether the proposed hypothesis was accepted or rejected. Based on the normality and linearity tests, it was known that the samples were distributed normally but the relationship between variables are not linear. Therefore, researcher conducted the correlation test between internet use variable and academic performance variable to test the hypothesis. It resulted in Pearson correlation (r value) of  $0,265 \leq r$  table of 0,396. Thus,  $H_0$  was accepted and  $H_a$  was rejected.

Based on the results, it can be concluded that there is no significant relationship between internet use for information search and academic performance of civil engineering students in Sariputra Indonesia University.

**Keywords:** Academic performance, internet use, qualitative descriptive research

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## Classification System Determining Stress Level Using K-Nearest Neighborhood Method

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### INTRODUCTION

Stress is generally viewed as a condition in which a person experiences a psychic disorder in response to the stresses it faces. Unlike adults who can recognize the stress they face and manage it, junior high students are often unaware of the stress they are experiencing, which usually happens around them. This study aims to design a classification system to determine the level of stress experienced by a student by applying the K-Nearest Neighborhood method. The data of this study came from 254 respondents of SMP Katolik Don Bosco Bitung. The determination criteria were taken from the age, class, sex, number of siblings including the student himself, the child to which he or she and the 20 questionnaire questions. For the value of the adjacent parameter K, we take K = 5 value for the nearest neighbors of the test data against the train data. The training data for this system itself was taken from a questionnaire distributed to 254 students of SMP Katolik Don Bosco Bitung. The results of this study suggest that the classification system is successfully implemented and can determine the stress level of junior high school in SMP Katolik Don Bosco Bitung.

### RESULTS AND DISCUSSION

Research conducted by Kanchana et al. (2018) studied a comparative analysis of artificial neural network method and classification method to stress level showed if classification method gives a better result. Encouraged by this, in this study will be made a system to classify the level of stress experienced by junior high school students using the K-Nearest Neighborhood classification method. The classification of stress level refers to research Warno et al (2015), where the research divides stress into three categories, namely mild stress, medium stress and severe stress.

#### K-Nearest Neighborhood Method (KNN)

K-Nearest Neighborhood method is an algorithm that is often used for classification other than used in prediction and estimation. Larose and Larose (2015) explain that classification has some similarities to the estimation, but the target variable is categorical rather than numerical.

KNN is classified as an instance-based learning in which the training data from the test data has been stored, so the classification of new data can be found by comparing it to the majority of similar training data at the time of testing (Larose and Larose, 2015), the majority of which is derived from the voting value of its neighborhood K (Prasad, 2016). In general, the distance function is for KKN ie Euclidean distance with:

$$d_{Euclidean} = \sqrt{\sum_i (x_i - y_i)^2} \quad (1)$$

Where :

d = Euclidean distance

xi = test data

yi = training data

For the value of K in this study, taken from the research of Banjarsari et al (2015), the value of K = 5.

From the distributed questionnaires, the variables taken into the assessment of the KNN method to classify the students' stress levels were gender, age, class, number of siblings and sequence to a number of siblings, and 20 questionnaire questions. However, in calculating KNN only numerical variables can be calculated, for that gender will be converted into a decimal format based on ASCII rules, so L is worth 76 and P is worth 80 This change refers from research conducted by Rahmawati and Adnan (2017). Table 1 contains self-data, answers to questionnaires, and the results of stress classification of students as many as 254 data.

Table 1. Training Data

No	Gender	Age	Class	No of Siblings	Rank of	Question								Stress Classification
						1	2	3	4	5	...	20		
1	76	13	2	2	1	2	2	2	4	2	...	4	Light Stress	
2	80	12	2	2	1	4	4	3	3	3	...	5	Medium Stress	
3	80	14	2	2	3	3	2	5	5	2	...	4	Medium Stress	
4	80	13	3	3	3	3	1	1	2	1	...	4	Light Stress	
5	76	14	3	2	1	3	3	5	5	3	...	5	Severe Stress	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
254	80	14	2	5	2	5	2	3	4	3	...	4	Medium Stress	

Based on table 1, a test will be performed on an unclassified test data where the student is male, 14 years old, 3rd-grade junior high school, and second child of 2 siblings. The student answer of questionnaire is written on table 2.

Table 2. Test Date

No	Gender	Age	Class	No of Siblings	Rank of	Question								Stress Classification
						1	2	3	4	5	...	20		
1	76	13	2	2	1	3	3	4	4	2	...	5	?	

By using KNN the classification result is light stress.

The results of this study concluded:

1. K-Nearest Neighborhood method to classify stress level successfully applied.
2. The classification results match the process of analysis performed.
3. The amount of training data affects the classification results of the test data.

**Keywords:** Classification, k-nearest neighborhood, stress, test data, training data,

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## Predict the Vehicle in the Parking Area of De La Salle Catholic University Using C4.5 Algorithm

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### INTRODUCTION

Transportation is a very important tool in expediting the economy of society. Transportation serves as a supporter, driver and driver for growth for a region. Congestion, lack of parking lots, roads damaged, the high cost of transportation and security in the use of means of transportation is a problem that can inhibit the transport activity.

Manado is one of the capital cities in eastern Indonesia. The capital city of Manado is in the Development Area of City V as a Secondary Service Center as a business, trade and service area. This is based on Manado City Spatial Plan Year 2007-2027. De La Salle Catholic University is one of the universities located in Manado City, causing De La Salle Manado Catholic University to be included in Manado City Spatial Plan. One of the problems that emerged in this plan was the lack of parking space in the De La Salle Catholic University area. Lack of parking space is very important for the development of the region itself. The problem of The lack of parking space can slow down some aspects such as business, trade and services.

The increasing number of visitors and students from year to year adds the number of vehicles that enter the university area. This causes the parking lot in the university area is decreasing. The need for parking space is increasing with the number of visitors and students who use the vehicle to the university. One solution is to avoid the time when vehicle buildup in the university area is also looking for another parking space is also the best alternative in avoiding the absence of parking space. However, till now there has been no precise way of predicting when and where there will be a buildup of vehicles in the university area. Based on these problems can be seen the existence of a need for information that can provide predictions when there will be an accumulation of vehicles at the De La Salle Catholic University. This is the background of the problem where this research is conducted.

This paper is organized as follows: section II introduces some related work, section III provides the systematic framework of this system, section IV explains the method that we used, section V shows the result that we get by using our method, and section VI presents the conclusions.

### RESULTS AND DISCUSSION

The data that has been initialized will be processed into machine learning. The data is then stored in the repository machine learning RapidMiner. In this test is done three times the processing. Because the label to be predicted, there are three levels. Where machine learning RapidMiner cannot process data simultaneously on any given label. For the first phase of data by using labels P.I to be processed from the results obtained model decision tree on P.I. Data processing is then continued on label P.II. From these results obtained results decision tree on P.II. Data processing was resumed for the third parking area on P.III label. Hence, the result of the decision tree is then modeled in the figure 1 and figure 2.

Based on the test results can see the results of the accuracy of the algorithm used in each parking lot that is Parking 1 has a true value of 33 of the total 40 data tested with an accuracy of 82.5%. Just as in Parking 2 has an accuracy of 80%. This is in contrast to Parking 3 where the true value data is 35 of the total 40 tested data (i.e. 87.5%), the percentage of the higher accuracy of other parking areas. This result can be seen in Table 1.

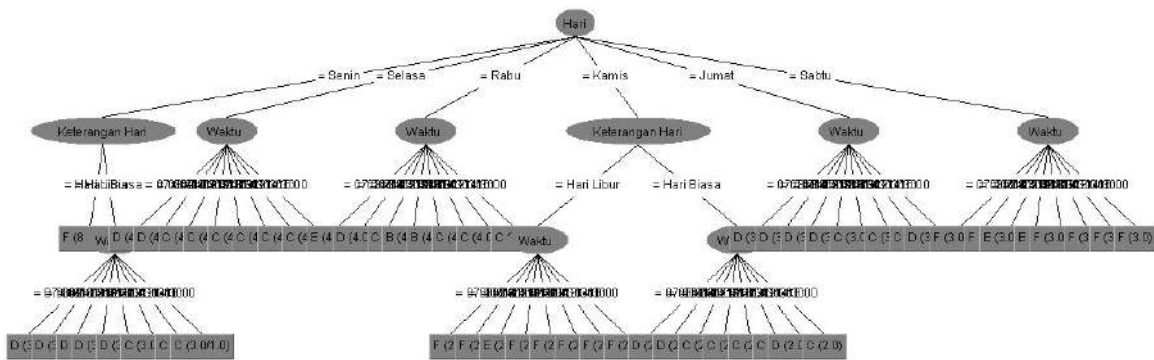


Figure 1. The Model of Decision Tree on the Second Parking Area

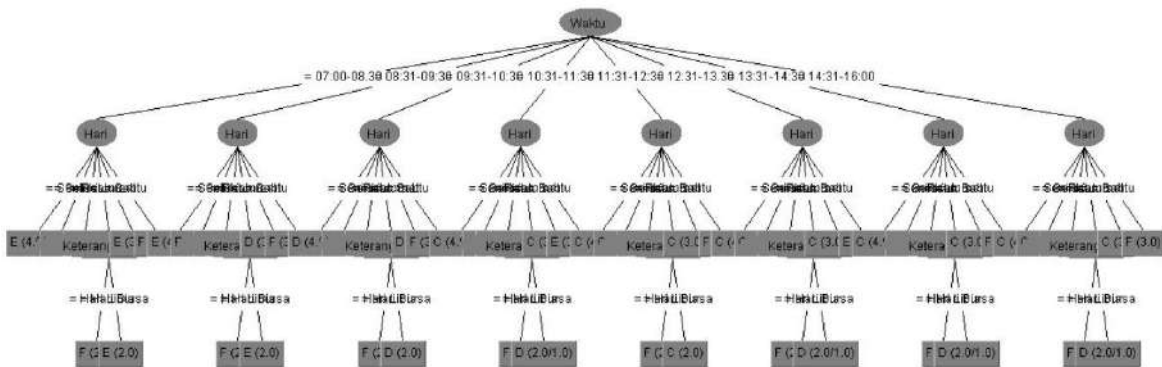


Figure 2. The Model of Decision Tree on the Third Parking Area

Table 1. Accuracy Result of each Parking Area

Attribute	Data Test		The Total of Data Test	Accuracy
	Correct	Incorrect		
P.I	33	7	40	82.5%
P.II	32	8	40	80%
P.III	35	5	40	87.5%

## Respiratory Diseases Expert System Using Dempster-Shafer Theory

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### INTRODUCTION

Breathing is a vital need for human being because without breathing human could not survive. The process of breathing is related to the respiratory system. Poor environmental and behavioral factors can cause problems with the respiratory tract. In 2013, Indonesia’s Ministry of Health reported that the asthma prevalence was about 4.5% while for bronchitis that associated with COPD (Chronic Obstructive Pulmonary Disease) around 3.7%. In Manado particularly, according to the Integrated Disease Surveillance (IDS) 2015-2016 report that collected from government community health clinics across the province, there are 10 prominent diseases where 5 of it are categorized as respiratory disease. These are Influenza (Flu), Asthma, Bronchitis, Pneumonia and Pulmonary TB.

In this study, we developed an expert system that can identify the 5 symptoms of the disease in the respiratory system and provide the treatment solutions. There were 25 symptoms defined in this study. Forward chaining method was used for the reasoning, while the uncertainty reasoning was based on Dempster-Shafer theory. Experimental results show that the trust value is up to 90.25 %. This results clearly shows that the system can performed well to identify the respiratory disease.

### RESULTS AND DISCUSSION

Expert system for respiratory diseases diagnosis consist of four major components, i.e. the knowledge base, inference engine, knowledge acquisition and user interface. The information for all disease’s symptoms and its trust value was obtained from medical expert, i.e. respiratory disease doctor. Table 1 shows the 25 symptoms for 5 respiratory diseases that used in this study.

Tabel 1 Respiratory Disease’s Symptoms

Symptoms	D1	D2	D3	D4	D5	Trust Value	Symptoms	D1	D2	D3	D4	D5	Trust Value
The body feels pain especially on the back	√					0.6	Night sweats without any reasons				√	√	0.7
Chills with fever	√		√	√	√	0.6	Green phlegm cough				√		0.5
Sneeze	√					0.8	Wheezing		√				0.6
Nasal Congestion	√		√			0.8	Nausea and vomiting				√		0.5
Runny nose	√					0.6	Coughing up blood				√	√	0.7
Sore throat	√		√			0.6	Diarrhea				√		0.4
Headache	√		√			0.5	Dry cough			√	√		0.8
White phlegm cough		√				0.6	Cough for more than a month					√	0.8
Feel tightness in chest		√				0.5	Appetite and weight loss					√	0.6



Shortness of breath	√	0,5	Insomnia/ Sleep Disorder	√	0.4		
Cough with phlegm after 2-3 days	√	0.6	shortness of breath on exertion	√	0.8		
Yellow phlegm cough	√	√	√	0.6	Chest pain	√	0.4
Sudden breathlessness	√	0.8	D1=Influenza; D2=Asthma; D3=Bronchitis; D4=Pneumonia; D5=Tuberculosis (TB)				

Tabel 2 shows the accuracy for predicting each disease using Dempster-Shafer method. The average accuracy from 5 runs was calculated to see the mean accuracy obtained by each disease.

Disease	Number of run				Average
	2	3	4	5	
Influenza	80.00	92.00	92.00	96.80	90.20
Asthma	80.00	90.00	92.00	96.00	89.50
Bronchitis	64.00	73.60	88.48	94.24	80.08
Pneumonia	80.00	90.00	94.00	97.00	90.25
Tuberculosis	80.00	88.00	92.00	95.20	88.80

The experiment reveals the average accuracy for five diseases range from 80-90.25%. This results clearly shows that the performance of the proposed expert system application based on Dempster-Shafer theory can performed well in identified the respiratory diseases. In addition, the accuracy for 5 times runs *provide consistent predictions. This indicate the application is reliable as an expert system application in identify the respiratory disease.*

**Keywords:** expert systems, respiratory disease, dempster-shafer

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## Measuring the Tourism Destination Images Based on Service Quality using Fuzzy Inference System

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### INTRODUCTION

Increasing the competitiveness of the tourism industry is able to create new sources of economic growth. North Sulawesi, as a case study, has a great potential in the tourism sector which can be utilized to increase economic growth. However, from the field survey it was found that infrastructure, such as roads, street lighting, communication facilities, and access to tourism objects were inadequate. Environmental cleanliness, comfort and safety of tourist destinations are still lacking. Tourism destinations, in order to look attractive and sustainably preserved, are generally not managed optimally. As well, human resources as the main players in the tourism services industry are still not competent enough [1]. If this weakness is not managed well, then the potential for increased economic growth will be difficult to achieve.

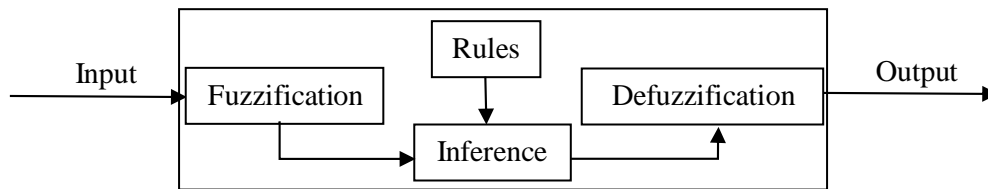
The tourism industry is a very complex service industry [2], involving many players, including hotel or accommodation businesses, travel agents, restaurants, food-beverage retailers, transportation businesses, the government, and local communities. All of these players serve travelers who have varying expectations, experiences, lifestyles and abilities. All travelers want to get a memorable and satisfying service, to stay longer and spend more. To satisfy travelers, one of the most important components of the tourism industry is the image of a tourism destination [3]. The image of tourism destinations is mainly related to the quality of services carried out in an integrated and systematic manner by all tourism players. Managing the tourism service industry by involving many players, in serving the various desires and needs of the traveler, requires an integrated management system approach. One management system that can be applied is Total Quality Management. In this study, not all components of TQM are studied, as the initial step of the study is limited to determining the measurement or indicator of service quality and its relation to the measurement or indicator of the image of a tourism destination. This is important to study, to get an overview of the expectations and perceptions of the traveler based on the experience of visiting objects or tourism destinations. This service quality measure can be used by decision makers as a monitoring and evaluation tool in improving service quality in the tourism service industry [4].

Furthermore, data which is a measure or indicator of service quality experienced by travelers is generally not much and incomplete is delivered systematically to tourism decision makers. No much travelers want to express their experience in a tourist destination, also if there is, usually not much data or information is conveyed. Lots of data or information scattered only as a passing story. This is because there are not many officers and media to collect data or information from the traveler. If there is a data collection media, only for the limited needs of the company, not much information has been shared for the shared needs of the players [5, 6]. Furthermore, the data or information submitted by the traveler is generally subjective and qualitative, namely in the form of words or statements that are vague or inexact. The other side, the data or information of the traveler, the type and form are varies, and continues to increase in line with the number of tourists [7].

## RESULTS AND DISCUSSION

### Fuzzy Inference System

Fuzzy inference system (FIS) is a process of formulating the mapping from a given input to an output using fuzzy logic [8, 9]. The mapping provides a basis from which decision can be made. FIS is sometimes called fuzzy reasoning, used in a fuzzy rule, to determine the rule outcome from the given rule input information. Fuzzy rules represent modeling knowledge or experience. Fuzzy rules are needed to compute the outcome for output variables in the rules consequence, when a specific information is assigned to input variables in the rule antecedent. The main components of FIS include fuzzification interface, inference engine and defuzzification [9]. Basic structure of FIS that comprises three components and rules can be seen in Figure 1.



**Figure 1.** Basic Structure of a Fuzzy Inference System

FIS can be envisioned as involving a knowledge base and a processing stage. The knowledge base provides membership function and fuzzy rules needed for the process. In the processing stages, numerical crisp variables are the inputs of the system. These variables are passed through a fuzzification stage where are transformed to linguistic variables, which become the fuzzy input for the inference engine. This fuzzy input is transformed by the rules of the inference engine to fuzzy output. These linguistic results are then changed by a defuzzification stage into numerical values that become the output of the system [9]. Creating decision using FIS involved several steps.

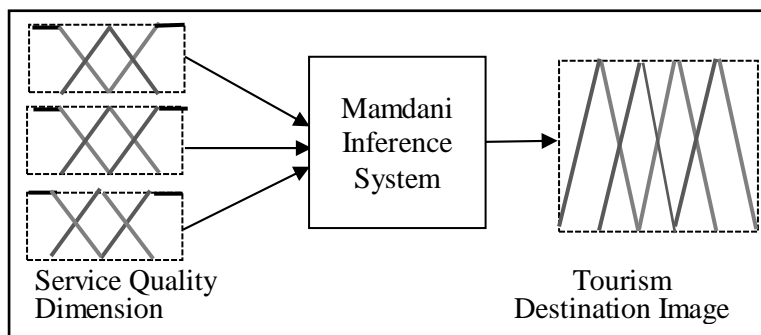
The steps in FIS, in this article are used to develop inference for the tourism destination image (output) based on service quality dimension (input). There are five dimensions of service quality, namely tangible, reliability, responsiveness, assurance, and empathy, that may influence the tourism destination image. On Table 1, the indicators of each dimension of service quality and tourism destination are identified.

**Table 1.** Service Quality's Indicators for Input Variable

Dimension	Indicators
Tangible	The infrastructure is designed in high-quality standards
	Modern and technologically relevant vehicles were available
	Enough security guards and provide security and comfort
	The meals that were served are of high quality
	The accommodation and facilities were appealing and in good design
	Physical appearance of the hotel were tidy and clean
	Physical appearance of the tours escort were tidy and clean
	There is free Wi-Fi internet with large bandwidth
	There is an adequate supply of electricity
	There is an adequate HP charger facility
	There are enough volunteer photographers for selfie and/or groupie
Traveler information officers are easy to find	
Responsiveness	Tourism servicer showed sincere interest in problem-solving
	Tourism servicer provided adequate and clear information about the service they deliver
	Tourism servicer were able to fulfil requests promptly in a timely manner
	Tourism servicer provided full information regarding the entertainment offered

Empathy	Tourism servicer showed sincere willingness and interest in helping/assisting
	Tourism servicer provided advice on how to best utilize free time
	Services offered were provided by pleasant and friendly personnel
	My exceptions and special needs were met as expected
	Personal safety was considered as a major aspect in every service provided
	Local people care about and pay attention to traveler needs
	Tourism destinations pay attention to the needs of disable traveler
Assurance	Traveler is served by a well-trained, customer-oriented personnel
	The level of service quality reinforces traveler confidence in the service provided
	Detailed, experienced and competent tour/hotel escorts was provided to facilitate traveler
	Staff communicated with fluently and in an understandable manner
	All food and beverages sold are certified according to international standards.
	There is an OK sign from the results of the food and beverage audit conducted by the authorities
Reliability	Every traveler infrastructure has been audited regularly and has passed the authorized institution
	Directions and signs were available properly
	Directions and signs easily guided me in finding the needed locations
	Services delivered were correct from the first time
	Services were delivered as promised to travelers
	Scheduled tours were met on a timely manner
	No troubles occurred with the service provided during my stay
	Information from taxi drivers / traveler information officers / hotel customer office/the tours escort were detailed, clear, and very helpful
Food and beverages sold are guaranteed safety and healthy.	

Mamdani inference system [10] is used in this article, which allow a system to take in a set of input values and apply a set of fuzzy rules to those values, in order to derive a quantitative output values (Figure 2). The data or information from service quality dimension are become the inputs of the Mamdani inference and the output of the system is tourism destination image. Figure 2 illustrate how the inputs related to the tourism destination services are being processed to create the output.



**Figure 2.** Input and the Output of the System

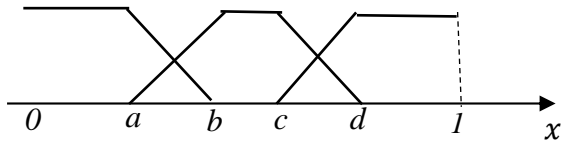
The data for the system inputs are taken from the indicator of service quality dimension (Table 1), the dimension and its indicators are derived from previous research [2, 3, 13]. The information can be collected from back pocket of an airplane, airport waiting room, hotel lobby, restaurant, information office of tourism destination, and via many resources, for example via questionnaires' to the traveler, check list button at hotel/restaurant toilet.

Based on the defined system functional and operational characteristics, input and output data, herein after

referred to as system variables, are needed to fuzzify. The following steps are executed to obtain tourism destination image based on service quality dimension.

**Fuzzy Membership Function of System Variables**

System variables are fuzzify in order to obtain fuzzy membership function. The system recognizes the input and output variables and defines its membership. In this research, all membership function for input variables (service quality dimension) is defined in three linguistic terms, ‘High’, ‘Medium’, and ‘Low’. Output variable (tourism destination image) is defined in five linguistic terms, ‘Very High’, ‘High’, ‘Medium’, and ‘Low’, and ‘Very Low’. Membership function for each variable are formulated by experienced travelers. Following are the membership function for each variable after normalized on [0, 1] interval. The membership functions (MF) for ‘Low’, ‘Medium’, and ‘High’ fuzzy set of input variables (equation 1) are approximated by a trapezoidal function  $MF_i = \mu_i(x) = tz(a, b, c, d)$  and for output variable (equation 2) is used triangular function  $MF_j = \mu_j(y) = ta(a, b, c)$ .

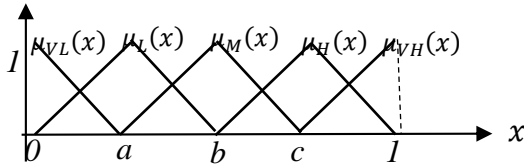


**Figure 3.** Membership Function for Input Variables

where

$$\begin{aligned} \mu_L(x) = tz(0,0, a, b) &= \begin{cases} 1 & 0 \leq x < a \\ \frac{b-x}{b-a} & a \leq x < b, \end{cases} & \mu_H(x) = tz(c, d, 1, 1) &= \begin{cases} \frac{x-c}{d-c} & c \leq x < d \\ 1 & d \leq x \leq 1 \end{cases} \\ \mu_M(x) = tz(a, b, c, d) &= \begin{cases} \frac{x-a}{b-a} & a \leq x < b \\ 1, & b \leq x < c \\ \frac{d-x}{d-c} & c \leq x < d \end{cases} \end{aligned} \tag{1}$$

For the utput variable:



**Figure 4.** Membership Function for Output Variable

$$\begin{aligned} \mu_{VL}(x) = ta(0,0, a) &= \frac{a-x}{a} \quad 0 \leq x < a, & \mu_{VH}(x) = ta(c, 1, 1) &= \frac{x-c}{1-c} \quad c \leq x < 1 \\ \mu_L(x) = ta(0, a, b) &= \begin{cases} \frac{x-a}{a} & 0 \leq x < a \\ \frac{b-x}{b-a} & a \leq x < b, \end{cases} \\ \mu_M(x) = ta(a, b, c) &= \begin{cases} \frac{x-a}{b-a} & a \leq x < b \\ \frac{c-x}{c-b} & b \leq x \leq c \end{cases} \\ \mu_L(x) \quad \mu_M(x) \quad \mu_H(x) \quad \mu_H(x) &= ta(b, c, 1) = \begin{cases} \frac{x-b}{c-b} & b \leq x < c \\ \frac{1-x}{1-c} & c \leq x \leq 1 \end{cases} \end{aligned}$$

(2)

**Fuzzy Rules Development**

Fuzzy rules are developed from information conveyed by travelers after they visit an object or a tourism destination. The forms and types of information are varied according to their different experiences, knowledge, and expectations. Fuzzy rules are defined as the IF-THEN rules to describe system behavior. The rules are design as to describe the causality relationship among indicators of service quality dimension and tourism destination images. For example: IF the direction sign to the tourism object is very clear AND the highway infrastructure is good AND the tourism destination is clean and comfortable AND ... THEN traveler will give a positive image of the tourism destination. In general, traveler ratings can be stated based on several dimensions of service quality, as follows: IF the *tangible* indicator is 'fuzzy set *i*' AND the *reliability* indicator is 'fuzzy set *j*' AND ... THEN the *image of a tourism destination* is rated as 'fuzzy set *k*'. Where fuzzy set *i*, and *j* can be categories as 'Low', 'Medium', or 'High', while fuzzy set *k* of output variable can be categories as 'Very Low', 'Low', 'Medium', 'High', or 'Very High'. As a simulation example, in this research article, the input variables use the five service quality dimensions and tourism destination images as an output variable. Table 5 shows 243 fuzzy rules that can be obtained from all possible combinations of service quality dimension and the tourism destination image perceived by travelers. As an example, Rule 1 states that IF service quality in Tangible dimension is MF1 AND Reliability is MF1 AND Responsiveness is MF1 AND Assurance is MF1 AND Empaty is MF1 THEN Tourism destination image will be MF1, where MF1=Low, MF2=Medium, and MF3=High for input variables (service quality dimension), and for output variable (Image) MF1=Very Low, MF2=Low, MF3=Medium, MF4=High, and MF5=Very High.

Rule	Active	IF Tangible	AND Reliability	AND Responsiveness	AND Assurance	AND Empathy	THEN Image
1	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF1	MF1	MF1
2	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF1	MF2	MF1
3	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF1	MF3	MF2
4	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF2	MF1	MF1
5	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF2	MF2	MF2
6	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF2	MF3	MF2
7	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF3	MF1	MF2
8	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF3	MF2	MF2
9	<input checked="" type="checkbox"/>	MF1	MF1	MF1	MF3	MF3	MF3
10	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF1	MF1	MF1
11	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF1	MF2	MF2
12	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF1	MF3	MF2
13	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF2	MF1	MF2
14	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF2	MF2	MF2
15	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF2	MF3	MF3
16	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF3	MF1	MF2
17	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF3	MF2	MF3
18	<input checked="" type="checkbox"/>	MF1	MF1	MF2	MF3	MF3	MF3
19	<input checked="" type="checkbox"/>	MF1	MF1	MF3	MF1	MF1	MF2
20	<input checked="" type="checkbox"/>	MF1	MF1	MF3	MF1	MF2	MF2
21	<input checked="" type="checkbox"/>	MF1	MF1	MF3	MF1	MF3	MF3
22	<input checked="" type="checkbox"/>	MF1	MF1	MF3	MF2	MF1	MF2
23	<input checked="" type="checkbox"/>	MF1	MF1	MF3	MF2	MF2	MF3
24	<input checked="" type="checkbox"/>	MF1	MF1	MF3	MF2	MF3	MF3
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234	<input checked="" type="checkbox"/>	MF3	MF3	MF2	MF3	MF3	MF5
235	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF1	MF1	MF3
236	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF1	MF2	MF4
237	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF1	MF3	MF4
238	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF2	MF1	MF4
239	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF2	MF2	MF4
240	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF2	MF3	MF5
241	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF3	MF1	MF4
242	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF3	MF2	MF5
243	<input checked="" type="checkbox"/>	MF3	MF3	MF3	MF3	MF3	MF5

Figure 5. Fuzzy Rules of the System

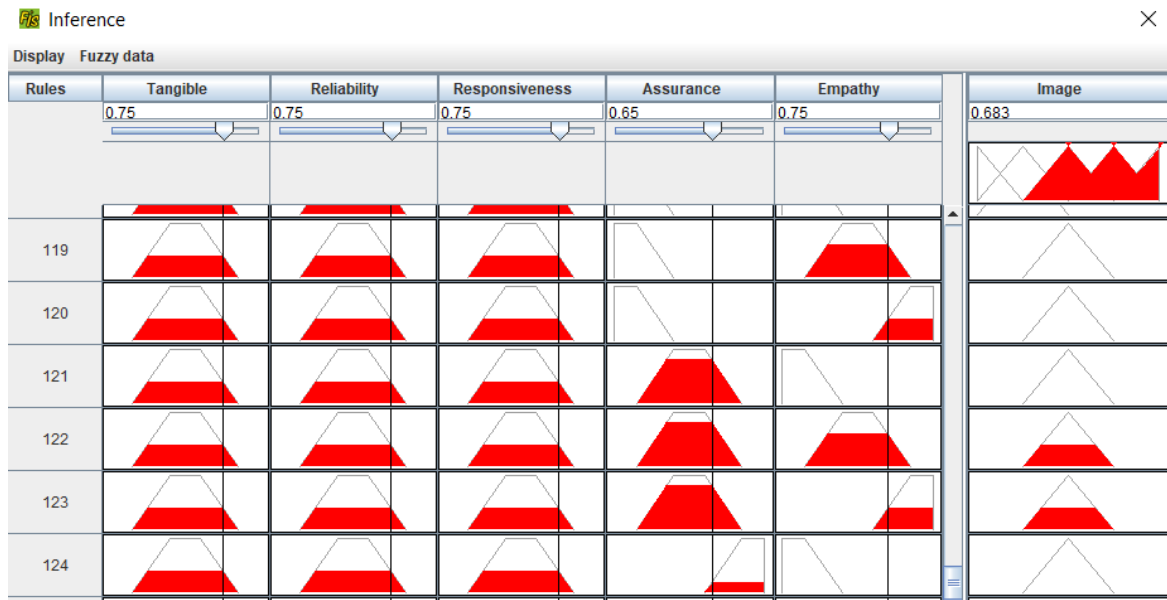


The inference rules set the premise to create output. The output then need to defuzzify in order to obtain crisp value.

### Defuzzification

Defuzzification step is needed to convert all input data into three linguistic term (Low, Medium, or High) that can be used to observe the tourism destination images (Very Low, Low, Medium, High, or Very High). The defuzzification process transform the fuzzy set into the crisp value that is meaningful to the decision maker.

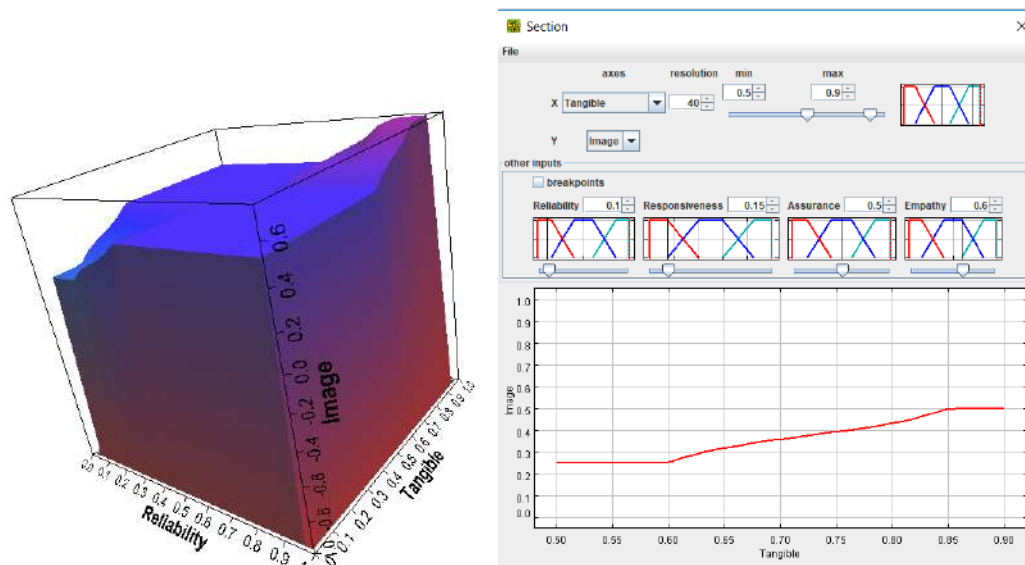
Figure 6 shows the results of inference of 243 IF-THEN rules. Based on the crisp value of each dimension of service quality, fuzzification is done into a red fuzzy set according to the corresponding fuzzy set, then connected with the AND logic which is operationalized with the MIN operator. Furthermore, the combination of all rules is operationalized with logic OR or MAX, the result is a total fuzzy set that describes the resulting image, finally defuzzification is performed by calculating the center point or centroid, resulting in a destination image in the form of crisp number, i.e. a quantitative score between [0,1].



**Figure 6.** Inference of 243 Rules

Figure 6 can be used as a detection and monitoring tool by decision makers engaged in the tourism industry, to find out the image of tourism services provided, based on the quality of tourism destination services, expressed by travelers based on their experience and expectations.

Based on the 243 fuzzy rules above, simulation can be done to determine the impact of changes in each dimension of service quality on the image of a tourism destination. From these simulations it will be known which dimension has a significant impact on improving the image of tourism destinations. Furthermore, changes can also be seen in 3 dimensions or 2 dimensions (Figure 7). As an example, changes in the image of tourism destinations can be observed due to changes in tangible and reliability dimensions, when other dimensions of service quality are constant. It appears that, when services on tangible and reliability dimensions increase, the image also increases.



**Figure 7.** Visualize The Tourism Destination Image in 3D and 2D

## Conclusion

The image of tourism destinations is very important in increasing the number of traveler visits. Increased visits have an impact on the economic growth of the tourism area. Increased tourism destination image is a strategic effort that must be carried out by tourism actors. One of the efforts to improve the image is to improve the service quality. To find out the service quality that need to be prioritized, firstly need to understand the indicators of service quality. This initial research, has identified several measures/indicators that are in line with tourism destination services. In this study also produced reasoning rules to improve the image of tourism destinations based on service quality dimensions using fuzzy inference system. This research is still in the early stages, there are many weaknesses, it has not produced reasoning rules using direct indicators of service quality dimensions. In the future, it needs to be developed continuously in real time, reasoning rules resulting from interviews or direct observation on a traveler.

**Key-words:** tourism services quality, Mamdani's fuzzy inference system, travelers perception.

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## Rainfall Prediction Modelling Based on Statistical Downscaling of Numerical Models Output and Adaptive Neuro Fuzzy Inference System (ANFIS) in Banjarnegara

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### INTRODUCTION

Banjarnegara is a region in Central Java that is prone to landslides. Landslides not only cause losses in material but also in human life. The variables of landslide such as slopes, rainfalls, and land uses have been used in several research (Sipayung et al., 2014). Heavy rainfalls in Banjarnegara is affected by its geographical features where mountains are dominant. Banjarnegara has a Monsoonal type of rainfall that has one peak of rainy season (Aldrian, 2003). High variability of rainfalls in Banjarnegara mainly caused by irregularities in rainfall patterns due to the La Nina and El Nino phenomena in Indonesian (Chang et al., 2004).

This study aims to produce rainfall prediction in a high resolution grid area (10 kilometers square) to be use further in landslides early warning information. This study used a statistical downscaling method to increase the resolution of the global numerical weather model (Global Circulation Model) (Juneng et al., 2010). In predicting monthly rainfall, we used Adaptive Neuro Fuzzy Inference System (Jang, 1993) or ANFIS to capture irregular (chaotic) rain patterns. Correlation analysis was conducted between predictors (precipitable water / total column water) and rainfall (predictions), then used as training data. Monthly observation rainfall data and outputs of numerical models from ECMWF (European Center for Medium-Range Weather Forecasts) reanalysis model with a 12.5 kilometer resolution within the 1997-2011 period were used as data training. The rainfall predictions were evaluated with 5 years rainfall observation data (2012-2016) to see the performance of the model. Analysis of rainfall patterns, correlation values and Root Square Mean Error (RMSE) were used as model performance assessment (Jolliffe and Stephenson, 2003). Moreover, the Autoregressive integrated moving average method (ARIMA) also used as rainfall prediction method to compare rainfall prediction and past observation time series (Komalasari et al., 2016).

### RESULTS AND DISCUSSION

Correlation between predictors and predictand shows a strong correlation (0.78). This correlation value indicates that if the potential water content in the atmosphere increases, rainfall also increases. Furthermore, the results of predictions using precipitable water as predictor showed a monsoon rainfall patterns such as observation rainfall data as shown in Figure 1. In general, Banjarnegara has a peak of rain in November and minimal in March-April.

The rainfall pattern shows that the model can capture the minima (50 millimeters) and reach more than 500 millimeters but was not be able to capture extreme value above 700 millimeters (Figure 1). The prediction results with the ARIMA method with a correlation value of 0.69 and RMSE of 157 mm compared to the ANFIS method with a correlation value of 0.78 and 119 mm, there is an increase in RMSE by 25%. From these we can conclude that predictions based on ANFIS are better and able to capture irregularities than ARIMA method.

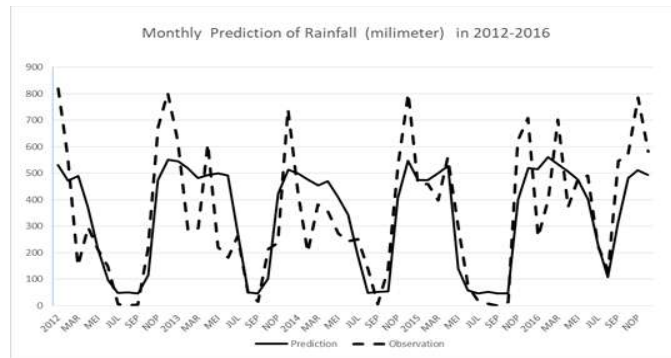


Figure 1. Seasonal Prediction and Observation

**Keywords:** ANFIS, Landslides, Numerical Prediction, Statistical Downscaling,

### Acknowledgment

The authors wish to thank the other members of Landslides Research Group at School of Meteorology Climatology and Geophysics (STMKG) for their contributions in this work. Further thanks to the Board of Directors of STMKG for funding this research.

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## **A Design of Multifunction Switch for Energy Efficiency**

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### **INTRODUCTION**

Climate Change caused by the effect of Green House Gas Emissions has become one of the great world impact nowadays, especially in human life, although scientifically it still cannot be proved clearly and still become a great discussion and tough debate between scientists in science and environment field. The essential suggestion is to keep maintaining the nature sustainability by bringing real actions to establish green environment, and increase surroundings care, such as plant trees, use bicycle instead of motor vehicles, promote a healthy green walk, and energy efficiency. Energy efficiency is an act or procedure taken for decreasing energy waste affected by human attitudes and life style, machine failures, or even nature phenomenon and reactions.

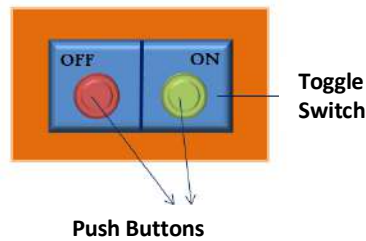
Switch is a small and essential electronic component of an electric circuit or electronic device, but not very difficult to use in operations. Although in simple and various form, but switch has a specific characteristic and could not be abandoned from its effect on setting time and efficiency use. The important of energy efficiency and a good way to get climate change and environmental care, generate ideas to optimize switch functions with more leverage, in addition to many products easily found on the market. Through this research, lecturers try to innovate by using standard switch/button to build a multifunction switch which is expected to support the energy saving and efficiency use. Methods being used in conducting research were literature study, observation, analyze function, and design a switch. Data was analyzed and processed to design or modify a new switch with a new function in controlling electrical equipment. The final result gives the shape and features of a new, multifunctional switch component that can be used to perform single machine operation or multiple operations.

### **RESULTS AND DISCUSSION**

To support energy saving and energy efficiency, a switch were designed from several switches (toggle and push buttons) sold in the market. A selection procedure had been conducted to design a new switch with multifunction specification, that need a good quality of proved reliability switch besides having a big and wide button surface that easily could add another switch or button at the centre. From voltage and current specification, those switches meet the requirement for design standard and electric circuit performance.

In this research, the switch was experimented to control a mouse and a lamp. When toggle switch is set to OFF position, mouse will be inactive and could not be use. The two push button switches will not be functioned although they are pressed, because the main switch (toggle switch) is in OFF condition. But when the toggle switch is set to ON position, the mouse will be active and those two push button switches will function well to make the USB outputs come out with 5 DC Volt so they could be used to control or turn ON a digital device connected to USB terminals, for example Mouse and Lamp.





**Figure 1.** Design concept of a multifunction switch



**Figure 2.** Experiment on a laptop using a mouse and a lamp.

From this basic research it can be concluded that a multifunction switch could be designed and built to control a mouse and USB digital devices. However the transition from OFF to ON position has ‘spike’ signal that need to be consider in the future for better design, including controlling low voltage wattage and high voltage wattage with right connections. This research output becomes a technology product for learning process. With continuous research and support from electronic component or electrical industries, it is possible to be designed in a form of market product for controlling lamp or digital machines.

**Keywords:** Energy Efficiency, Switch, Multifunction Switch, Toggle Switch, Push Button.

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## Algorithm for Printing a Fold Book

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### INTRODUCTION

Book is a window of the world that helps us to get all kinds of information, extends our own view on science and technology, and understands daily problems. Although the development of Information Technology slowly starts to shift the existence of book, but book is still considered important and essential so *e-book* is created to change the role of book in human reality world.

Although the e-book is getting easier to get, but some people still prefer print books rather than read e-books because printed book has several advantages over e-book. For example, it does not make our eyes become quickly tired, and there are also those who consider printed books to have more trading value if collected in printed form.

For students, book is something that cannot be negotiable. Unfortunately it is not easy to get English text books in Indonesia. In addition, these text books are generally much more expensive than local books. Fortunately nowadays is very easy to get text book in a form of e-book. E-book can be printed again in a form of book for easier reading and learning.

When printing a book, generally page number is one of the important parameter so reader could follow all the content and information from the book. Several books are printed in a form of Fold Book in order to be more environmental friendly. Print a book in form of Fold Book needs more time and a little bit complex because we need to arrange all the page numbers in sequence orders whenever they are folded. To make the printing process faster, it is necessary to know the steps to do page numbering and how to print, to avoid any error and make the process easier. This research is conducted to derive an algorithm for page numbers printing which will be able to be used by human or applied on machines or computers. The methods used for this research were literature study, experience based observation, analysis, programming, and testing. The result will expect to meet the aim of this research, and really helpful for printing booklet, information, and textbook.

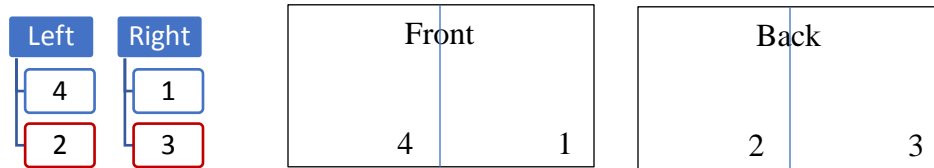
### RESULTS AND DISCUSSION

Normally when we print a book, page number is the important parameter so readers could follow all the content and information from the book. If the book does not print in a right sequence number, both us and the readers could get confused or do not know where to start reading it, and would be a little mess with the book being printed.

Several books are printed in a form of Fold Book in order to be more environmental friendly. Print a book in form of Fold Book needs more time and a little bit complex because we need to arrange all the page numbers in sequence orders whenever they are folded. To make the printing process faster, it is necessary to know the steps to do page numbering and how to print, to avoid any error and make the process easier. This research is conducted to derive an algorithm for page numbers printing which will be able to be used by human or applied on machines or computers. The methods used for this research were literature study, experience based observation, analysis, programming, and testing. The result will expect to meet the aim of this research, and really helpful for printing booklet, information, and textbook.

Most booklets are created with Saddle-Stitch binding method. This method uses printed sheets that are folded and nested one inside the other and then stapled through the fold line with wire staples. Based on literature study and experience based observation, first we derive the basic concept for doing

numbering. It starts from the minimum page that we could have, i.e. 4 pages which need only 1 sheet of A4 paper. If we fold the paper, we could get 4 pages with the sequence as follows:

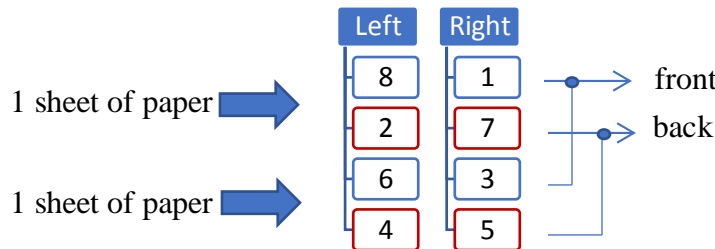


**Figure 1.** Basic Concept of an Algorithm for Printing Fold Book

The printing selection should be 2 pages per sheet. Do the right sequence, the first printing at the front of the paper will be page 4 and page 1 (4,1), and the other printing on the back of the paper will be page 2 and page 3 (2,3).

From the basic concept, we can derive an algorithm to help us do page numbering and print the fold book easier:

1. Write the number of page that need to be printed (including cover and all sections). Number of page = n.
2. Round up n to multiplication of 4 (4,8,12,16,20,24,28, and so on).
3. Divided by 4 to know the number of sheet that will be needed for printing.
4. List and write the page number into LEFT and RIGHT cells in a zigzag pattern, started with page 1 on the upper right cell. When arrive at the bottom cell, back again until at the top, ended on the upper left cell.



**Figure 2.** Numbering a booklet that has 5, 6, 7, or 8 pages

5. Set the print process for 2 pages per sheet.
6. Set the sequence of pages that will be printed in a form of (left,right).
7. Start printing all the front pages, and then idle for 2 or 3 minutes for paper reversing that will continue printing all the back pages.

This algorithm can be used manually by human to print a fold book, or applied on machines or computers. To describe more briefly, we simulate the algorithm using C# programming to get the desired output logically.

**Keywords:** Print a Book, Fold Book, Pages Printing Algorithm.

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## A Hybrid Data Mining Model for Indonesian Telematics SMEs Classifications

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### ABSTRACT

The power of information technology and communication (telematics) is one of the vital forces for every country. In the Industrial Revolution 4.0 era, the development of telematics was one of the priorities of the Indonesian government nawacitas. The development of the field of telematics in Indonesia for a decade is inseparable from the role of SMEs. The role of telematics SMEs in the strength of national development can be mapped through the optimization of National Economic Census data (Susenas). The detailed 2016 Susenas data has not been released by BPS. Therefore, this research still uses 2006 Susenas data. The 2016 Susenas recapitalization shows that Indonesian telematics has a very large power, consisting of 2.6 million players. This great strength needs to be optimized to have high competitiveness so as to be able to support Indonesia's development. The purpose of this study was to conduct hybrid data mining modeling to be used as a decision model in mapping the classification of Indonesian telematics SMEs. The classification map includes the feasibility of assistance for the empowerment of Indonesian telematics SMEs, business prospects and development plans for Indonesian telematics SMEs. The hybrid data mining model with K-Medoids & C4.5 technique shows better performance compared to other models, with an average accuracy rate of 71.87%. This model validation test also involves K-fold cross validation.

**Keywords:** Decisions Model, Hybrid Data Mining, Industry Revolution 4.0, Nawacita, Telematics.

## Development of Digital Data Acquisition and Data Processing Automation to support Quantitative Research

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### ABSTRACT

In quantitative research that uses research instruments in the form of questionnaires, the questionnaire is usually distributed to research respondents in hardcopy and the data collected is then processed manually or by using the Exel or SPSS program. It was felt by most researchers to be troublesome and considered impractical, because in addition to requiring quite a long time not all researchers were proficient in processing statistical data.

This study aims to develop a digital data acquisition program and perform data processing automatically so that researchers can easily carry out data acquisition and obtain data processing results quickly and accurately. The development of the data acquisition program was carried out using Google Form, while the data processing program was developed using the Turbo C ++ computer programming language.

To provide a clearer picture of how this digitalization and automation program is operated, in this paper a description of application examples is given to improve the teaching profession's commitment through the development of empowerment and trust. The results of the analysis using the program indicate that there is a positive relationship between empowerment and trust with the lecturers' professional commitment, which means that the lecturers' professional commitment can be improved through improvements of empowerment and trust factors that are not yet in line with expectations, which are as follows: 1. authority, 2. discretion, 3. creativity and innovation, 4. confidence in ability and strength, 5. openness, 6. partnership strength, 7. awareness, 8. dedication and devotion, 9. consistency, 10. skills development. While the factors that have been good and stayed maintained include: open communication, readiness to accept occupation risks, sooth, and improvement desire.

**Keywords:** digitizing research instruments and data acquisition, automation of statistical data processing, lecturer profession commitment, lecturer empowerment, trust.



## Optimization of E-Commerce Product Categorization

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### INTRODUCTION

Product classification is a process of selecting and grouping products on a certain basis and putting them together in the same place. The classification of this product is used in the trade sector between sellers and buyers. Online sales are done by inputting information about the products to be sold, including product names, product images, prices, and product details. The seller must also choose the type of product category. Problems arise when many errors are found in inputting product categories. This proves that manual selection of product categories can cause errors. There are several studies that have conducted research that conducted research related to the classification with the Naive Bayes method [1] [2] [3]. The naive bayes method is a method of classifying with probability and statistics put forward by British scientist Thomas Bayes. Each decision class calculates probability with the condition that the decision class is correct, considering the vector of object information. This algorithm assumes that object attributes are independent. The probability involved in producing the final estimate is calculated as the number of frequencies of the "master" table. The purpose of this study is to optimize product classification using the Naive Bayes method so that automatic categorization can be generated [3]

### RESULTS AND DISCUSSION

Data is taken from Lazada's sales site. A total of 2100 data were scrapped with 2 categories of yatom, namely women's fashion and electronics, with 6 sub-categories, namely blouse, jacket, sandals, sneakers, cellphone and tablet. The amount of training data is 70% and the test data is 30%. The attributes taken are the product name and product details. Data cleaning is the process of removing inconsistent data or irrelevant data. Data cleaning will also affect the performance of data mining techniques because the data handled will reduce the number and complexity. Data cleaning is done by deleting data that is still empty, data that does not match the category type and the same data in several categories. Of the 2450 data obtained, invalid data was 14.2%. The successful selection and will be processed in this study are 2100. Naive Bayes is a classification with probability and statistical methods proposed by British scientist Thomas Bayes, which predicts future opportunities based on past experience. Naive Bayes is one method that is widely used based on several simple properties. Each decision class calculates probability with the condition that the decision class is correct, considering the vector of information from objects [4] [5].

The system built can automatically categorize e-commerce products based on product name data and product details. Classification of product types is done by way of tokenisation, looking for the probability value of words in the case, then looking for the likelihood value of each category, and calculating the final value of the classification. The largest final value of classification shows that the level of similarity of cases is greater with this category. In other cases an experiment was carried out to determine the final classification value by inputting the product name and product details that did not come from the same category. Case calculation simulations are carried out as follows (Tabel 1):

Based on the results of the accuracy test of each category in table 1, the jacket category has the highest valid value, this is because the jacket category has a distinctive word and has a high probability value. The lowest validation value is shown in the cellphone category, this is because the handphone category has several similarities in the feature words with the tablet category, and has a low word probability value. The results of the calculation of accuracy show an accurate value of 79%

Tabel 1. Accuracy

Category	Valid Data
Blouse	62
Jacket	67
Sandal	66
Sneakers	63
Handphone	29
Tablet	44
Total	331

**Keywords:** ecommerce, classification, bag of words, Naïve Bayes

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## Supplier Evaluation and Order Allocation Using Fuzzy Hierarchy Process and Augmented Epsilon Constraint Methods

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### INTRODUCTION

Nowadays, enterprises realize that effective and efficient supply chain management practices can affect both direct and indirect profit [1]. It's because enterprise must focus on reducing operational cost and enlarging overall profit to keep competitive in this globalization era[2]. However, environmental issues awareness are gradually increasing. It force enterprise to consider environmental aspect in managing their operations and supply chains and this consideration is often called as green supply chain management [2]. Global competition push firms to have effective and efficient green supply chain management. One of critical aspect in green supply chain management is green supplier selection. Choosing suitable supplier is important responsibility for any organization in procurement activity. In addition, almost 70% of the total production cost are derived from raw material purchasing cost. "Who to buy from and how much to buy" question are common supplier selection problem

Although supplier selection has been discussed in many literature in last 2 decades, it has many gaps that can be improved. This research proposes two-phase meta model for supplier selection and order allocation that considers environmental criteria besides traditional criteria such as quality, cost and delivery. For supplier selection phase, the author combine fuzzy set and analytical hierarchical process (AHP) that allow uncertainties and vagueness due to human decision making and subjective criteria and also easy to be implemented. For order allocation phase, the author use one of multi-objective mathematical programming method (MOMP), the augmented  $\epsilon$ -constraint (AUGMECON) method to find Pareto optimal solutions for multiple sourcing. AUGMECON can reduce computational burden due to its advanced computational characteristic compared with the other programming method. This proposed meta model is tested in one of tyre manufacturer company in Indonesia.

Fuzzy AHP can deal with uncertainties and vagueness of human decision making. In principle, fuzzy AHP is the same as classical AHP. AHP use crisp value but fuzzy AHP use fuzzy value. There is three main steps in fuzzy AHP: (1) problem structuring, (2) evaluation of local priorities, and (3) computing the global priorities of alternatives to come to a decision [3]

### RESULTS AND DISCUSSION

Based on literature review, it is concluded that there are 41 sub-criteria for supplier selection that grouped into 9 criteria: 8 traditional criteria and 1 green criterias. The eight traditional criteria included quality, price, delivery, service, customer relations, technical capability, image and reliability. While green criterias consists of nine sub criterias. Based on the criteria and subcriteria defined, questionnaire in the form of pairwise comparison developed. Complete criteria and subcriteria are shown at Table 1.

Dealing with order allocation the results are  $x_1 = 0$ ,  $x_2 = 10,000$  tonnes,  $x_3 = 4,000$  tonnes, and  $x_4 = 15,000$  tonnes. The selected solution gives 0.16% of the total cost lower than the existing order. Other advantages of this model is its quick time to get the solution as well its ability to incorporate decision maker's preference.

**Table 1.** supplier selection criteria and sub criteria

Criteria	No	Sub Criteria
A Quality	1	Rejected material ratio
	2	Quality management system/ISO 9001 certification
	3	Defect rate
	4	Meeting minimum standard and requirement
B Price/Cost	1	The average market price level of commodities
	2	The lowest market price level of commodities
	3	Shipping costs
	4	Payment term
	5	Transaction price
	6	Discount
C Delivery	1	Delivery time rate
	2	Lead time delivery/geographical location
	3	Delivery flexibility
	4	Reserve capacity
	5	Delivery quantity rate
	6	Inventory availability
	7	Order frequency
D Service	1	Quick response to customer demand
	2	After sales support
	3	E-transaction capability
E Customer relations	1	Willingness to share information
	2	Long-term relationship development
F Technical capability	1	Continuous improvement ability
	2	New product development ability
	3	Technology sharing capability
	4	Flexible production capability
G Image	1	Reputation
	2	Past operation performance
H Reliability	1	Financial capability
	2	Guarantee & liability/claim
	3	Country's political situation
	4	Currency exchange situation
I Green competition/Environment management performance	1	Environment planning (program to reduce impacts, green research and development)
	2	Environmentally friendly material selection (low waste, easiness recycle and reuse capability)
	3	Prohibited/toxic substances usage
	4	Cleaner production technology (pollutant emission: CO <sub>2</sub> equivalent, VOC, BOD, and COD content, etc.)
	5	Waste management
	6	Environment management system/ISO 14001 certification
	7	Green image
	8	Green packaging
	9	Distribution

**Keywords:** AUGMECON, fuzzy AHP, green supplier selection, order allocation, tyre industry

**Acknowledgment**

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## The Mathematical Model Of The Enzymatic Reactions Of The Coconut Coir Substrate Treated By The Alkaline And Ionic Liquid Into The Reducing Sugars Using The Power Series

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### INTRODUCTION

Currently, the scientists have been interested in the lignocellulosic materials because they can be converted into sugars and biofuels and are available abundantly on earth especially, in the tropical countries [1-2]. The study showed that prior to conversion into more valuable materials, lignocellulose should be treated that purposed to decline the lignin content and to modify the cellulosic structure [3]. The conversion evaluation of lignocellulose treated by chemical or physical pretreatment has been reported of many investigators [4-6].

The kinetic study is an important aspect of the chemical reaction in which we can predict the product, which will be obtained in the extended range of time though not conducted. The poplar wood has been liquefied into the reducing sugar by using the wet oxidation pretreatment and the yield of product was formulated in form of the mathematical model. The equation obtained was successful in predicting the reducing sugar yield [7]. The transformation of sugarcane bagasse into levulinic acid enhanced by acid was reported by authors [8]. The kinetic formulas of enzymatic hydrolysis were written in some equations depending on the temperatures and sulfuric acid concentrations employed.

The kitchen waste was converted to the bioethanol with using acid and hot water treatments whereby the kinetics of the biochemical reaction was modelled in the simple form [9]. Authors [10] reviewed the kinetic model of enzymatic hydrolysis of many substrates. The results found the simultaneous hydrolysis and yeasting in continuous mode gave the biggest yield. The mathematical model of anaerobic digestion in the fermenter in producing biogas was studied previously [11]. The studies discovered as described that through a kinetic mathematical model, biochemical process inside reactor would be understood deeply and the prediction of product yield was well known.

This study reported the simple kinetic model of bioconversion of coconut coir dust treated by ionic liquid 1-ethyl-3-methylimidazolium dimethyl phosphate ([mmim][dmp]), which was synthesized in the author's Lab and NaOH (alkaline) and then the result was compared to that of non-pretreatment. The kinetic model was formulated after the reducing sugars were obtained through an enzymatic hydrolysis with a catalyst loading was constant.

### RESULTS AND DISCUSSION

The mathematical model, which was proposed, followed and modified from an established equation as proposed previously by authors [7,13]. The first, lignocellulose converted into the reducing sugars could be modeled as



The rate formulation was defined as follows:

$$-r = km_s^n \quad (2)$$

Where,  $r$  is reaction rate ( $g/s$ );  $k$  is the reaction constant (unit depends on the reaction order),  $m_s$  is the substrate mass ( $g$ ) and  $n$  is the reaction order. In this study, since the catalyst loading is constant, the



influence of *cellulase* was absorbed in  $k$  parameter and the temperature reaction was kept in 60°C and the variable  $r$  was the decrease rate of substrate mass with respect to time or  $\frac{dm_S}{dt}$ .

To solve Eq. (2) was assumed that the order of enzymatic hydrolysis was an order one,  $n=1$  as proposed by investigators [13-14]. The mass of initial substrate and reducing sugar were assigned by  $m_0$  and  $m_{RS}$ . The substrate mass could be written as  $m_S = m_0 - m_{RS}$  so the differential equation of Eq. (2) was modified as:

$$\frac{dm_{RS}}{dt} + km_{RS} = km_0 \quad (3)$$

The solution of Eq. (3) was solved in two ways by the analytical method and mathematical series. The solutions of Eq. (3) were two parts, homogeneous solution in which the right side was zero and particular solution that was easy to obtain and will be elaborated widely in results and discussion below. By employing a variable separation, the mass of reducing sugar ( $m_{RS}$ ) can be written as

$$m_{RS} = m_0(1 - e^{-kt}) \quad (4)$$

The solution of Eq. (3) could be expanded in form of mathematical series by assuming the  $k$  is much less than unit as follows:

$$m_{RS} = \sum_{n=0}^N a_n t^n = a_0 + a_1 t + a_2 t^2 + a_3 t^3 + a_4 t^4 + \dots \quad (5)$$

The advantage of using the power series method is that we do not need to solve the differential equation analytically which is more difficult by employing the conventional way. The using of power series technique only needs the ability to equate the parameters which attach to the similar order and then quantities are made as function  $k$  and  $a_0$ .

$$a_n = \sum_{n=0}^N \frac{k^{2n} a_0}{(2n)!} \quad (9)$$

$$a_m = - \sum_{m=0}^N \frac{k^{2m+1} a_0}{(2m+1)!} \quad (10)$$

The particular part is found through supposing that  $m_{RS} = \text{constant}$  whose its value is an  $m_0$  after being substituted to Eq. (3). The general solution obtained is an addition the homogenous- and particular parts written as:

The experiment was observed that at  $t=0$ ,  $m_{RS}=0$ , the  $a_0$  found is a negative of the initial mass of substrate, so the Eq. (12) could be written as

$$m_{RS} = m_0 \left\{ 1 - \left[ 1 - (kt) + \frac{1}{2!}(kt)^2 - \frac{1}{3!}(kt)^3 + \frac{1}{4!}(kt)^4 - \frac{1}{5!}(kt)^5 + \dots \right] \right\} \quad (12)$$

$$Yield = \left\{ \left[ (kt) - \frac{1}{2!}(kt)^2 + \frac{1}{3!}(kt)^3 - \frac{1}{4!}(kt)^4 + \frac{1}{5!}(kt)^5 + \dots \right] \right\} \quad (13)$$

The Eq. (13) derived from power series is actually similar to the Eq. (4) that is obtained from solving the differential equation of Eq. (3) by an analytical method [15-16]. The fitting the data from experiment and model was carried out to obtain the rate constant  $k$  using the solver *software* that is available in excel program and would be elaborated the following.

In the present work elaborated the yield of reaction kinetic model of the substrate treated by an ionic liquid, alkaline and, alkaline followed by ionic liquid converting into the reducing sugars after conducting a fitting process and compared to the experiment data which are in Table 1 and 2. The Fig. 1 shows the yield model of reducing sugar liberated from treated substrates (coconut coir) using a single enzyme, cellulase. If

compared to the experimental yield that the error of initial reaction was quite big since the sugar rate released from substrate for pretreatments was relatively high [17-18]. The assumption that the reaction for an enzymatic hydrolysis is the first order is necessary to be evaluated for this case. As time increases, however, the experimental- and kinetic model yields tend to high accuracy that they are coming to an agreement. The data shows that the combination method, NaOH+IL pretreatment gives the biggest yields of the sugar obtained both an experimental and model hydrolysis that was comparable to previous reports.

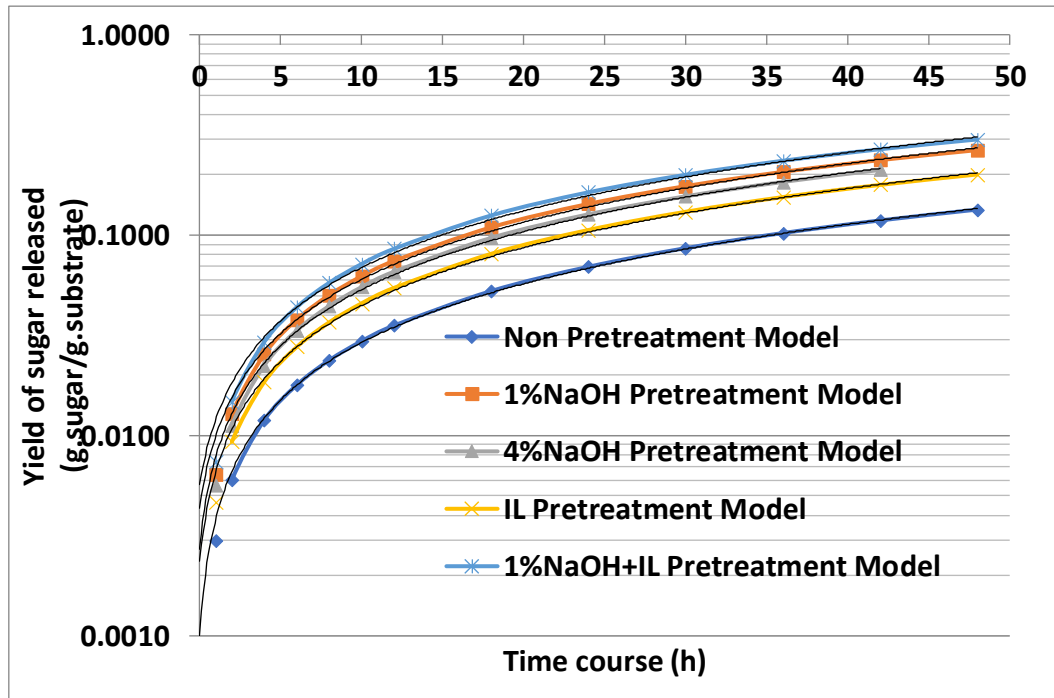


Figure 1. The kinetic model of reducing sugars yields released from substrates with respect to the time course employing a single cellulase.

The second place of sugar yield found is the NaOH pretreatment and then followed by IL technique and the least is the original substrate. It was found that NaOH pretreatment could increase significantly the sugar released from substrate since lignin and hemicellulose dissolved into alkaline and the porosity of substrate increased [19]. When alkaline concentration inclined into 4%, the sugars liberated decreased slightly. The increase of alkaline concentration started liquefying cellulose and hemicellulose as the source of sugar. It meant that the more alkaline added can be decreasing the yield of sugar obtained since cellulose is decomposed into the water-soluble substances.

The data present the constant rate of reaction kinetic model of sugars released from substrates that were pretreated by 1%NaOH-, 4%NaOH, IL and 1%NaOH+IL and compared to non-pretreatment written in the first row. The constant rates of sugar from native coconut coir employing cellulase and mixture of enzymes are of 0.0029999 and 0.0048220 h<sup>-1</sup>. When solid was treated by 1%NaOH, the constant rate increased to 0.0064311 (cellulase) and 0.0076116 h<sup>-1</sup> (cellulase+xylanase). If alkaline concentration inclined to 4%, the constant rate went down to 0.006000 h<sup>-1</sup> for two enzymatic. The decrease was similar to the experiment data obtained which was caused by decomposing of cellulose into water-soluble substances.

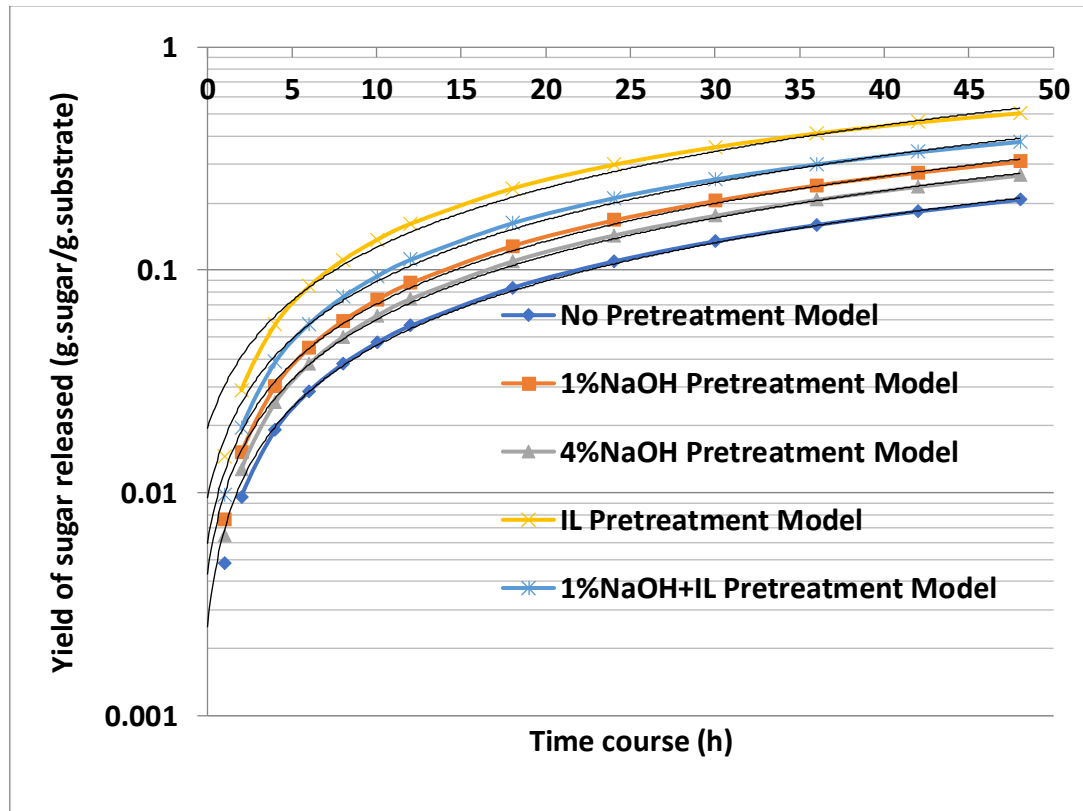


Figure 2. The kinetic model of reducing sugars yields released from substrates with respect to the time course employing a mixture of cellulase and xylanase.

The combination method (NaOH+IL), the constant rate of an enzymatic reaction increased to 0.0074400 (cellulase) and 0.02 h<sup>-1</sup> (cellulase+xylanase) that were the highest rate obtained. The significant increase was primarily caused by the dissolution of lignin and hemicellulose because of alkaline treatment and then the change of substrate crystallinity after IL application [21]. The substrate used in this study was coconut coir dust that had a lignin composition around 41% [22]. The combination method, alkaline followed by ionic liquid was the best option for high lignin biomass before converting it into sugars, or bioethanol.

**Table 2. The constant rate the chemical reaction of sugar released from substrates using cellulase and mixture cellulase+xylanase**

No	Pretreatment	The constant rate (1/h)	
		cellulase	Cellulase+xylanase
1	No-	0.0029999	0.0048220
2	1%NaOH-	0.0064311	0.0076116
3	4%NaOH-	0.0060000	0.0060000
4	IL-	0.0046700	0.0146717
5	1%NaOH+IL-	0.0074400	0.0200000

The regressions show that the parameters of determination for employing cellulase were calculated and found from 0.9874 (no-pretreatment), 0.8364 (1%NaOH-), 0.7966 (4%NaOH-), 0.8066 (IL-), and 0.8127 (1%NaOH+IL-). While those employing mixture of enzymes declined to 0.6111, 0.4161, 0.5572, 0.3499, and 0.34419, respectively. The low R<sup>2</sup> values are indicative that the employing of a mixture of enzymes is harder to predict than that of single cellulase.

### Acknowledgments

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## Optimization of Impeller Design for Stirred Tank using Computational Fluid Dynamics

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### INTRODUCTION

Stirred tanks are among the most common process equipment used in chemical and other process industries since their good mixing ability and the characteristics for scale-up. Stirred tanks can be classified in different ways. Firstly, they can be sorted by the way of operation of the units, such as batch, semi batch or continuous. Secondly, by thermal operation as isotherm or adiabatic. Thirdly, by the type of applied impeller, such as turbine, jet, blade, etc. Normally in a stirred tank with the centrally positioned impellers, a rotating motion with a pair of vortices behind each blade, one above and one below the disk is generated. The flow generated in the stirred tanks are predominantly turbulent due to high impeller rotation speeds to achieve necessary process conditions [1].

The most commonly used type of stirred tanks is a fluid stirring reactor type. The problem that often arises in the fluid stirrer reactor is the emergence of stagnant or dead zone or cavern formation phenomenon as shown in Figure 1. In the non-Newtonian fluidizing process, the viscosity value of the fluids are vary depending on the shear stress occurring in the fluid. The higher the shear stress occurs, the lower the viscosity of the fluid as related with the shear-thinning in pseudo-plastic property. Hence, the fluid located close to the slats tend to have lower viscosity, while the fluid away from the blades has a higher viscosity value resulting in a stagnant zone or cavern formation.

The stirred units have many parts, therefore experimental information or data during the production phase are difficult to obtain. Hence, to build an accurate and validated model of the units can require much time which cannot be afford nowadays. Experiments in laboratory scale can support the modeling process but the scale-up of the tanks to industrial scale can be a problem because the developed flow pattern of scale-up levels can be significantly different. Using CFD or Computational Fluid Dynamics, the operation of equipment can be studied in detail without disrupting the production process. The CFD approach has the possibility to model the entire geometries in three dimensions even multiphase systems [2]. In addition, CFD simulations applicable not only in development [3], safe operation [4] and modeling the dynamic behavior of the experimental system, but also after integration of the mathematical description of considered parameters it can be describe mass and energy with related to transport process [5]. CFD can lead to a better understanding of the behavior of stirred vessel and macro mixing phenomenon in three-dimensional turbulent flow [6].

The purpose of this study is to provide a solution to the stagnant or dead zone or cavern formation phenomenon that occurs in the fermentation stirring process in the fluid stirrer reactor to produce bio-ethanol that caused by the weak propulsion of the blade. A new blade design for a pseudo-plastic type of fluid behavior has to produce a higher propulsion or pumping rate and also maintaining the stability of the power required to rotate the blades, using CFD software with ANSYS Fluent.

### STIRRED TANK REACTOR

Stirred tank as biological reactor or bioreactor like a fermenter, which is producing a product, using the work of micro-organisms or enzymes studied by the industrial microbiology domain. Bioreactors always set the condition of their tanks in a controlled environment therefore the micro-organisms can live and work.

Hence, there is a classification of bioreactors based on the needs of the desired results. The classification of the bioreactor according to the moisture content contained in the tank can be divided into submerged-culture fermentation and solid-state fermentation. For stirred tank reactor it is categorized into submerged-culture fermentation.

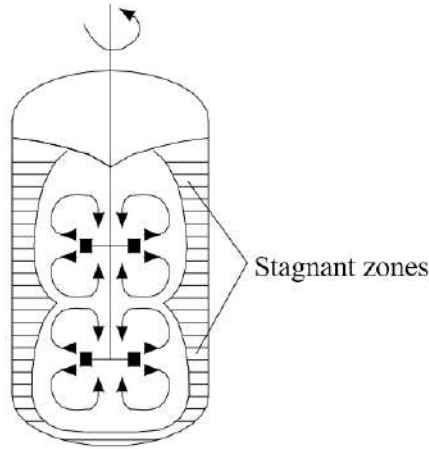


Figure 1. Stagnant or dead zones [7]

The power number  $Po$  to turn the wheel of fluid is:

$$P_0 = \frac{P}{(\rho \times N^3 \times D^5)} \text{ where } P \propto N^3 \times D^5$$

and  $N$  is the impeller angular velocity and  $D$  is the impeller diameter. This equation becomes the basis for the power or newton number ( $Po$ ) equation, which goes into the list of dimensionless parameter groups [8]. The pumping number  $Nq$  is obtained based on the fluid flowing from the blade to the outer blade of the region at any time, which can be represented by the amount of flow flowing through the surface area. The mass flow out through the surface area can be calculated by the following equation,

$$Q = \frac{\dot{m}_{axial} + \dot{m}_{radial}}{\rho}$$

where,  $\dot{m}$  is the mass flow rate. Hence the pumping number is then obtained by using the following equation,

$$Nq = \frac{Q}{N \times D^3}$$

The wall shear stress  $\tau$  is obtained related with viscosity that can be modelled with fluids consisting of several layers following both the plates on the top and bottom without slippage between them. The expression of shear stress for Newtonian fluids with the variable of shear rate is [8]

$$\tau = \mu \times \dot{\gamma}$$

In the fluid stirrer, the mean specific energy dissipation rate can be calculated by the equation, where all energy occurring in the fluid, as a result of the impulse movement in the vessel, changed or dissipated into heat energy,

$$\bar{\varepsilon}_T = \frac{P}{\rho \times V} = \frac{P_0 \times N^3 \times D^5}{V}$$

The predictable mixing time or the time required of a mixture to reach the level of homogenization, can be calculated with the following equation,

$$\tau_n = \left( \frac{\nu}{\bar{\varepsilon}_T} \right)^{1/2}$$

where,  $\nu$  is the kinematic viscosity of the fluid and  $V$  is the total volume of liquid inside the stirred tank. Mixing time has been used as a key parameter for assessing the performance of a mixing system. For Newtonian fluid, this phenomenon can occur due to the vertical stress drop  $\sigma_v$  occurring in the fluid or the horizontal fluid stress increase  $\sigma_h$  in the stagnant zones area.



The flow density as the flow decreases, causing the increase of the horizontal stress at a point from the flow to the stagnant zone. Due to the velocity difference at that point the formation of wall shear stress and the vertical stress value in the stagnant area increases that result to a periodical slip. On the same principle for non-Newtonian fluids, that there is a velocity difference between flowing fluids and stagnant zones or cavern formation. In the fluid stirrer reactor, the velocity difference due to the increased concentration of shear stress at the center of the blade region will result for the viscosity difference between the fluid that flows and at the stagnant zones.

## RESEARCH METHODOLOGY

The stirred tank geometry represents a typical “standard” configuration where the tank diameter  $T$  is 0.8 m and other dimensions may be related to  $T$  as follows,

Fluid height  $H_L = T$

Impeller diameter  $D = 0.4 T$

Impeller clearance  $C = T/3$

Blade thickness = 0.001 m

Tank bottom type = ASME 6% bottom

Shaft diameter = 0.03 m

Angular velocity = 60 rpm

This study uses data validation for power number and pumping number from experimental results by Lane and Koh [9] as  $Po = 4.67$  and  $Nq = 0.73$ . Data for effective viscosity  $\mu = 0.3$  kg/ms and specific gravity 1.21 from reference [8]. For shear thinning non Newtonian fluids, where the viscosity decrease with increasing shear rate, the data obtained from the study of Fraiha et.al [8].

The standards used to design the geometry of the new blade design is that it should increase the pumping number and shear rate generated by the blade since they allow for a solution to reduce the stagnant or dead zone. The new design also has additional effect to stabilize power consumption of the stirred tank. Numerical simulation set up based on the new design of impeller was specified for turbulence using  $k-\epsilon$  model with standard wall function and the simulation run as a transient problem with standard initial condition of absolute reference frame zero velocity at all grid nodes [10].

## RESULTS AND DISCUSSIONS

The study on development of stirred tank reactor did an analysis of causes and effects of the phenomenon from the mechanical approach of blade geometry using numerical analysis. Results from numerical simulation have shown the percentage of error for power number  $Po$  and pumping number  $Nq$  are small, as seen in Table 1.

**Table 1.** Validation data for  $Po$  and  $Nq$

Variables	Symbol	Experimental Result	Numerical Result	Error [%]
Power Number	$Po$	4.67	4.35	7.40
Pumping Number	$Nq$	0.73	0.70	3.94

After analyzing a correlation between the angle of attack to the performance of the blade, the  $30^0$  angle of blade is selected since the angle of blade has the ratio of  $Nq$  to  $Po$  to the second highest while maintaining the stable wall shear stress. The design of the new blade has a basic principle that the larger surface area of blade to drive fluids, the greater the resulting  $Nq$ , but the  $Po$  value increases. Hence the number of blades was reduced to 3 pieces or AM 30 (Axial-flow Mix-solidity) with addition to two wings or flaps on the top and bottom of blades (Figure 2). The shape of the blade resembles hydrofoil in order to lower  $Po$  and increase the number of surfaces that push the fluid to increase  $Nq$ . Figure 3 shows the relationship between impeller type and the ratio of  $Nq/Po$  and average effective viscosity.

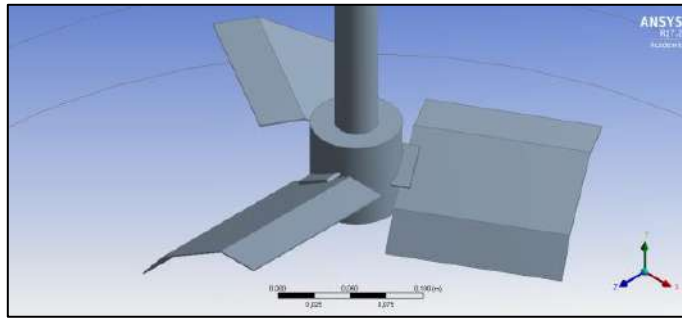


Figure 2. ISO view of new blade design 3 AM 30

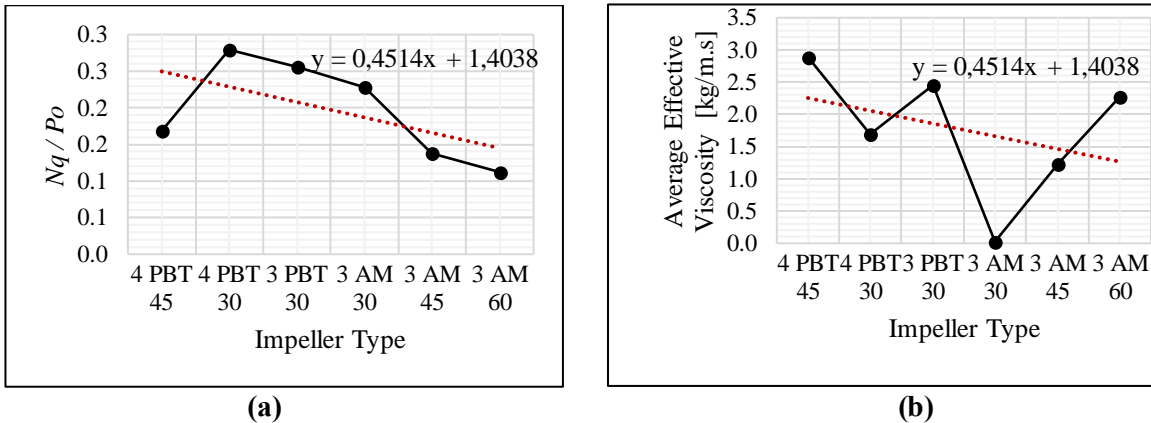


Figure 3. Graph of impeller type vs (a)  $Nq/Po$  and (b) average effective viscosity

The new blade design 3 AM 30 has the ratio of  $Nq/Po$  is 0,229 but it has the lowest effective viscosity which is useful in reducing the stagnant or dead zone phenomenon in stirred tank. This phenomenon is possible to occur only in a fluid stirrer reactor for non-Newtonian fluids aggregation processes. The fluid viscosity may change depend on the amount of shear stress that occurs in the fluids, as seen in Figure 4.

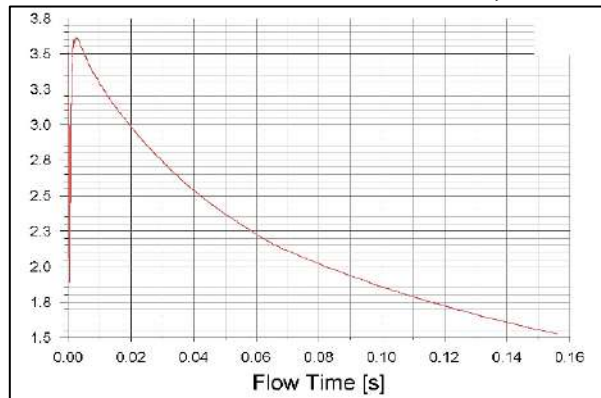
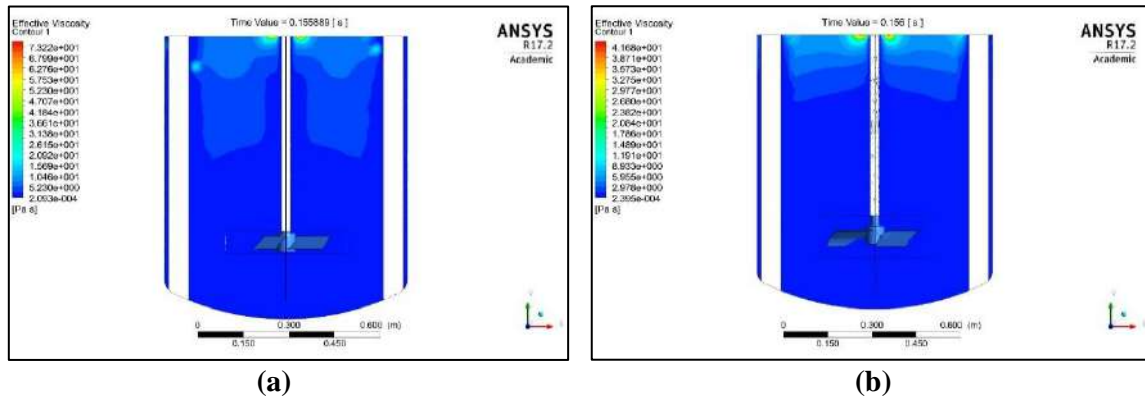


Figure 4. Average effective viscosity vs flow time

The stagnant or dead zone phenomenon has a negative impact on the fermentation process in the stirred tank reactor as it decreases the homogeneity level of the fermentation mixture.

A comparison between two contours for the tendency to form a cavern formation is shown in figure 5, where the blades 3 AM 30 has areas of less effective viscosity than stirring results using blades 4 PBT 45 type. The average effective viscosity of blade design 3 AM 30 is 0.026 kg/ms which is smaller than the average effective viscosity of blade 4 PBT 45 as 2.889 kg/ms. The maximum effective viscosity of blade design 3 AM 30 is 43.173 which is smaller than the maximum effective viscosity of blade 4 PBT 45 as 75.838 kg/ms.



**Figure 5.** Contour of effective viscosity in cross section of stirred tank for impeller type (a) 4 PBT 45 and (b) 3 AM 30

## Conclusions

CFD analysis on the optimization of high-efficiency stirred tank reactor using mechanical approach from blades can minimize or eliminate stagnant or dead one or cavern formation using a new design blades. Independent variables such as power number, pumping number and wall shear stress are also compatible variables to develop high efficiency stirred tank. Some dependent variables such as impeller design and the angle of attack have a correlation with high efficiency stirred tank reactor. The new design of the impeller to produce high efficiency stirred tank can be developed to produce high efficiency stirred tank can be developed by reducing the number of blades, increasing the surface area of the impeller blade and make it similar to hydrofoil.

The new impeller design as 3 AM 30 is able to reduce the power consumption but maintain the pumping number at the similar value as 4 PBT 45. Optimization of impeller design to 3 AM 30 can prevent the phenomenon of stagnant or dead zone in stirred tank reactor with “standard” configuration of  $T$  equal to 0.8 m.

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## SCREENING PHYTOCHEMICAL OF *Padina australis* Hauck FROM MOLAS COAST OF NORTH SULAWESI

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### INTRODUCTION

Algae (seaweed) produce chemical compounds as primary metabolites known as hydrocolloid. This hydrocolloid has been used for a variety of raw materials in industrial fields such as gelatin, keraginan and alginate. In addition to primary metabolite products, secondary metabolite products are now being studied. One of the results of the secondary metabolites that are currently being studied are bioactive substances which have the potential to be developed as antimicrobials such as antibacterial, antifungal and antiviral. Algae (seaweed), especially macroalgae have the potential to be used as a promising source of bioactive compounds in the medical world (Leary *et al* [1]. Molas Beach is one of the beaches located on the coastal area of the Sulawesi peninsula precisely in the Bunaken District of Manado City. Based on observations in the field, some macroalgae can be found in the Molas Coast, *Galaxaura*, *Gracilaria sp.*, *Halimeda opuntia*, and *Padina australis*, but macroalgae laboratory testing from Molas beach as a pharmaceutical preparation material has not been widely reported. Research on phytochemical screening and bioactivity testing of *Padina australis* Hauck have not been widely reported. Therefore, in this study, phytochemical screening of Brown Algae (Phaeophyta) *P. australis* Hauck was taken from the coast of Molas Beach, North Sulawesi. The purpose of this study was to identify bioactive compounds contained in the ethanol extract of *P. australis* Hauck obtained from the coast of Molas Beach, North Sulawesi. Phytochemical screening of *Padina australis* Hauck extract includes examination of alkaloids, flavonoids, tannins, phenols, terpenoids / steroids and saponins.

### RESULTS AND DISCUSSION

After algae macerated, the first filtrate will be used for phytochemical screening. for Saponin Examination, 50 mg of extract was added 10 mL of water while added 1 mL of concentrated HCl and shaken vigorously. If the foam formed remains stable for approximately 15 minutes, then the positive extract contains saponins (Darwis, [2]. A total of 50 mg of extract was added with glacial CH<sub>3</sub>COOH as much as 10 drops and 2 drops of concentrated H<sub>2</sub>SO<sub>4</sub>. The solution is shaken and leave for a few minutes. Steroid positives will give blue or green, while the triterpenoid will give red or purple (Nohong [3]. 50 mg extract added 1 mL of 10% FeCl<sub>3</sub> solution. The presence of tannins is indicated by the formation of dark blue or greenish black (Robinson [4]. 50 mg of extract added 100 mL of hot water, boil for 5 minutes then filtered using filter paper. A 2 mL filtrate was added 0.05 grams of Magnesium powder (Mg) and 1 mL of concentrated HCl, then shaken. A positive test is indicated by the formation of red, yellow or orange (Sutisna [5].

The results of screening phytochemical of Ethanol Extract of *P. australis* Hauck obtained from the coast of Molas Beach in North Sulawesi by analyzing the presence of bioactive compounds include alkaloids, phenols, flavonoids, tannins, steroids and terpenoids. Screening results can be seen in Table below.

Table Screening Phytochemical Result of Ethanol Extract of *P. australis* Hauck from the coast of Molas Beach, North Sulawesi.

Screening Phytochemical	Positive Results According to Literature	Test results	Conclusion
Alkaloid Reagen Dragendorf	Orange Red Sediment	White Sediment	Negative
Alkaloid Reagen Mayer	White Sediment	White Sediment	Positive
Alkaloid Reagen Wagner	Brownish Red Sediment	Thin brownish red deposits	Positive
Flavonoid	Dark red (magenta), yellow or orange	Clear	Negative
Fenol	Forms of green, red, purple, blue or solid black	Dark Black	Positive
Steroid	Formed in a turquoise color	Greenish blue	Positive
Triterpen	Forms red or purple	Greenish blue	Negative
Saponin	A stable foam is formed	Stable foam with a height of $\pm 1$ cm	Positive
Tanin	Formed in dark blue or greenish black	Blackish green	Positive

The results obtained from the qualitative examination of the alkaloid compounds in the Dragendorf reagent are white precipitate formed on the surface of the tube, the results obtained from the Mayer reagent are formed white deposits on the tube surface and the results obtained from Wagner reagent are very thin brown deposits. Meyer and Wagner's reagents showed positive results while Dragendorf's reagent showed negative results. The results above can be concluded that the ethanol extract of *P. australis* Hauck positively contains alkaloids. The principle of this method is the sedimentation reaction that occurs due to ligand replacement. According to Sastroamidjojo [6], this method has the disadvantage that these reagents can not only precipitate alkaloids but can also precipitate several types of compounds such as protein, coumarin, alpha python, hydroxy flavones, and tannins. The reaction is known as falsepositive.

**Keywords:** Algae, Bioaktive, Molas, Screening Phytochemical.

#### Acknowledgement

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## Diversity Of Marine Heterobranchia (Gastropoda, Mollusca) In Bangka Island North Sulawesi, Indonesia

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### INTRODUCTION

Bangka Island is a small Island (4800ha) located in North Minahasa, North Sulawesi, with coral reef, sea grass and mangrove habitats, the home of many exotic marine organisms (F. Noel, 2011). This island is less affected by tourists than the more famous Bunaken National Park (BNP), although both areas lie in similar proximity of the International Airport in Manado. Bangka Island came into focus due to iron mining starting in 2012 at the Southern coast line with high impact on the adjacent coral reefs (B.H Rarumangkay, 2012; R. A. Buol, 2015). Impact on the environment was not investigated before implementation of mining constructions, and only 5 years' operating led to damage of benthic habitats. For better assessing impact of humans, as well as with regard to global climate change, we surveyed in several places around Bangka Island for the first time marine Heterobranchia (Gastropoda, Mollusca), which stand as a model system due to their high variety and thus reflect the health of unaffected coral reefs. The data was collected during 8 days survey (day and night sampling by snorkeling and Scuba diving)

### RESULTS AND DISCUSSION

A total of 65 species (35 genera) of the taxa Cephalaspidea (Aglajidae, Colpodaspididae), Saccoglossa (Plakobranchidae), Pleurobranchomorpha (Pleurobranchidae) and Nudibranchia (Arminidae, Bornellidae, Tritoniidae, Facelinidae, Samlidae, Flabellinidae, Chromodorididae, Ployceridae, Hexabranchidae, Phyllidiidae, Discodorididae, Goniodorididae) has been collected. We used Gosliner et al., 2015 and <http://www.marinespecies.org> for preliminary identification and verified subsequently by partly analyzing CO1 and 16S. No members of the Umbraculida and Anaspidea were collected during this short period. Also the number of Cephalaspidea was rather low. When comparing our results with two studies obtained from Bunaken National Park (Burghardt et al. 2006, Kaligis et al. 2018), marine heterobranch diversity is lower on Bangka Island; however, man power as well as collecting time was about twice in BNP compared to our sampling period. Overlap of recorded species between Bangka and BNP is low (22 species) when comparing collection sites (see figure 1).

**Keywords:** Marine Heterobranch, Biodiversity, Bangka Island.

### Acknowledgment:

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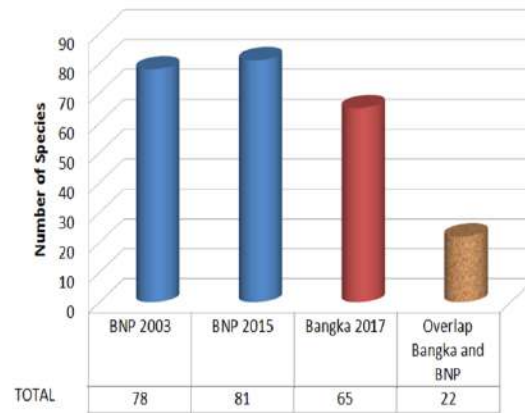


Figure 1. The overlap of recorded species between Bangka and BNP

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## **Bats as Spreaders of Animal Diseases to Humans at Batu Putih Tangkoko Nature Tourism Park North Sulawesi**

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### **ABSTRACT**

Batu Putih Tangkoko natural tourism park (TWABPT) is one of tourist attractions in North Sulawesi Province which is often visited by local and foreign tourists. This place is included by the Tangkoko nature reserve which is a habitat for wildlife. Tourist penetration that often passes through the entrance to the nature reserve will have an impact on the potential for transmitting diseases from animals to humans. Several international studies report that bats have the potential as zoonotic reservoirs and vectors. This study aims to take inventory on bats that have the potential as zoonotic vectors in TWABP. Bat sampling is done by using mist net which is placed in 3 locations, namely primary forest, secondary forest, and agricultural land in TWABPT, conducted from May to July 2018. A total of 256 bats were caught which after being identified consisted of 10 species namely *Rousettus celebensis*, *R. amplexicaudatus*, *Cynopterus brachyotis*, *C. luzoniensis*, *Thoopterus nigrescens*, *T. taliniensis*, *Nictymene cephalotes*, *N. minimus*, *Macroglossus minimus*, and *Dobsonia exoleta* grouped into order of Chiroptera.

**Key Word:** Bats, Zoonosis, Tangkoko, Sulawesi

## ***Anoxybacillus thermarum* FM-RBK01 a Thermophilic Bacterium Isolated from a Hotspring Located in the Tourist Attraction Sumaru Endo Remboken North Sulawesi Indonesia as a Potential Producer of Thermostable Alpha-amylase**

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### **ABSTRACT**

Located on the Ring of Fire, Indonesia has an array of geothermal systems with distinctive ecological features. Geothermal areas are regarded as a good source of the main habitats of thermophilic microorganisms. Thermophiles including bacterial and archaeal species are found in various heated regions such as hot springs and deep-sea hydrothermal vents. Over the last few decades thermophilic bacteria, which live and survive in temperatures above 70°C, have gained world-wide attention due to their great potential to produce thermostable enzymes that have wide applications in pharmaceuticals and industries. Little is known about the occurrence and distribution of thermophilic bacteria in North Sulawesi. This work is among the first studies focusing on culturable thermophilic bacteria in this region. The aim of this study was to isolate, identify, characterise, and to explore their potential to produce thermostable  $\alpha$ -amylase enzyme. Thermophilic bacteria were isolated from three hot springs in Remboken North Sulawesi Indonesia, one of which is located in the Tourist Attraction Sumaru Endo. Four isolates were characterized by morphological, microscopic, and biochemical characteristics, all of which were indicated as Gram-positive, motile bacilli. Polymerase chain reaction (PCR) analysis conducted to amplify 16S RNA yielded a single band of 1400 bp. Sequencing of the PCR products followed by BLAST search on EzBioCloud database showed that two isolates have 100% similarity with *Anoxybacillus thermarum*. Starch hydrolysis test conducted to assess qualitatively the ability of one isolate, designated as *Anoxybacillus thermarum* FRM-RBK01, to produce  $\alpha$ -amylase showed a positive result, indicated by a clear, colorless zone around the growth. Quantitative analysis of  $\alpha$ -amylase activity using iodine method (Fuwa method) showed that this bacterium strain possess  $\alpha$ -amylase activity of 0.67 U/ml at 70°C and pH 7. In conclusion, *Anoxybacillus thermarum* FRM-RBK01 has a potential to be employed as a producer of thermostable  $\alpha$ -amylase.

**Key words:** *Anoxybacillus thermarum*, thermophilic bacteria, Fuwa method,

## Biodiversity of Seagrass Ecosystem of Mehong Coastal, South Tabukan, Sangihe Islands

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### INTRODUCTION

Biodiversity is very important to guarantee human welfare. The declining of biodiversity is caused by human activities including habitat changes, sedimentation and pollution. Coastal ecosystem has high biodiversity that needs to be maintained for the next generation. Seagrass ecosystems are located in intertidal areas on the coast. Seagrass are flowering plants that have adapted to the tidal environment on the coast<sup>1</sup>. The seagrass ecosystem is inhabited by various organisms including macroalgae which also have important ecological functions<sup>2</sup> for the coastal and marine ecosystems. The study aims to analyze the biodiversity of seagrass ecosystems. The study was conducted at Mehong Beach located in Palareng Village, South Tabukan District, Sangihe Islands, North Sulawesi Province - Indonesia at coordinates 03°31'08.74"N and 125°39'39.60". The study applied survey methods in seagrass ecosystems at the lowest level in August and September 2018.

### RESULTS AND DISCUSSION

Mehong Beach has sand substrate on the beach and mixed coral fragments and sand in the seagrass ecosystem. Land use in the land is coconut farming and nutmeg trees which have high economic value. The seagrass has 6 species namely *Cymodocea serrulata*, *Cymodocea rotundata*, *Thalassodendron ciliatum*, *Halophila ovalis*, and *Syringodium isoetifolium*. Seagrass species are common in Indonesia, especially in Sulawesi. Seagrass ecosystem is not only inhabited by seagrasses but also by macroalgae. The macroalgae found in seagrass ecosystems is higher than seagrass. Macroalgae found include *Halimeda discoidea*, *Halimeda cylindracea*, *Dictyosphaeria cavernosa*, *Caulerpa sp.*, *Boergesenia forbesii*, *Amphiroa fragilis*, *Laurencia sp.*, *Padina australis*, *Turbinaria sp.*, *Udotea sp.*, *Neomeris vanbasseae*, and *Bornetella oligospora*. Macroalgae found included in Group. All macroalgae were found to represent the three classes of seaweeds, Rhodophyceae (red algae), Chlorophyceae (green algae), and Phaeophyceae (brown algae)<sup>3</sup>. High biodiversity in the seagrass ecosystem on Mehong Beach need to be maintained. The efforts will reduce the rate of change in seagrass ecosystems that cannot be separated from sustainable coastal management. Policy actors can make decisions that ensure the sustainability of the ecological functions of seagrass ecosystems. Human activities such as tourism and agriculture that can change land allotment require ecological and social studies not only economic issues.

**Keywords:** biodiversity, macroalgae, Mehong Beach, Sangihe Island, Sea grass

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## Distribution Of Butterfly Habitat *Troides helena* L. In Tumpa Manado Mountain Forest Park

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### INTRODUCTION

Forest damage will cause habitat fragmentation. Habitat fragmentation will threaten the diversity of butterflies. Several studies have shown that the occurrence of forest destruction in the tropics caused by illegal logging, timber extraction from forests and the conversion of forests to agricultural land will affect the distribution, structure and composition of the community, species richness and biodiversit (Koneri dan Saroyo 2012)[1]. Butterflies (Lepidoptera) are among the insects that live in the northern Sulawesi protected forest area The insect has a very important role as a pollinator that encourages pollination of plants (Boonvanno, 2000)[2]. Butterflies can also be used as bioindicators for changes in environmental quality (Lewis, 2001)[3]. This is because butterflies are very sensitive to changes in ecosystems. This study aims to examine the spread of *Troides helena* species as a basis for the conservation of endangered and protected butterflies. The research method is a survey method with a line transect sampling to determine the hábitate of the *Troides helena* butterfly population. The research location is divided into 3 transect lines, namely settlement, plantation and secondary forest with a length of 1000 m and an observation area of 100 m.

### RESULTS AND DISCUSSION

Based on the results of the study Transect 1 is located at the coordinates N = 01034'0638'' E = 124050'04.88''. Transect 1 is a settlement area where this area is a trajectory area and a place to find nectar because there is a *Spatodea campanulata* tree which is a tree producing nectar for *T helena* butterflies. On transect 2, the plantation area is located at coordinates 01034'21,53 'and' E = 124050, '3,25', namely the plantation area, is a trajectory area and a place to look for nectar because in this region there are several plants which are plants that produce nectar for *T helena* butterflies such as *Spatodea campanulata* plants and *lantana camara* plants. Transect 3 is a secondary forest transect located at the coordinates N = 010 33'50,84 and E = 124050'05.72. This area is a place to play, land, mate and fly and look for nectar with the availability of *Spatodes* and *Lantana camara* plants as nectar-producing plants and also the availability of host plants where eggs are laid, *Aristolochia tagala*.



Figure 1. *Spatodea casmpanulata* plant as a nectar-producing plant.



Figure 2. Aristolochia tagala plant as a host plant



Figure 3. T. helena butterfly that is perched

Based on observations from the three research transects, transect 3 which is a conservation area of the Gunung Tumpa Forest Park area is higher because of the secondary forest vegetation structure where there are nectar-producing host plants such as *Spatodea campanulata*. Pontororing 2016 [4], states that the butterfly *Spatodea campanulata* is a nectar-producing plant for *T. helena* butterflies. Butterfly *T. helena* likes bright and red flowers, Krafiani (2010)[5]. Pontororing (2016) stated that in the Gunung Tumpa Forest Park, the host plant *Aristolochia tagala* was found. *A. tagala* plant is a food plant for *T. helena* larvae. *T. helena* larvae eat the *Aristolochia tagala* forest betel leaf (Maryatul *et al.*, 2010; Sri *et al.*, 2014)[6,7].

**Keywords:** distribution, *Troides helena*, Tahura Manado.

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## Butterfly Morphometric *Troides helena*.L (Lepidoptera; Papilionidae) in Tumpa Manado Mountain Forest Park

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### INTRODUCTION

The life of the butterfly *Troides helena* faces the threat of scarcity and extinction, mainly due to the conversion of forests. Hutan asli di Sulawesi utara tinggal sedikit saja, the existence of this forest area is increasingly pushed and converted into residential and agricultural lands. Most types of butterflies are very dependent on one or two types of host plants, so the threat to these types of plants is tantamount to threatening the existence of butterflies. Depreciation and changes in forest ecosystems that occur due to rapid exploitation is a threat to the existence of butterflies in North Sulawesi. This study aims to reveal the morphometrics of the *Troides* species in North Sulawesi

This study aims to determine the morphometrics of *Troides* species in North Sulawesi. This study uses descriptive methods with direct surveys and collections in the observation area using insect nets, this method is also called the swing mesh method (sweeping). Standard measurements commonly used for butterflies include measurement of head length, thoracic length, abdominal length, antenna length, wing length and wingspan. (Lemauk, 2003)[1]

### RESULTS AND DISCUSSION

Morphology of the *Troides helena* butterfly can be seen in Figure 1.



Figure 1. Male and female *Troides helena* butterflies

Based on the results of the research of butterfly *T. helena* can be distinguished between males and females based on color that is for males have a golden yellow color with the number of black spots on the wings are less than males. Morphology The king butterfly *helena* belongs to the Papilionidae with the characteristics of having a large body with beautiful color patterns (Noerdjito dan Amir , (1993)[2], in general have sexual dimorphic properties, namely there are morphological differences between male butterflies (Peggie dan Amir, 2006)[3]. These butterflies consist of 3 main parts, namely the head, thorax and abdomen. According to Nurjanah (2010)[4], in general, the body of a butterfly is divided into three parts, namely caput (head), thorax (chest) and abdomen (abdomen) (Figure 1). A small round butterfly head, there are a pair of antennae, a pair of eyes and mouth instruments. Butterflies have a type of mouth sucking device (proboscis). Proboscis can roll if the butterfly does not eat (Scoble, 1992)[5].

The results of morphometric research on *T. helena* butterflies can be seen in table 1 below :

Table 1. Morphometrics of *Troides helena* butterflies in the Gunung Tumpa Manado Forest Park

Morphometric butterflies	Female	Male
	(cm)	(cm)
Head length	0.2	0.2
Thoracic Length	1.8	1.3
Long Abdomen	3-3.3	2.7
Antenna Length	2.8-3	2.8
Wing length	8.8	7.2
Wingspan	4.5	4.1
span of wings	18	14.3

Based on the results of the research of *T. helena* butterfly wings which is 7.2-8.8 cm with a wingspan of 4.5cm. And if stretched 18 cm. According to Peggie 2011 [6] that the wings of the butterfly *Troides helena* 6-8.4 cm and when stretched can reach 9.8-13.8 cm. In female butterflies have a black brown head with a red kupulengkungan on the upper side, a brown chest and red scaly, the stomach is generally gray, brown, or yellow, covered with black scales, gray wings, gray front, brown or black.

**Keywords:** morphometrics, *Troides helena*, tahura manado

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## Number Of Species And Number Of Individual Bats In Mount Duasudara Sanctuary, North Sulawesi, Indonesia

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### INTRODUCTION

Sulawesi Island has a level of endemic fauna, and supports the life of the most unique bat in Indonesia<sup>6</sup>. Of the 21 species of bats recorded in Sulawesi, eight species (38%) were endemic species and of the eight species, two (sometimes three) species were classified as endemic to the level of genera<sup>1,2</sup>. Mount Duasudara Sanctuary is one of the most important conservation areas found on the island of Sulawesi. This means that North Sulawesi has enormous potential as a tourism object because it has biodiversity and fauna endemic levels compared to other regions in Indonesia. In this region there are many endemic animals such as: black monkeys (*Macaca nigra*), tangkasi (*Tarsius spectrum*), kuskus (*Ailurops ursinus*), maleo birds (*Macrocephalon maleo*), hornbills (*Rhyticeros cassidix*), King prawns and several species bat<sup>4,5</sup>. This sanctuary area is also not spared from various habitat disturbances, such as: forest fires, agricultural land clearing and hunting. Bats as a tourist attraction have not been utilized especially when the bat population exits at dusk from the mouth of the cave giving an interesting attraction. The purpose of this study was to identify the number of species and the number of individual bats in the Mount Duasudara Sanctuary. The study site consisted of seven main vegetation zones at altitudes ranging from 0 to 1351 m above sea level. All habitat types were observed using the Mist-net method at altitudes of 1 and 3 m.

### RESULTS AND DISCUSSION

After measurement and identification of bat species caught in the Mount Duasudara Sanctuary, 15 research species and 475 individuals were discovered during their search activities. Based on the catch, it is known that the number of bat species from various zones in the Mount Duasudara Sanctuary varies greatly (Table 1). Based on the table, it can be seen that there are more species in the submontana forest zone (13 species), and lower in the grasses zone (4 species). More numbers of individuals in the moss forest zone (121 individuals), and lower in the *Casuarina* forest zone (16 individuals). The greater number of bat species in each zone varies depending on vegetation. *T. nigrescens* in the moss forest zone is a larger species of individuals from various zones.

The more number of species in the submontana forest zone shows that almost all the netted bats in the Mount Duasudara Sanctuary are found in this zone, except *R. tangkokoensis*. This means that it is a habitat that is suitable for almost all bats because there are kongkoriang trees (*A. dumosa vidal*) and langsung (*Ficus* sp.) which are fruits that are preferred by bats. In addition, it is suspected that bats are abundant in the area because they are close to the caves in the moss forest zone. The low number of species in the grasses zone is due to the absence of fruit trees favored by bats. There is a bat species in the reed zone because there are two caves on the beach which are inhabited by bats. Furthermore, in the moss forest zone with more individuals because there are nine caves which are dwellings for bats like *T. nigrescens*. In the *Casuarina* forest zone with the lowest number of individuals thought to be caused by frequent high winds, bats are easily carried by the wind up to the zone. In addition, there is also one green snake (*Tropidolaemus wagleri celebensis*) which is one of the predators for bats.

**Keywords:** Sulawesi Island, Mount Duasudara Sanctuary, vegetation zone, bat.

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## The Potential Use of “Tapak Dara” (*Catharanthus roseus*) As A Beach Tourism Jewelry and As An Effective Herbal Medicine for Tourists

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### INTRODUCTION

Marine tourism is one of the leading programs and priorities in national tourism development with the direction of development consisting of: introduction of tourist destinations, support for environmental conservation campaigns, and enhancement of marine cultural tourism. Indonesia has around 17,508 islands, of which 10,000 are small islands, with a coastline of 81,000 km, sea area of about 3.1 million km<sup>2</sup>, and coral reefs of around 50,875 km<sup>2</sup>, Indonesia has great potential for the development of marine tourism. Indonesian coral reefs contribute as much as 21% of the world's coral reef wealth and 75% of the world's coral species can be found in Indonesia.

The development of maritime tourism potential has a strategic meaning in the development of maritime culture, multisector business, regional economy, and strengthening community participation. Marine tourism consisting of beach and sea tourism. Beach tourism has helped development in Indonesia. One of the beaches that has been advertised or promoted as a marine tourism destination in North Sulawesi is Likupang and Bunaken Beach. Bunaken Beach and Likupang Beach that have been commercialized by the local community naturally without science and technology and creative industries. Maritime tourism development will be smooth and advanced in Indonesia, if the community continues to be demanded to actively develop creative industries. The creative industry has contributed more than 6% to GDP in Indonesia. The creative economy market is in the tourism sector and will be a very promising sector if tourism and the creative economy are able to maximize the opportunities that exist. Maximizing the potential of maritime tourism requires hard work and cooperation from both central and regional governments, local communities, and investors.

Utilization of the results of science and technology research such as tapak dara plant can also be very potential to be developed into creative industries. The tapak dara plant (*C. roseus*) is one of the plants that is widespread in the tropics. This plant originally came from Madagascar so it was also known as Madagascar Periwinkle. At this time this plant has spread in almost all tropical regions such as China, India, Indonesia, Australia, North and South America. In Indonesia, these plants are often found as ornamental plants that are planted in the front yard of the house. This plant is a chronic shrub with a plant height of less than 1m.

The data collection method used in writing this article is by searching online related libraries. Then the real potential continued, followed by a survey to the beach beaches around Manado. The beaches that have been traveled are Likupang, Kianari Beach, Lumintang beach, Bentenan Beach in the North part of North Sulawesi. The southern coast of northern Sulawesi is also traced directly from Malalayang, Kalasea, Taleli, Koha, Mokupa, Tombariri, Tana Wangko, Pondang, Bitung, Benteng portugol, Kapitu, Majaan, Boyonpante, Aergale, Tanamon, Nanasi, Mariri Baru, Pantai Lolan, Ambang I, Inobonto, Bolaang Uki, Pantai Sondana, Tabila, Pantai Linawan, Pinolosian until to Kombot, it was concluded that the breeding site grew around the beach well. Observed also the morphology, place of growth, temperature and abundance and diversity

## RESULTS AND DISCUSSION

Tread plants have beautiful flower colors such as light purple, pink or white. The widespread distribution of tapak dara in various regions, causes these plants to have local names. In Indonesia, this garden ornamental plant is known by various names, such as called sindapor atau tapak dará (Sulawesi), bunga tembaga (Sundanese), and kembang tapak dara (Javanese). Malaysians know him as a kemunting cina, pokok rumput jalang, pokok kembang sari cina, or pokok ros pantai. In the Philippines it is known as tsitsirika, in Vietnam as hoa hi dang, in China it is known as chang chunhua, in England as rose periwinkle, and in the Netherlands as soldaten bloem. Tread plants can grow in the lowlands to the highlands with an altitude of 800 m above sea level (asl.). This plant likes open places, but can also grow in shaded places. This plant can be grown with seeds, stem cuttings, or roots.

In Indonesia, *C. roseus* although not native to Indonesia but from the results of a survey along the coast of Bolevard Manado, the Bololosian Bolot shows that this plant grows wild and some have been cultivated as ornamental plants. But it is still not well organized. This plant has been studied a lot and has been used as a medicinal plant. The content of vincristine and vinblastine, which has been known recently as a cure for cancer, has opened up opportunities for farmers to cultivate these virgin plants. One of the causes of the poor growth of vetiver plants is the lack of knowledge of the community about the growing requirements for good growth of virgin plants. Good plant quality is characterized by good flower growth, resistant to pests and diseases. Efforts to cultivate tapak dara plants with good growth are fulfilling the desired growth requirements, one of which is the height of the best place for the growth of this plant.

The altitude factor will show the difference in climate on certain terrain which will affect plants such as temperature. Temperature is an environmental factor that affects plant growth and development. High and low temperatures around the plant are determined by solar radiation, plant density, light distribution in the plant canopy. This *C. roseus* can be known as the flower appearing from the armpit. The color of the flower is white, some are pink petal, small shaped petals (Fig. 4). Flower crowns are trumpet shaped, and the ends are wide. A flat flower edge, consisting of an ovoid-shaped flower, and a pointed end close to the left. The *C. roseus* has a cylindrical shaped house hanging from the stem. The fruit is cylindrical, pointed, stony. The result of surveying the observations of *C. roseus* growth along the beach road starting from Manado Boulevard, Malalayang, Kalasea, Taleli, Koha, Mokupa, Tombariri, Tana Wangko, Pondang, Bitung, Benteng portugal, Kapitu, Majaan, Boyonpante, Aergale, Tanamon, Nanasi, Mariri Baru, Pantai lolan, Ambang I, Inobonto, Bolaang Uki, Pantai Sondana, Tabila, Pantai Linawan, Pinolosian until to Kombot, it was concluded that the breeding site grew around the beach well. The growth of *C. roseus* depends on environmental conditions and physical disturbances that occur because these plants just grow on the roadside without being cultivated. The growth of *C. roseus* is very easy and able to withstand infertile soil conditions or lack of nutrients.

**Keywords:** Tourist maritime, *Catharanthus roseus*, herbal medicine, ornamental plant.

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## Dipole-dipole Configurations of Resistivity Geoelectric Methods Exploration to Detect Landslide Slip Surface in Tomohon City

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### INTRODUCTION

Tinoor 1 Village, North Tomohon Subdistrict, Tomohon City, is passed by the main road from Manado City to Minahasa Regency, this village is a hilly area. The main road is located on the slopes of the hills with steep slopes, in some locations there have been avalanches. Landslide is one of the most aggressive natural disasters that causes loss of lives and billions of dollars worth of damages annually worldwide. However, there are different factors such as geological, topographical, and human causes (disregard for sustainable developments) contribute towards landslide occurrences [1].

Landslides are one of the critical geological processes, which cause not only enormous damage to civil engineering structures i.e. roads, railways, bridges, dams, bio-engineering structures, and houses but also lead to loss of life. Hence, there is a need for landslide susceptibility mapping for identification of potential landslide areas. Interaction between local geology and the long-term climatic conditions result in significantly different landforms with varying degree of susceptibility to land sliding. Although landslides are local phenomenon, but the total loss of life and property due to landslides is far greater than any other hazard [2]. The relationship between the landslide and slope is correlated with the geological environments within the certain area closely. Comprehensively, the different landslides often correspond to different critical slope[3].

Landslides can manifest themselves in many different forms, including rock falls, rockslides, debris flows, soil slips, rock avalanches, and mud-flows. Some infrequent landslides may lead to catastrophes. Considering the scale of these events, they are basically unpreventable. The most reliable way to prevent landslide-induced casualties and economic losses is to avoid building towns or cities in the vicinity of steep terrains. But, this is considered impracticable or impossible in many countries due to the rapid growth of human population or due to the expensive cost in relocating of ancient or historical cities. Thus, regional landslide hazard analysis and management is becoming an important task for city planners and officials [4]. Landslide disasters including debris flows are the one of the most frequent natural disasters in Korea, and losses of lives and property damages due to these catastrophic events have been increased every year. Various mitigation programs and related policies have been conducted in order to respond and prepare landslide disasters[5].

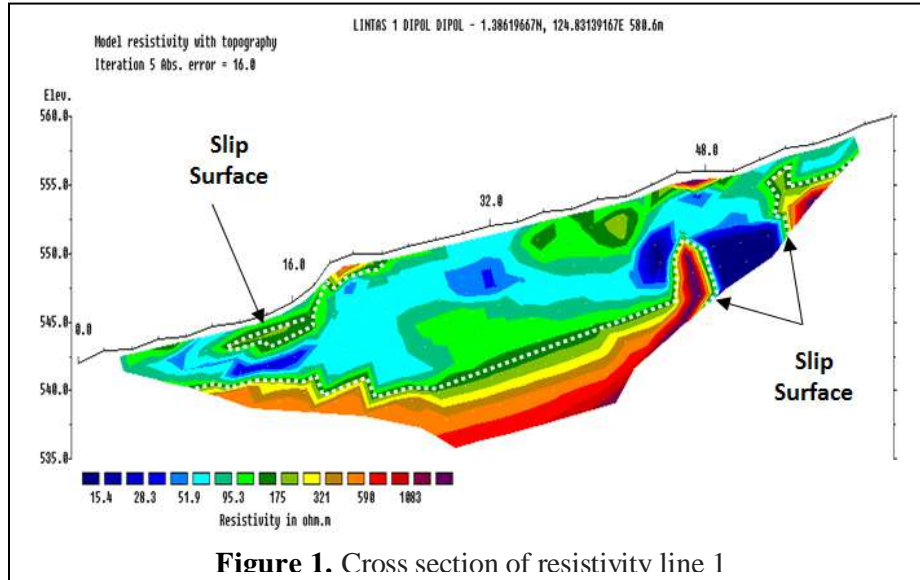
Jongmans and Garambois presented an interesting diagnosis of the relatively limited use of geophysical methods in identifying landslide hazards. They found that *geophysical methods provide images in terms of physical parameters, which are not directly linked to the geological and mechanical properties required by geologists and engineers. Another reason comes from a tendency among some geophysicists to overestimate the quality and reliability of the results.* Undoubtedly, these statements are relevant to much geophysical work, so it is important to continually emphasise the principles behind proper identification of hazards using geophysical means. It specifies the geophysical methods which are of greatest importance in the study of landslides. Their advantages and limitations are presented. The principles of the geophysical methods applied at the stage of designing and carrying out measurements, processing and interpreting data, analysis of results and their documentation are described [6].



## RESULTS AND DISCUSSION

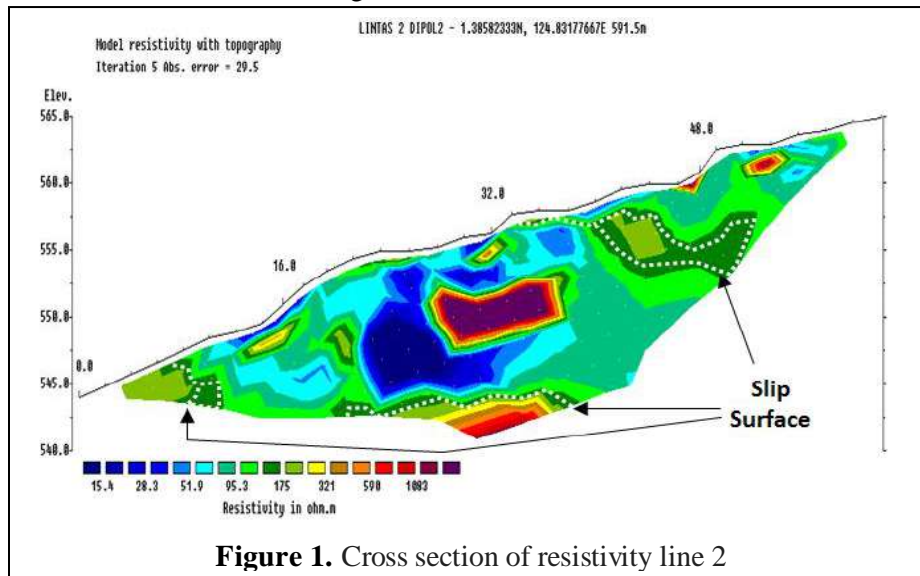
Exploration using geoelectric resistivity method of dipole-dipole configuration is carried out on 3 lines, each path is 62 m long, spacing is 2 m. The data was processed using Res2Dinv software and generated 2-dimensional resistivity crosssection. The slip surface is interpreted as a sandy clay layer with resistivity (30 - 215)  $\Omega\text{m}$ .

Exploration results on line 1 can be seen in Figure 1,



The layer identified as a slip field in two places. Layer 1 is located on the 8th - 18th meter with a depth of  $\leq 2$  m. The second layer in the image looks to consist of two parts which are thought to be the same layer, layer 2 is located along the path with a depth of 2 - 10 m.

The slip field on track 2 can be seen in Figure 2



On line 2, the slip field was identified in 3 locations. Location 1 on the 6th to 10th meter with a depth of  $\leq 5$  m, the second location at 20th to 38th meter with a depth of 12-15 m, location 3 at 34th to 53th with a depth of  $\leq 7$  m. The slip surface at location 1 and location 2 is thought to be interconnected and continuous.

**Keywords:** slip surface.

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## Anatomical Characters Of Stomata, Mesophylls, And Petiolus Six Varieties Of Sweet Potatoes (*Ipomoea batatas* L.) After Organic Fertilizer Induction

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### INTRODUCTION

The anatomical structure of the leaves is arranged by three tissue systems namely epidermis, mesophyll and vascular tissue. The epidermis is a layer of outer cells and covers the surface of plant organs. In leaf organs, the epidermis is on the adaxial and abaxial side<sup>1)</sup>. Epidermal cells in later development are modified and specialized into structures in the form of stomata, trichomes, cuticles and fan cells. Stomata generally located on the abaxial side of the leaves, while in certain plants the stomata are found on the adaxial and abaxial sides of the leaves. The shape and type of stomata are anomocytic (*ranunculaceous*), anisocytic (*cruciferous*), paracytic (*rubiaceous*), diacytic (*caryophyllaceous*) and actinosytic<sup>2-3)</sup>. Stomata together with neighboring cells are called stomata complexes.

Anatomical characters are antixenotic resistance parameters, can be in the form of color and plant shape, cell wall thickness and proliferation rate of plant tissue, hardness and characteristics of the stem, trichomes, magnitude of stomata, cuticle layer and wax<sup>4-6)</sup>. The anatomical characteristics of the leaves can be seen through the length and width of the stomata, the density of the stomata, the thickness of the mesophyll and the length of the petioles<sup>7-8)</sup>. Six varieties of sweet potatoes show specific resistance to pests and pathogens, characterized by qualitative and quantitative morphology, the ability to synthesize primary and secondary metabolites including the anatomical characteristics of leaves. Description of anatomy and morphology is a product of the response to the conditions of the environmental factors in which the plant grows. Application of organic fertilizer will provide mineral nutrients<sup>9-10)</sup>, so that plants can grow optimally and can induce the nature of antixenosis resistance, antibiosis and tolerance.

The study aimed to evaluate the anatomical character of six sweet potato varieties after induction of organic fertilizer. The research is conducted using Completely Randomized Design with 3 replications. Treatment of sweet potato varieties (J): Antin 3 (J1), Jago (J2), Cilembu (J3), Shi Royutaka (J4), Local Purple (J5) and Local White (J6). Petroganic Organic Fertilizer is given as much as 20 tons / ha, the application is 3 weeks before the sweet potato cuttings are planted. Observation of anatomical characters include: 1) Stomata density, 2) The length of the stomata pore when open, 3) The width of the stomata pore when open, 4) Thickness of mesophyll, 5) Diameter of the petiolus cortex, observed at 60 days after planting (HST) using a microscope with a camera Optilab 2.2 and image capture with the Image Raster 3.0 program.

### RESULTS AND DISCUSSION

The results of measurements of anatomical characters in sweet potatoes J1, J2, J3, J4, J5 and J6, mean stomata density respectively 8.56, 6.11, 5.11, 6.33, 8.56 and 9.11 in 75796.36  $\mu\text{m}^2$ . The mean length of stomata pore when it was open are 26.99  $\mu\text{m}$ , 32.08  $\mu\text{m}$ , 28.96  $\mu\text{m}$ , 38.72  $\mu\text{m}$ , 39.52  $\mu\text{m}$  and 35.86  $\mu\text{m}$ . The mean of the stomata pore width when open are 7.95  $\mu\text{m}$ , 5.11  $\mu\text{m}$ , 4.67  $\mu\text{m}$ , 5.04  $\mu\text{m}$ , 9.28  $\mu\text{m}$  and 6.98  $\mu\text{m}$ . The mean mesophyll thickness are 364,986  $\mu\text{m}$ , 280,703  $\mu\text{m}$ , 389,743  $\mu\text{m}$ , 245,749  $\mu\text{m}$ , 261,439  $\mu\text{m}$  and 434,913  $\mu\text{m}$ . The mean diameter of the petiolus cortex are 454,030  $\mu\text{m}$ , 373,453  $\mu\text{m}$ , 456,439  $\mu\text{m}$ , 373,001  $\mu\text{m}$ , 275,647  $\mu\text{m}$  and 318,785  $\mu\text{m}$ , respectively.

Sweet potato plants have parasitic kidney type stoma, namely the closure cell is surrounded by two neighboring cells with an elongated axis parallel to the closing cell axis (Figure 1). The anatomical structure of stomata is strongly associated with ontogeny stomata. Stomata distribution, pore length and width are

closely related to plant physiological processes, namely transpiration, photosynthesis and respiration. The flexibility of the stomata pore wall allows the stomata to open and close<sup>11)</sup>. The number and density of stomata between cultivars are influenced by the environment in which they grow. Light intensity, water availability and temperature are factors that determine the density of stomata<sup>12)</sup>. Mesophyll leaves are built by the parenchymal tissue with a transport file. The parenchyma tissue contains chloroplasts for photosynthesis. Each cultivar has a variety of different thicknesses<sup>13)</sup>. The petiolus cortex (Figure 2) illustrates the ability to position the lamina in relation to the efficiency of the plants physiological processes. The relationship with antixenotic resistance to cell wall thickness and leaf cuticle layer affect leaf hardness. The length and width of the stomata pores are related to insects that have a sucker-type mouth tool that can insert the stylet through the stomata opening. Stomata diameter does not have a direct effect on movement and feeding activity but is related to the product of plant cell metabolism which is needed by insects for growth and development. Stomata diameter affects the amount of CO<sub>2</sub> diffusion for the synthesis of primary metabolite products, namely carbohydrates, proteins and fats, and the synthesis of metabolites secondary to plant resistance. Stomata pore size is tightly regulated by plants, and cover cells participate in resistance by closing in response to the molecular pattern of microbial association<sup>14)</sup>.

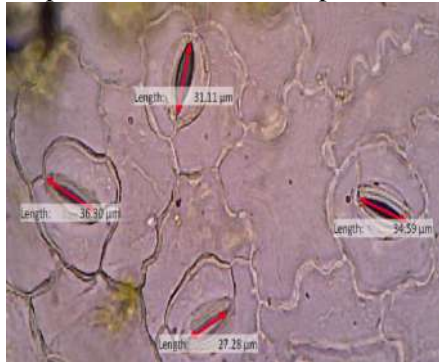


Figure 1. Stomata Anatomical Structure (Magnification of 40 X)

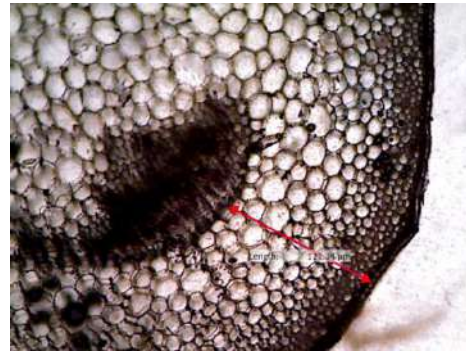


Figure 2. Petiolus transverse slices (Magnification of 4 X)

**Keywords:** Ipomoea batatas L., Stomata, Mesophyll, Petiolus

#### ACKNOWLEDGMENT

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## Formulation Of Functional Beverages Powder Based On Ambon Banana Flour (*Musa acuminata Colla*) Which Enriched With Legume Flour

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### ABSTRACT

Banana (*Musa acuminata Colla*) is one of the plants that has many benefits in the world, especially in tropical regions such as Indonesia. The flesh of banana fruit contains high potassium and low sodium so that it can be used as an antihypertensive drug. While banana flour is an alternative form of semi-finished products that are more resistant to stored, easily mixed and enriched with nutrients. In this study, the formula functional beverages of Ambon banana flour made which enriched with legumes flour to increase protein levels. Functional beverage powder made four formulas with different add-on ingredients, namely formula 1 enriched with soybean flour (F1), formula 2 enriched with mung bean flour (F2), and formula 3 enriched with red bean flour (F3), and formula 4 without add-on ingredients (F4 ). The four formulas were carried out by an organoleptic test, sedimentation rate, and sediment height. Formula 1, 2, and 3 were carried out by a hedonic test, and the best formula was carried out by proximate analysis and testing the determination of potassium and sodium levels. The results showed that F2 was the best formula, and the results analysis of functional beverage powder of F2 had 2.32% moisture content, 1.48% ash content, 5.62% protein, 1.41% fat, 89.17% carbohydrate, potassium 452.41 mg / 100 g, and sodium 320.04 mg / 100 g.

**Keywords:** Ambon Banana Flour, Functional Beverage Powder, Protein, Potassium, and Sodium



## **The Effectiveness Of The Ethanol Extract Of Sidaguri (*Sidarhombifolia L.*) Leaf On The Decrease Of Total Cholesterol Levels In White Male Rats Of *Sprague Dawley***

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### **ABSTRACT**

The purpose of this study was to determine the effectiveness of sidaguri leaf ethanol extract on the reduction of cholesterol levels in male Sprague Dawley rats, which had been induced by PTU. The test animals used were 20 rats divided into 5 groups, each group consisted of 4 rats. The treatment group consisted of dose I (22.8 mg / 200 gBW), dose II (45 mg / 200 gBW), dose III (91 mg / 200 gBW), positive control (Simvastatin 0.252 mg / 200 gBW) and negative control group (CMC Na 5%). The results of the study, it was known that the ethanol extract of sidaguri leaves at all doses was effective in reducing cholesterol levels in rats during 15 days of treatment. Dosage II (45 mg / 200 gBW) is the most effective dose to reduce cholesterol levels in male *Sprague-Dawley* white rats.

**Keywords:** *Cholesterol Levels, Sprague Dawley male white rats, Sidaguri Leaf Ethanol Extract.*

## Magnetic Properties and Mineralogy of Fe-Rich Coastal Sand from North Sulawesi

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### INTRODUCTION

Coastal sand located on the west and east coasts of North Sulawesi province, Indonesia, are thought to have potential iron content. For the purpose of exploitation, it is necessary to study the physical and chemical characteristics of the sand. In this study, physical measurements have been carried out in order to determine the magnetic properties and mineral content of iron sand from four locations in North Sulawesi Province, two locations from the east coast and two others from the west coast. The representative samples from the east coast region were taken from Hais and Minanga, whereas samples from the west coast were taken from Lalow and Lolan. Measurements of magnetic susceptibility and isothermal remanent magnetization (IRM) were conducted in order to find out the magnetic strength as well as type and concentration of magnetic minerals. These things are related to iron mineral content in the sample. Determinations of element composition as well as mineralogy analysis were then carried out using X-Ray Fluorescence (XRF) and X-Ray Diffraction (XRD).

### RESULTS AND DISCUSSION

The results show that the average maximum value of magnetic susceptibility measurements in bulk samples is more than  $4 \times 10^{-6} \text{ m}^3\text{kg}^{-1}$ . Although the level of magnetization in acquisition curves of Isothermal Remanent Magnetization looks varied, all curves are saturated in fields less than 300 mT which indicates that the magnetic properties of the sample are strongly influenced by magnetite ( $\text{Fe}_3\text{O}_4$ ) mineral (Figure 1). XRF measurements showed that the samples were rich in Fe. The percentage of Fe in all samples was relatively high, ranging from 69.07 to 81.46 wt.%, while Ti ranged from 4.4 to 7.3 wt.% (Table 1). X-Ray Diffraction analysis shows that Fe-bearing minerals in sand samples originating from the east coast, as well as west coasts of North Sulawesi, are not only associated with magnetite but also with orthopyroxene and ferroaxinite.

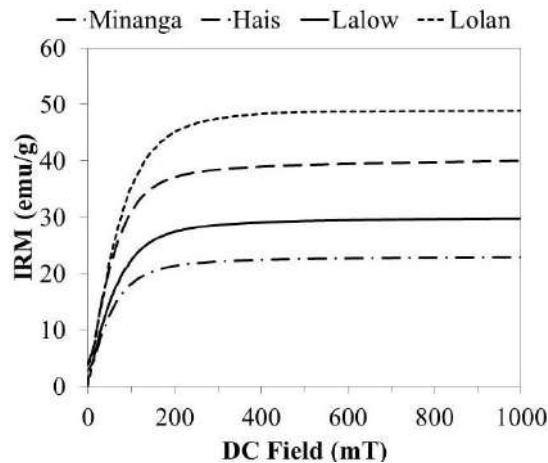


Figure 1. IRM acquisition curves were saturated at field less than 300 mT.

Table 1. Selected primary elements and oxides on iron sand samples

Location	Elements (wt.%)				Oxides (wt.%)			
	Al	Si	Ti	Fe	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>
Lalow	3.20	12.70	6.50	69.07	4.50	20.00	7.36	60.33
Lolan	3.50	2.80	7.30	81.46	5.00	4.60	0.83	76.7
Hais	4.10	8.40	5.70	74.82	5.80	13.00	6.64	67.39
Minanga	4.20	11.70	4.40	72.30	6.10	18.00	5.23	64.72

**Keywords:** Isothermal Remanent Magnetization, Mineralogy, Iron sand, North Sulawesi

### Acknowledgment

This research was financially funded by the Riset Unggulan Unsrat (RUU) 2017 Research Grant to GT.

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## Morphology and Grain Size Distribution of Iron Sand from North Sulawesi

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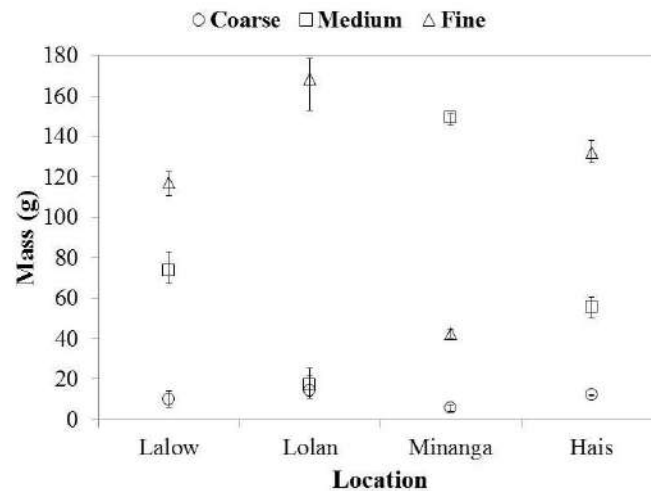
### INTRODUCTION

The coasts of North Sulawesi have very potential natural resources. Coastal sand with relatively high iron content or commonly known as iron sand was detected in several locations. Iron sand is a source of economical minerals, namely iron (Fe), which is easier to treat compared to sources in stone form. However, scientific studies on the iron sand minerals, especially those in the coastal areas of North Sulawesi, are still poor. Therefore, a study is needed to find out how the mineralogy, morphology, and characteristics of iron sand particles in the North Sulawesi.

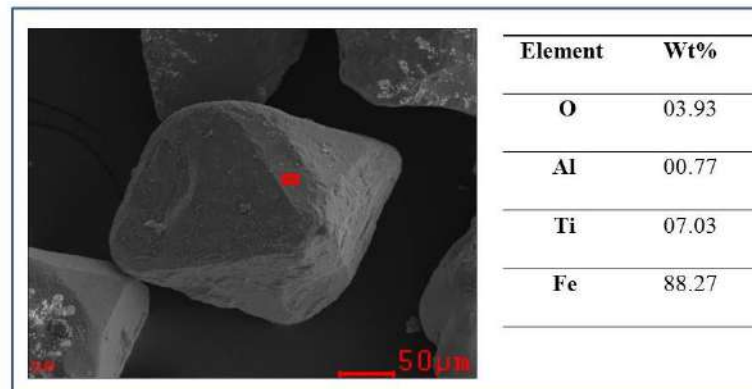
The samples were obtained from four locations. Two locations are on the west coast and two other locations are on the east coast of North Sulawesi province. Five samples were taken at different points at each location and then prepared through the drying process. Sieving with two different sizes was conducted in order to classify the size of the sand grains in the categories of coarse, medium, as well as fine sand. Weighing was aimed to find out the mass percentage of each grain size. Morphological and mineralogical analyses of iron sand particles then were carried out using a scanning electron microscope (SEM) and energy dispersive X-ray (EDX).

### RESULTS AND DISCUSSION

Figure 1 shows the mass distribution of three different grain sizes in each sample. The fine-sized grains were dominant in the samples from Lalow, Lolan, as well as Hais regions, whereas the medium-sized grains were dominant in the sample originating from Minanga. The standard deviation of grain size on samples from Hais and Minanga is relatively lower compared to Lalow and Lolan regions. In general, SEM observations show grains with relatively rounded in their morphology which is indicating a long transport process of these grains. The EDX results on some grains show the high content of Fe ranging from 60 to 90 wt.%, but are poor in Ti content (less than 10 wt.%). Figure 2 shows the bi-tetrahedral shaped of Ti-poor Titanomagnetite grain, which generally derives from weathering processes of volcanic rocks.



**Figure 1.** Mass variation of three different grain sizes



**Figure 2.** The bi-tetrahedral iron oxide grain was observed by SEM in fine-sized samples from Hais area. EDX result shows that the grain has a high Fe content.

**Keywords:** Iron sand, North Sulawesi, Grain size, SEM.

### Acknowledgment

This research was funded by PNBPN Sam Ratulangi University through Riset Dasar Unggulan Unsrat (RDUU) 2018 Research Grant to AT & GT.

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## Numerical Modeling For Tsunami Wave Propagation (Case Study: Manado Bays)

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### INTRODUCTION

A computer based numerical modeling, which can simulate the propagation of the tsunami wave, was developed for the coastal area of Manado bays. Tsunamis also known as seismic sea waves are a series of enormous waves created by an underwater disturbance such as an earthquake, landslide, volcanic eruption, or meteorite. Tsunamis are ocean waves that occur due to an exclusive disturbance in the volume of sea water. This exclusive disruption occurs due to sudden sea deformation, especially in the vertical direction. A tsunami can move hundreds of miles per hour in the open ocean and smash into land with waves as high as 100 feet or more. Indonesia is the third largest country in the world within 500 years, with a population of around 5.5 million people killed by the tsunami waves. The Indonesian archipelago is located at the boundary of three major tectonic plates the Indo-Australian, Pasific, and Eurasian plates. As a country located in the seismic zone of Southeast Asia, Indonesia is one of the countries with the most active seismicity in the world. One area of Indonesia's with high seismicity is the north arm Sulawesi. As a result of the complexity the movement of plates on this area resulted in the formation subduction of North Sulawesi (North Sulawesi Trench) which could potentially cause medium to large earthquakes in megathrust zones which could trigger a tsunami. Historical tsunami data shows that the area of the north arm Sulawesi has been several times by hit the tsunami which has caused loss of life and material and environmental damage due to the tsunami waves. Mitigation efforts need to be done as early as possible. Tsunami disaster mitigation is one of them through numerical modeling for tsunami wave propagation. Numerical modeling uses linear theory in deep sea, shallow-water theory in shallow sea. Modeling uses the help of the TUNAMI N2 package, is a numerical method of tsunami simulation with the leap-frog scheme.

### RESULTS AND DISCUSSION

Tsunami generation and propagation due to earthquakes with different fault parameters were studied. This scenario requires data such as strike, dip, slip, length and width fault with earthquake mechanisms interpreted in source parameters as presented in Table 1 below:

Table 1. Source Parameter

Parameter	Scenario 1	Scenario 2
Long	120,735	121,558
Lat	1,879	2,29
L (m)	100 km	200 km
W (m)	60 km	60 km
Strike	60	100
Dip	20	20
Slip angle	85	85
Depth	10 km	10 km

Modeling results in snapshots per minute that describe the time of arrival of the tsunami wave (travel



time) and tsunami height (run up). Figure 1 present the propagation of the tsunami wave due to an earthquake as given in Table 1.

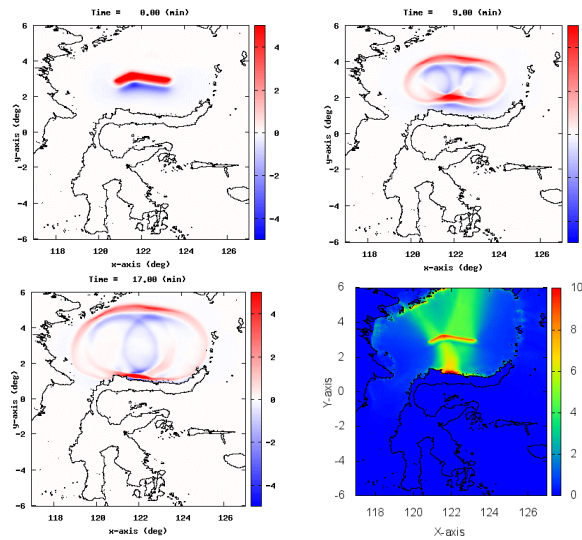


Figure 1. Tsunami wave propagation for 0 minute, 9 minutes, 17 minutes and maximum wave height

Modeling results indicate that the tsunami wave is estimated to arrive at the northern coast of the north arm of Sulawesi at 16-20 minutes. As for the Manado bays area it is estimated that tsunami waves arrived 24 minutes to 32 minutes after the earthquake.

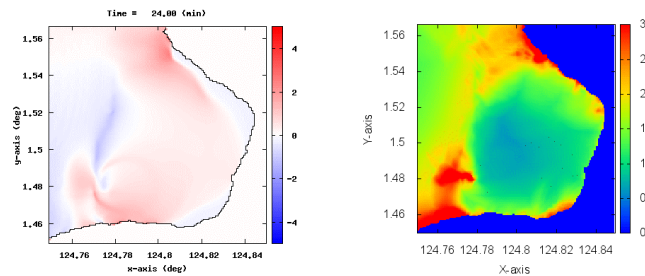


Figure 2. Tsunami wave propagation at layer 4 for snapshots of 24 minutes and maximum run up on Manado Bays

**Keywords:** earthquake, mitigation, modeling, tectonics, tsunami, tunami.

### Acknowledgment

We would like to express our sincere gratitude to the Ministry of Research, Technology, & Higher Education (RISTEK DIKTI) for the for the financial support.

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## Pest And Natural Enemy Monitoring And Population In Potato Plant (*Solanum tuberosum* L.) In Modinding North Sulawesi

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Potatoes, *Solanum tuberosum* L., is one of the important food crops in North Sulawesi. This area has a potato development area "Modassi" (Modinding, Modayag and Passi) as an intensive horticulture area, Ministry of Agriculture program since 2008. Potato production in North Sulawesi shows a significant decline. According to data from the Central Statistics Agency (BPS. 2016) for potato production, respectively from 2013 (115,202 tons), 2014 (113,979 tons) and 2015 (54,737 tons). Pest attacks are an important factor affecting potato production in this region. The study was conducted with the intention of obtaining comprehensive data on the types of insects associated with potatoes both pests and natural enemies and the number of populations. This data is needed for planning potato pest control strategies. The study was conducted in three locations, namely in the villages of Palelon, Makaanoyen and Lineleyan, Modinding District. Sampling at each location uses a diagonal slice method which is a five-point sub-plot, 4 points at the end of the location and 1 point in the middle. Sampling by sweeping method at each point uses insect nets, each of which is ten double swings. The captured insects were then anesthetized using ethyl acetate and collected in a sample bottle. Samples were taken to the Biology and Conservation Ecology laboratory, Faculty of Mathematics and Natural Sciences, UNSRAT for identification and calculation of the population. Sampling is carried out every 2 weeks when the plants are 14,28,42,56,70,84 days after planting or the total of each village is 6 times the data collection. The most insect population was found in Makaanoyen village (224,83 indv), while in Palelon village (196,33 indv), and the lowest was in Lineleyan village (184,83 indv).

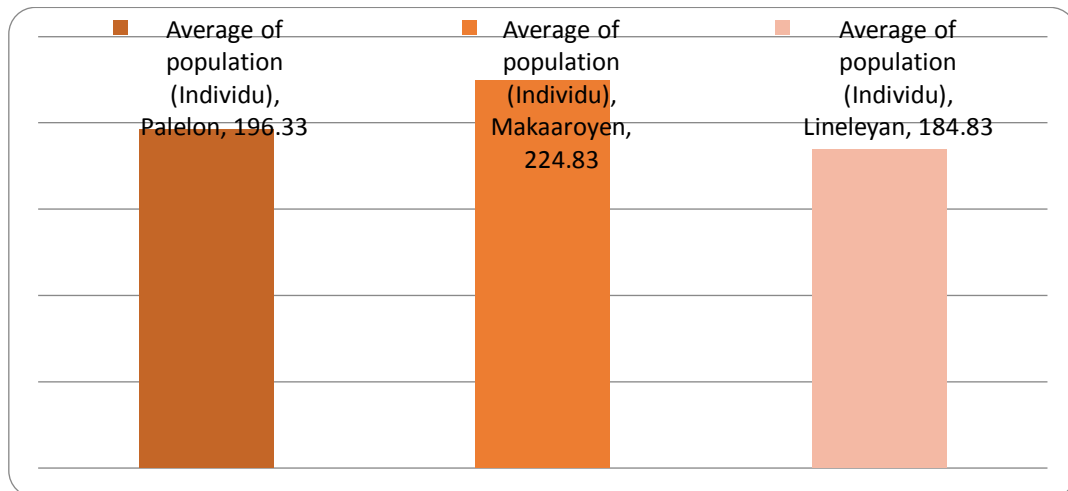


Figure 1. The average of population in each plot.

There were 8 orders found associated with potatoes namely Coleoptera, Diptera, Hemiptera, Hymenoptera, Orthoptera, Lepidoptera, Dermaptera, Araneae. The average population found from Hemiptera with 98,78 indv, Diptera 42,11 indv, Coleoptera 30,61 indv, Orthoptera 11,44 indv, Lepidoptera 10,17 indv,

Hymenoptera 8,33 indv, Araneae 2,39 indv and Dermaptera 0,56 indv. A total of 27 types of insects associated with potatoes consist of 18 pests, 7 predators and 2 parasitoids. Eighteen pests and the average population are *Empoasca* sp. 49 indv, *Lygus* sp. 16,44 indv, *Leptopterna* sp. 15,89 indv, Acrididae 11,44 indv, *Nezara* sp. 11,22 indv, *Epilachna* sp. 10,89 indv, *Bactrocera* sp. 10,78 indv, *Phthorimaea* sp 10,17 indv, Chloropidae 10 indv, *Peronyma* sp. 8,89 indv, *Liriomyza* sp. 6,89 indv, *Alphitobius* sp. 6,72 indv, *Scotinophora* sp. 6,22 indv, *Chaetocnema* sp. 3,06 indv, *Scarabaeidae* 1,5 indv, *Forficula* sp. 0,56 indv, *Cerambycidae* 0,44 indv, *Graphognatus* sp.0,39 indv. Seven associated predators are *Dolichodeus* sp. 5,94 indv, *Dolichopus* sp. 4,95 indv, *Stethorus* sp. 3,72 indv, Carabidae 0,94 indv, *Pemphredon* sp. 0,78 indv, Syrpidae 0,61 indv and Araneae 2,39 indv. Two associated parasitoids are *Hyperaspis* sp. 2,94 indv, *Eriborus* sp. 1,61 indv. The number of types of insects found this time were 27 insects, in contrast to the previous report by Bororing et al. (2015) which found 12 insects (8 pests and 4 natural enemies) associated with potato plants in Modinding. *Empoasca* sp. which was the most dominant pest previously reported amounted to 109.03 indv (Bororing et al. 2015). In this study the average population of *Empoasca* sp was reduced to 49 indv. This decrease in the population of pests may be due to the intensive administration of insecticides. However, this triggers the emergence of other pests. Redcliffe *et al* (2009) states that excessive use of insecticides can cause environmental pollution, the occurrence of pest resistance, the emergence of secondary pests, the emergence of pest resistance and the killing of natural enemies.

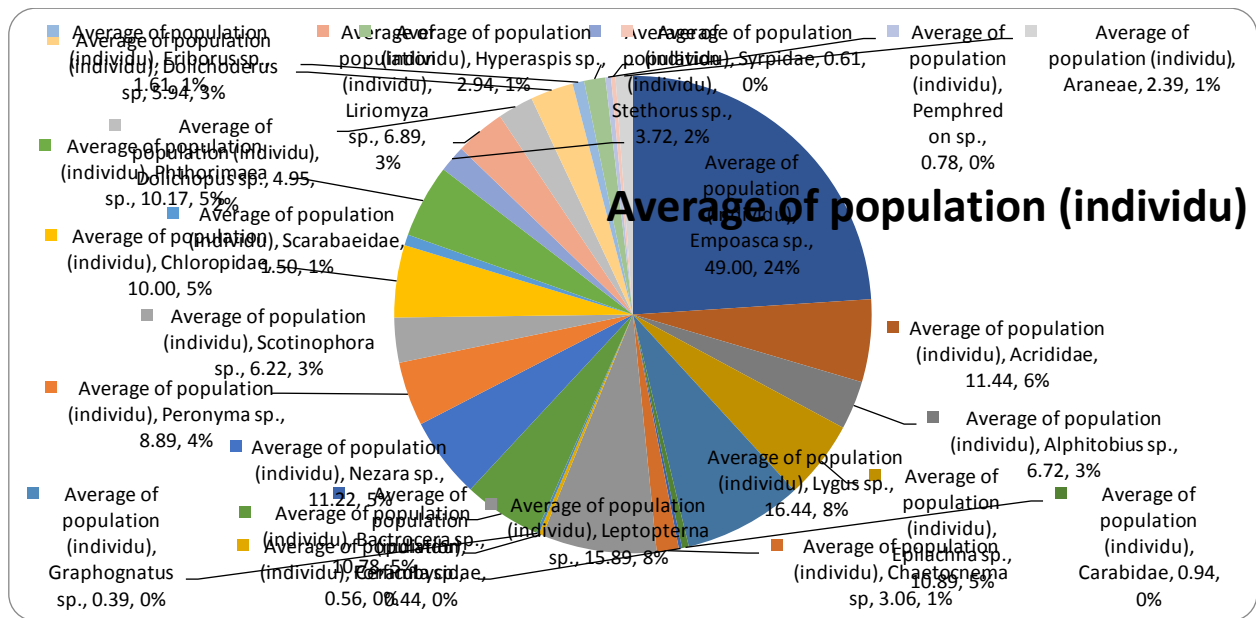


Figure 2. The Average of population each insect

**Keywords:** potatoes, identification, pests, natural enemies, population

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## The Potency Of Drug Reconciliation Need On Ederly Diabetic Patient At RSUP Prof DR. R. D. Kandou Manado

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### Introduction

Drug Reconciliation is a process of evaluating a patient's medication regimen that is carried out regularly which aims to prevent medication errors that can include omission, duplication, dose errors, or drug interactions, as well as compliance and adherence of patients [1]. Drug reconciliation is needed to the patients who receive drugs that include high alert, one of them is a patient with Diabetes Mellitus (DM) who get insulin and oral antibiotics [2]. In patients with diabetes mellitus, the risk factors for incompatibility medication are greater.

The prevalence of diabetes mellitus in Indonesia has increased. The research of Basic Health (Riskasdas) in 2007 showed the prevalence of DM in Indonesia was 1.10% while in 2013 it was 2.01% [3,4]. One of the 17 provinces with a percentage of DM prevalence that is greater than the national DM prevalence percentage is North Sulawesi with the prevalence of DM diagnosed by doctors and the symptoms of 1.60% [4].

The aim of this study is to identify the potential needs of drug reconciliation in elderly people with diabetes mellitus. This aim can be achieved through identifying; the first, discrepancies that occur in the administration of diabetes mellitus patients at the time of admission to hospital and out of hospital. Second, in-depth interviews with patients and health care providers regarding their choice of perception and tendency towards drug reconciliation services. This research will be useful for the development of health services, especially drug reconciliation and as input for health services at Prof.Dr. R. D. Kandou Manado and health community in Manado.

### Methods

#### 2.1 Study design, Setting and Participant

The study was divided into two stages, namely: the first stage, quantitative descriptive study to identify medication discrepancies in elderly DM patients who left RSUP Prof. R.D. Kandou. This was done by comparing the treatment data of patients when they were discharged from the hospital with the best source of information related to the patient's medical history (Best Possible Medication History/BPMH) before the patients entered the hospital adjusted to the patient's condition in the medical record.

The second stage is a qualitative descriptive study with in-depth interviews with patients including perception, preference, and patient willingness to pay for drug reconciliation services. Interviews are also conducted with health care providers regarding perceptions, preferences, and willingness of service providers to be paid for implementing drug reconciliation

The study was conducted for 8 months from January to October 2018. Samples which taken in the first stage were 32 elderly patients who were diagnosed with diabetes mellitus who came out of Prof. Dr. R.D. Kandou Manado, while in the second stage there were 32 patients with Elderly Diabetes Mellitus and as many as 29 service providers included 15 pharmacists and 14 doctors.

#### 2.2 Outcome

In qualitative research, the outcomes produced according to the nonconformity criteria based on Herrero-herrero et al [5], include:

- A. There is no medication discrepancies: the medication upon discharge from the patient in the patient's medical record is the same as the medicine before entering the hospital obtained from BPMH.
- B. Medication discrepancies: the difference between the patient's medication when he was discharged from the hospital and the drug before entering the hospital obtained from BPMH. The medication discrepancies in this study included:
  - 1. Unintentional discrepancies), such as:
    - a. Omission medication: drugs that patients use before entering the hospital are not re-prescribed when they leave the hospital without a clinical explanation in the patient's medical record.
    - b. Giving new prescriptions at the time of hospital discharge: change in dosage, route of administration or frequency of medication when exiting the hospital in the patient's medical record compared to the dose, route of administration or frequency of the drug before entering the hospital without any changes in the patient's condition.
    - c. Commission medication: patients who were prescribed at the time of discharge did not use by the patient before entering the hospital. There is no clinical explanation for the addition of the drug in the patient's therapy in the patient's medical record.
    - d. The prescription is incomplete: dosage, frequency or duration of use is not recorded for one prescription drug upon discharge.
    - e. Treatment duplication: prescribe more than one drug with the same class
  - 2. Intentional discrepancies are discrepancies between drugs obtained when patients are out of hospital compared to before entering the hospital and the changes are based on the patient's condition in the medical record or carried out with the aim of correcting medication errors that occur at the time before entering the hospital. New therapies or changes in route of administration include intentional discrepancies if according to the patient's clinical status or the diagnosis recorded in the report upon discharge
- C. Cannot be identified is unable to identify because there is no information related to the treatment history of BPMH patients.

2.3 Data Analysis

In the first stage, data collection was carried out in the period of 21 May 2018 to 9 July 2018. The obtained data were in the form of patient demographics, drugs before the patient was admitted to the hospital were obtained from the patient himself or care giver, while the patient's medication at the time of leaving the hospital obtained from the patient's medical record.

Medicines data before hospital admission and medication discharged from the hospital were compared to identification of the percentage of nonconformities that occurred based on the Hererro-Herrero classification [5]

In the second stage, the obtained data in the form of interview transcripts were conducted based on thematic analysis [6]. Transcripts are read repeatedly, coded and if there are the same main ideas and keywords, they will be listed and produce a theme. Analysis is done until saturation data is obtained.

**Result**

Based on research conducted on 32 inpatients, demographic data obtained as follows:

**Table 1.** Patient Demographic Table

Characteristics	Total	Percentage
Sex		
Male	12	37,5%
Female	20	62,5%
Age		
Early Elderly 46-55 years	10	31,25%
Late ederly 56-65 years	14	43,75%
Aged >65 years	8	25,00%

The number of diagnosis per patient		
1-2	3	9,37%
3-4	13	40,63%
≥5	16	50,00
The number of drug items obtained at the time of the patient's hospital discharge		
3-4	6	18,75%
5-6	8	25,00%
≥7	18	56,25%

<sup>a</sup>Age grouping based on Department of Health 2009

### 3.1 Medication discrepancies

There are 36 discrepancies were obtained from 32 inpatients which included the following:

**Table 2.** Classification table for nonconformities based on the Herrero-Herrero classification

Classification	Total	Percentage
There is no medical discrepancies	0	0,00%
Unintentional discrepancies		
Omission Medication	9	28,12%
Giving new recipes	1	3,12%
Commission Medication	0	0,00%
Not complete prescription	0	0,00%
Duplication of medication	1	3,12%
Intentional discrepancies	23	71,87%
Cannot be identified	0	0,00%

Of the 32 patients, as many as 11 patients experienced unintentional discrepancies and as many as 2 patients experienced 2 nonconforming discrepancies. Based on data obtained shows the need for drug reconciliation for patients with chronic disease patients who tend to get a lot of drugs.

### 3.2. Knowledge, Perception, Choice Trends and willingness to pay for Diabetes Melitus patients for drug reconciliation services

3.2.1 Knowledge of Diabetes Patients regarding drug reconciliation services  
All Patients do not know about drug reconciliation. Some statements that show patients' ignorance about drug reconciliation.

"not know. What is that?"

(Patient 1, Female, 61 years old)

"I've never heard about that"

(Patient 4, female, 59 years)

#### 3.2.2 Perception of Diabetes Patients towards drug reconciliation services

Based on in-depth interviews conducted with DM patients, all patients did not know about drug reconciliation services. This shows a lack of patient knowledge of drug reconciliation. The patient's perception of the service of drug reconciliation is very supportive and considers good service of drug reconciliation. Some statements that support this.

"Very good to be done to be sustainable"

(Patient 4, female, 59 years old)

"Very good, because I've experienced drug interactions"

(Patient 12, female, 61 years old)

"Good to be controlled"

(Patient 30, female, 63 years old)



The patient's statements show the patient's support and desire to get drug reconciliation services. There is one patient who has experienced drug interactions so that the service of reconciliation is very necessary

### 3.2.3 Trends in the Choice of Diabetes Mellitus Patients for Drug Reconciliation services

#### 3.2.3.1 Types of patient-selected drug reconciliation services

The type of service that patients want is to call the patient and visit the house. Some patients prefer the service provider to call the patient shown in the following statement:

"Just call. The problem is more practical "

(Patient 1, female, 61 years old)

"Calling saves more time, cost and distance"

(Patient 10, male, 50 years old)

"More comfortable on the phone"

(Patient 11, female, 59 years old)

Some patients who choose to call a patient care provider think it is more practical and convenient if over the telephone. Some patients who choose to call consider the distance of the house of patients who live far away in other cities or outside the island. Some patients do have a place to live far from the hospital.

Some patients choose service providers to make a home visit. This is shown in the following statements:

"If you go home it's clearer to ask anything"

(Patient 6, Female, 69 years)

"A direct visit so I can ask right away the right direct information to"

(Patient 9, male, 72 years old)

"Better visit home to be more monitored"

(Patient 14, Female, 54 years old)

The patient chooses the service provider to make a home visit assuming that with a home visit, the patient can communicate directly with the service provider, have the flexibility to ask health care providers and feel more monitored. These statements show the patient's desire to interact directly with health care providers

#### 3.2.3.2 Frequency of patient selected medication reconciliation services

Patients choose the frequency of drug reconciliation services 1x a week, 2x a week, 1x monthly and 2x monthly. Some statements that show frequency selection of drug reconciliation services are:

"2 times a week so that my communication with the pharmaceutical department is smooth"

(Patient 5, Female, 50 years old)

"It is better 1x per week, so it can be controlled"

(Patient 28, Female, 55 years old)

"1x a month only because for chronic diseases the drug is prescribed for 1 month better one month visit "

(Patient 30, Female, 63 years old)

"If I am rarely at home, it's better for 2x a month."

(Patient 3, Male, 61 years old)

The frequency of services both home visits and calling depends on each patient's situation from time availability, the patient's need for communication with the service provider and the patient's desire for the service provider to control the medication that the patient is drinking. Research on the frequency of follow-up in diabetics shows an intensive frequency of improving quality of life and clinical indications [11]

#### 3.2.4 Willingness to pay for Diabetes Melitus patients for drug reconciliation services

The willingness to pay patients is very diverse. There are some patients who object to paying 50,000-100,000, transportation and voluntary money.



Some patients do not have the willingness to pay. Some statements indicate the patient's objection to pay, ie

"I don't want the problem, because I entered a BPJS patient so I shouldn't pay it, right?"  
(Patient 1, Female, 61 years old)

"If I just say thank you,"  
(Patient 9, male, 72 years old)

"Not because I already entered the health insurance"  
(Patient 26, Male, 50 years old)

Some patients who are willing to pay 50.00-100,000. Several statements that show the patient's choice are as follows:

"I was able to pay 100,000 / visit"  
(Patient 3, male, 61 years old)

"Thank you, only 50,000"  
(Patient 11, female, 59 years old)

Some patients show willingness to pay transportation money

"Will you pay for transportation money?"  
(patient 25, female, 63 years old)

There are patients who show willingness to pay voluntarily

"Can I pay, but for the sake of gratitude, just be a participant."  
(patient 28, female, 55 years old)

Patient willingness to pay for drug reconciliation services depends on the patient's economic condition and the health insurance that the patient has.

3.3. Perception, Choice Trends and willingness to be paid by Health Service providers for drug reconciliation services

3.3.1 Knowledge of health care providers regarding drug reconciliation services

Some health care providers do not know about drug reconciliation. Statement that shows this, namely:

" Not yet. Just heard first "  
(Service provider 3, Female, 49 years old)

"For reconciliation ever. Yes unite, combine opinions so that it is in line. If the reconciliation of medicine has never been "

(Service provider 5, Female, 28 years old)

Some health care providers know about drug reconciliation. Some statements that show this, namely:

"Ever. Hospital reconciliation compares treatment obtained patients before entering the hospital.

See the interview data for patients come to the hospital

(Service provider 26, Female, 27 years old)

Service provider knowledge is based on training and seminars followed by service providers because some service providers have conducted training on drug recommissioning usually carried out by service providers in hospitals.

3.3.2 Perceptions of Service Providers for Drug Reconciliation services

The service provider supports the service of drug reconciliation. This is indicated by the statement of the following statement:

"Nice. Very helpful on the part of the patient especially us as medical personnel"  
(Service provider 7, Female, 24 years old)

"It is important, so that we can monitor the adherence to taking medication, whether the patient is regular or not"

(Service provider 14, Male, 27 years old)

There are also service providers who consider drug reconciliation services to be ideal services.

"Ideally treatment must be like that, it must be sustainable, because we are also did not close my eyes from previous treatment "

(Service provider 2, Female, 33 years old)

Statements from service providers indicate support and consider it important to carry out drug reconciliation. Service provider perceptions affect the willingness of service providers to carry out drug reconciliation

### 3.3.3 Trends in the choice of service providers for drug reconciliation services

#### 3.3.3.1 Types of Reconciliation services Drug choices of service providers

Some service providers prefer to call the patient. A statement that shows the choice of calling the patient as follows:

"It's better to call if the choice is just that. The reason is saving time, henat power, time, funds more efficiently "

(Service provider 9, Male, 24 years old)

Many service providers prefer a patient's home visit. Statements that indicate this as follows:

"From myself it's better to face-toface, because in terms of direct explanation to patients is better

(Service provider 7, Female, 24 years old)

"If the phone is likely the patient can lie, it's better direct visit to home "

(Service provider 12, male, 67 years old)

Some service providers choose both depending on the patient's condition. This can be seen from the following statements.

"If you choose depending on the patient's condition, if you adhere to taking medication via the call is enough, if the patient's specific condition is certain, for example the patient is not can move or have a wound, then we also visit directly "

(Service provider 3, Female, 49 years old)

"It's better both. There is also a home visit for patients limitation of motion. Telephone to remind and home visit for see the situation "

(Service provider 10, Female, 33 Years)

Many service providers choose home visits to see the patient's condition directly and interact with patients directly, while those who choose to call are due to a lack of time available from the service provider.

#### 3.3.3.2 Frequency of Reconciliation services Drug selected by the service provider

The frequency chosen by the service provider for drug reconciliation services is 1x per month, 1x 2-3 weeks. and 1x a week. Many service providers choose the frequency of drug delivery 1x per month. A statement that shows this as follows:

"Maybe once a month while checking fasting blood sugar"

(Service provider 12, male, 67 years old)

"Once a month, because the average DM patient takes medication a month once"

(Service provider 21, male, 25 years old)

Some service providers choose once every 2-3 weeks. Statement that shows this, that is "2-3 weeks more efficient time"

(Service provider 14, Male, 27 years old)

Some service providers choose 1x a week. Statement that shows this, that is

"Once a week at home, because compared to once a month it can while at home, patients take other drugs (because of other illnesses), can seen from there "

(Service Provider 25, Female, 54 years old)

The frequency of drug reconciliation services chosen by the service provider depends on the time availability of the service provider, the use of drugs by the patient, the desire of the service provider to control the condition and treatment of the patient

#### 3.3.4 Willingness to be paid by service providers for drug reconciliation services

Willingness of service providers to be paid for drug reconciliation services, ie no need to be paid, 20,000-50,000, 50,000-100,000, transportation money, voluntary patients.

"Obviously, patients don't pay. Now the era of JKN, let alone patients routine"

(Service Provider 2, Female, 33 years old)

"If patients are willing to pay around 20.00-50,000"

(Service Provider 26, Female, 27 years old)

"The applicable price range is between 50,000-100,000"

(29 service providers, male, 27 years old)

"For a visit, it takes a fee, so maybe it's just transportation money"

(Service provider 24, Female, 35 years old)

"If I am just patient,"

(Service provider 21, male, 25 years old)

The willingness of health care providers is influenced by health insurance that patients have, the type of service provided by service providers such as home visits requires more money than calling patients and a sense of service from the service provider to the patient

### Discussion

This study shows the need for drug reconciliation services. In the first phase of the study, 11 out of 32 patients experienced unintentional discrepancies and 2 patients experienced 2 nonconforming discrepancies. The most accidental nonconformity in the form of omission medication was 28.12%.

These results are the same as those of Herrero Herrero and García-Aparicio [5] showing the highest nonconformity of omission medication was 84.6% of 52 reports of unintentional medication discrepancies. In a systematic review by Michaelsen MH et al, the general discrepancies that occur are omission medication of more than 56% and the second is a new prescription in the form of inaccuracies in dosing, route and frequency of 44% of nonconformities [7].

In the second phase of the study, it was found that there was no patient knowledge about drug reconciliation. This was due to the absence of drug reconciliation services in the community while few were in the hospital. Drug reconciliation carried out in hospitals is limited to certain diseases and DM disease is not one of them. For service providers, few know about drug reconciliation. This shows the need for socialization and drug reconciliation training to service providers. Patients and service providers support drug reconciliation. Both patients and service providers consider drug reconciliation to be an important and good service.

The tendency of patients to choose the type of drug reconciliation service is home visits and calling, while those who provide services other than home visits and calling are those who choose both depending on the patient's condition. Some studies that show both calling and home visits have a positive effect on the patient's condition and the patient's response to treatment. Research conducted on the usefulness of telephones for health services shows that the telephone is useful for motivating and reminding patients of their treatment in patients with chronic diseases. Digital communication can improve patient interpersonal relationships with service providers. [8] A meta-analysis study by Ploeg et al. Showed that home visits for elderly patients reduced mortality by around 17%. [9] Home visits make patients feel care for patients and improve patient trust in health care providers. [10]

The frequency of drug reconciliation services selected by patients is 1x per week, 2x weekly, 1x monthly and 2x monthly, while the service providers choose 1x monthly, 1x 2-3 weeks. and 1x a week. The choice of patient frequency is more frequent than the choice of the service provider due to the availability of the time of the service provider and depending on the medication that the patient gets

Willingness to pay patients for drug reconciliation services, namely objection to pay, 50,000-100,000, transportation and voluntary money. Willingness to be paid by service providers does not need to be paid, 20,000-50,000, 50,000-100,000, transportation money, voluntary patients. Willingness to pay patients and readiness is paid by the service provider depending on the economic conditions of the patient and the existence of health insurance. For Service Providers the type of service performed also affects the example of a home visit requires more costs than when calling a patient. The results obtained are in accordance with

research on the willingness to pay patients for health services in Aceh by Rina S, where willingness to pay patients is influenced by the patient's ability to pay and the existence of health insurance [12]

This research limitation is only can be applied to a hospital like Prof. Dr. Kandou Manado hospital as type A of as Type A Referral Hospital. The second stage of research can only be applied to economic conditions in countries with low to middle economies. In addition to the large number of samples that are not representative due to the length of time to get medical record data from the Hospital, for the future research there is more time span of the study.

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## Population Survey of the Sulawesi Tarsier (*Tarsius spectrum*) in the Agricultural Area Near Water Sources in North Sulawesi to Support Ecotourism Activities

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### ABSTRACT

Tarsier (*Tarsius spectrum*; syn. *Tarsius tarsier*) is one of the endemic primate species of Sulawesi Island. This species is spread on the main island of Sulawesi and several satellite islands in the vicinity. They can be found in several habitat types, including primary and secondary tropical rainforests, mangroves, agriculture, and shrubs. Tarsier is one of the animals that attracts ecotourism so that its presence in agricultural areas can be combined with agrotourism to develop agroecotourism activities. Agricultural areas adjacent to water sources, such as lakes, rivers, swamps and springs, and small ponds, turn out to be protective habitats for tarsiers because these area are usually overgrown with bamboo (*Bambusa* spp.), sugar palm (*Arenga pinnata*), sago (*Metroxylon sagu*), and screwpine (*Pandanus* spp.) vegetation which can be a nest for tarsiers. In addition, these vegetation often stay green throughout the year which provide location for the daily activities of tarsiers, especially in feeding. Surveys on agricultural habitat types near water sources on the mainland of Sulawesi island have been carried out from 2017 to 2018. The survey results show that these habitat types are potential protection sites for tarsiers, although the threat to their survival is also high, especially land clearing and land conversion for housing, roads, dams and other buildings.

**Keywords:** agricultural habitat, ecotourism, North Sulawesi, population, tarsier

## Host Plant and Intensity of Pest Attack *Paracoccus marginatus* on Papaya Plants in North Minahasa Regency

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### INTRODUCTION

The mealybug *P. marginatus* attack papaya and other types of plants because it is polyphagous or eats many types of agricultural plants and horticultural and ornamental plants. *P. marginatus*, sucks plant liquid by inserting the stylet into the leaf, fruit and stem epidermal tissue. The purpose of this study was to determine the host pest of mealybug *P. marginatus* and determine the intensity of the attack of *P. marginatus* on papaya plants. The survey was conducted in papaya plantations in North Minahasa Regency which is the center of papaya production in the province of North Sulawesi. This study used a survey method and was carried out in four villages, namely: Matungkas, Laikit, Dimembe and Tetei, North Minahasa. The tools used in this research are: papaya plants, clear plastic bags, brushes, cutters, loup, label paper and writing instrument. Sampling of host plants that are attacked by mealybug is done by observing various types of plants around the papaya plant and checking whether or not there is a mealybug attack. Observation The level of attack of mealybug do in the papaya garden by seeing whether there are symptoms of papaya mealybug attack. Each village selected three locations for papaya planting. Each location determined 50 papaya trees as sampling plots. Determination of selected samples diagonally in each plot of 10 plants/plots. Furthermore, the papaya trees in the plot were observed for mealybug attack rates. The intensity of mealybug attack is calculated based on the formula: the number of plants attacked is divided by the number of plants observed multiplied by 100%. Observation Parameters: 1) Types of plants attacked by mealybug, symptoms of mealybug attack and 3) intensity of mealybug attack.

### RESULT AND DISCUSSION

The results of this survey found host plants of *P. marginatus* consisted of seven species of plants, besides papaya namely: *Annona muricana*, avocado *Persea gratissima*, *Codiaeum* spp, *Aglonema* spp, *Anthurium* spp, *Hibiscus* spp. and *Jatropha* spp. This shows that this pest has a wide host range. The study results showed that mealybug can generally attack papaya plants in North Minahasa Regency starting from young plants to fruiting plants. Mealybug can attack papaya from leaves, petioles, stems, fruit stalks and fruit. Symptoms of a distant mealybug attack appear on the part of the plant that is attacked like cottony white mass (Figure 1). Symptoms of mealybug attack on papaya plantations in the crop varies from the symptoms of low until high intensity, which is indicated by the attack of mealybug already in the whole fruit, and the spread of attacks on plants from leaves, stems to fruit stalks. The results showed the intensity of attack of *P. marginatus* ranged from 16.67% to 60% (Table 1).

Intensity of attack by mealybug found higher in papaya in Matungkas village, due to the planting conditions using a monoculture system, allowing these pests to develop properly due to the availability of resources. In Tetei village, the intensity of attack of this mealybug is lower, compared to other plant on the other villages because there are quite a variety of natural enemies, namely *Cryptolaemus* sp, *Scymnus* sp, *Pheidole* sp, *Spalgius epius* and several types of spiders. The conclusion that can be drawn from this research is: a) *P. marginatus* can attack papaya plants from leaves, petiole, stems, fruit stalks and fruit, b) the intensity of attack of mealybug on papaya cultivation in North Minahasa Regency was ranges from 16,67-60% and c) Plant host of this mealybug is papaya, *Annona muricana*, avocado *Persea gratissima*, *Codiaeum* spp, *Aglonema* spp, *Anthurium* spp, *Hibiscus* spp. and *Jatropha* spp.





Figure 1. Symptoms of mealybug attack on papaya

Table 1. Intensity of attack by papaya mealybug *P. marginatus*

Villages	Intensity of attack (%)
Matungkas	60.00
Laikit	40.00
Dimembe	36.67
Tetei	16.67

**Keywords :** Host plant, intensity, mealybug, North Minahasa, papaya, *Paracoccus marginatus*

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## Mortality of *Crocidolomia binotalis* Larvae Treated with *Jatropha* Extract (*Jatropha curcas* L.)

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### INTRODUCTION

Dependence on the use of chemical insecticides in the cultivation of food crops to date has not been avoided. The lack of information on the use of natural ingredients that can be used as insecticide ingredients and lack of understanding of the community is a factor that is still a high dependence on chemical-based insecticides. On the other hand, the market's need for nutritious and safe foodstuffs against pesticide residues that is excessive in the present day continues to increase proportionally, in line with the increase in population, the increasing level of education, knowledge and awareness of food that is safe for body health. Therefore the use of vegetable pesticides is a necessity in sustainable crop cultivation activities. *Jatropha curcas* is one of the plants that is known to have toxic content on insects. *Jatropha curcas* has compounds including alkaloids, saponins, cardenoline and bufadienol, and flavonoids (Nurwidayati A. *et al.* 2014). These compounds have toxic, anti-bacterial, anti-microbial and insecticidal activities. This study aims to determine the effectiveness of the *jatropha* on the mortality of caterpillar pests in cabbage *Crocidolomia binotalis*. The research method used was a Completely Randomized Design (CRD), which consisted of 7 treatments and each treatment consisted of three replications. Each treatment used 10 *C.binotalis* larvae. Observations were made on 24, 48, 72, 96, 120, 144 haa (hours after application). Activities are carried out in 2 stages. The first stage is extraction of *jatropha* seeds and breeding of *C. binotalis* test larvae. The second stage is the *Jatropha* extraction test using a concentration of 10.000, 20.000, 30.000, 40.000, 50.000, 60.000 ppm.

### RESULT AND DISCUSSION

The results of the study in Table 1 show that the extraction of *Jatropha* seeds gives a death effect on larvae. Larvae that experience death turn blackish in color and curved body shape. From the table, the greater the concentration, the more effective it is to cause death in the larvae. Death of more than 50% of larvae at a concentration of 30,000 ppm at 144 haa. While giving 40,000 ppm on 120 haa caused larval mortality of 83.33%, significantly different from the concentration below it. Sayuthi *et al.* (2014) stated that the fraction of kepyar castor seeds with a concentration of 60 mL / L in 120 haa caused the mortality of *C. pavonana* caterpillar by 46.67%. Pebriansyah *et al* (2016) *Jatropha* seed extract with a concentration of 10,000 ppm at 96 haa caused more than 50% mortality of *C. pavonana*. The different effectiveness of concentration that causes larval death is influenced by several things including differences in extraction methods and differences in solvents used to extract.

**Keyword** : *Jatropha curcas* L, *Crocidolomia binotalis*, extraction, mortality, concentrate

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Tabel 1. Average of larvae mortality

time (haa)	Average of mortality at ppm treatment						
	%						
	0	10000	20000	30000	40000	50000	60000
24	0.00%	3.33%	6.67%	20.00%	60.00%	73.33%	83.33%
48	0.00%	6.67%	10.00%	26.67%	66.67%	73.33%	96.67%
72	0.00%	10.00%	10.00%	33.33%	70.00%	83.33%	100.00%
96	0.00%	10.00%	13.33%	33.33%	76.67%	90.00%	100.00%
120	0.00%	16.67%	20.00%	53.33%	83.33%	96.67%	100.00%
144	0.00%	16.67%	23.33%	56.67%	86.67%	100.00%	100.00%

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## Isolation, Molecular Identification Using Genes 16S rRNA and Antibacterial Activity Test of Algae Endophytic Bacterial Symbionts *Padina* sp.

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### INTRODUCTION

Algae *Padina* sp. Is a type of algae from the class of Phaeophyta (brown algae) which are scattered in large area of sea in North Sulawesi, and has potensial as antibacterial agent. Endophytic symbionts microbial are microbes attached to the part of the plant body, including bacteria and fungi.

Endophytic bacteria has great potential in the search for new drug sorces. The purpose of this research is to know the antibacterial activity of endophytic symbiont bacteria isolated from algae *Padina* sp. Against *Staphylococcus aureus* and *Escherichia coli* and to know the endophytic symbiont bacterial species of algae *Padina* sp. Which has the greatest antibacterial activity.

### RESULTS AND DISCUSSION

Saples were smashed and dissolved up to 10-7, has been planted, isolation and inoculation on nutrient agar (NA) médium then incubated for 1 x 24 hours. Three different isolates of endophytic bacteria were obtained and the antibacterial activity was tested by the well-diffusion method, the diameter was measured and the results are MB.1 (6,58 mm), MB.2 (7,66 mm), MB.3 (00.00) against bacteria, whereas againts *Escherichia colibacteria* are MB.1 (7,22 mm), MB.2 (8.58 mm), MB.3 (9.61 mm). The isolate which has the greatst antibacterial power againts both bacteria is the isolate MB 2.

The molecular identification results indicate that the MB 2 isolate has 100% similarity with *Bacillus* sp.

**Keywords:** Algae *Padina* sp, Endophytic, Antibacterial, Molecular, 16S rRNA

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## The Effect of Difenconazole Fungicide on the Viability of Fungi *Phytophthora infestans* de bary Causing Leaf Rot Disease of Tomato (*Solanum lycopersicum*)

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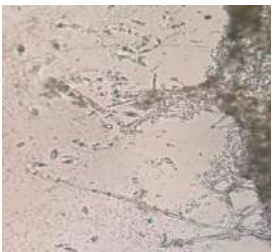
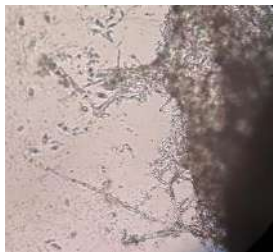
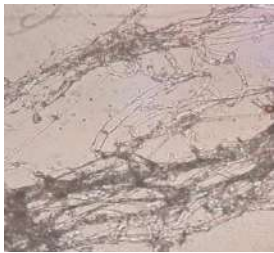











### INTRODUCTION

Modonding is one of the sub-districts in South Minahasa Regency which has a large area with ten villages and has a cold climate, which is a potential area for the development of tomato as highland horticultural crops. Efforts to increase tomato production often face obstacles in the form of pests and diseases attacking. There are several pests and diseases that attack tomato, one of which is tomato leaf rot caused by the fungus *Phytophthora infestans* de bary. The use of pesticides, especially fungicide difenoconazole in tomato plants left residues that can result negative impacts on the environment and humans. There is no scientific information about the influence of fungicidal difenoconazole residues on the viability of fungi associated with tomato leaf rot. The purpose of this study was to determine the effect of fungicide difenoconazole on the viability of *P. infestans* de bary. Fungi *P. infestans* de bary. were isolated from the leaves of tomato plants that attacked by leaf rot disease, referring to the method carried out by Haniah [1]. Measurement of the viability of fungus *P. infestans* de bary. carried out using a center-curved glass object, then soil fungus isolates left for 3 days, 5 days and 7 days. Observations were made under a microscope by looking at the ability of spores, conidia, and growing hyphae.

### RESULTS AND DISCUSSION

After it has been isolated and identified, based on observational data that matched with the identification book of *Compendium of Soil Fungi* (Domsch et al. [2] and Introduction to General Tropical Fungi by Gandjar, et al. [3], and *Introduction to Food – Borne Fungi* (Samson et al. [4], the obtained fungal isolates were *P. infestans* de bary fungus, Pythiaceae family, suited to macroscopic and microscopic observations. *P. infestans* de bary fungi is included to species that has a fairly low viability, where this fungus is only able to grow at 25 ppm of Difenconazole fungicide (treatment B) to treatment C (50 ppm) and is unable to grow when exposed to Difenconazole fungicide 75 ppm (treatment D) to 100 ppm (treatment E), this was characterized by the inhibition of the growth of their zoospores, sporangium, and hyphae (Table 1). Growth of *P. infestans* de bary. in the treatment of difenoconazole 75 ppm to 100 ppm, showed a difference with the control, namely conidia with slow growth with hyphae that were irregular in shape, unclear, and short. This is because Difenconazole is a systemic fungicide that causes hypha shortening and decreasing of haustoria function. Vyas (1984) in Situmorang [5], stated that difenoconazole causes hyphae shortening and decreasing of haustoria function as food absorbers in each infected part. Hyphae will swell and bend, even 36 hours after infection will cause death. The decreasing in hyphae growth is not always followed by the decreasing of conidial growth, although the growth is remaining to continue, the decreasing of the conidia numbers is remain taken place. Difenconazole is a broad-spectrum fungicide, belongs to the triazole fungicide class which works systemically and has preventive and curative power. Difenconazole works to inhibit demethylation during ergosterol synthesis, so that stopping fungal development.

Table 1. The viability of fungi *P. infestans* de bary. at Glass Object for 3 days.

TREATMENT	FORM OF SPORE, CONIDIA, AND HYPHAE		
	DAY		
	3	5	3
A (0 ppm)			
B (25 ppm)			
C (50 ppm)			
D (75 ppm)			
E (100 ppm)			

Priadi (2009) in Sari [6] stated that the higher the concentration of active ingredients of fungicides used causes spore germination to be inhibited, because high fungicide concentrations cause the least amount of water that can enter by osmosis into spore cells. To germinate spores requires sufficient amount of water as a medium for chemical reactions in cells, activating enzymes, circulating nutrients to all parts of the spore

cells that are actively doing cell division to germinate. Fungus *P. infestans* de bary. does not show resistance to fungicides Difenoconazole which is characterized by its low viability. The decreasing of fungal viability due to application of fungicide has also been reported by Mulyati et al. (2004) in Situmorang [7]. Toxic properties of fungicides will neutralize toxic enzymes, affect membrane permeability, cell wall synthesis and cell division, conduct chelation and precipitation of chemicals, and affect the synthesis of proteins and nucleic acids which result in reducing the fungal viability.

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## The Development Of Data Acquisition System Of Temperature Sensor Array For Subsurface Temperature Mapping

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### INTRODUCTION

Surface geothermal manifestation is occurred from the heat propagation from subsurface or because of cracks that enable the geothermal fluids (steam and hot water) flow to surface [1][2]. To know the geothermal source, it needs a method that has ability in detecting geothermal sources. The thermal method is the direct method that measure temperature to know the temperature gradient, and heat flow. Temperature is influenced by heat transfer method in rocks and also able through conduction or convection. Convection depends on fluids movement in the rocks through pores and cracks. The occurred heat amount at each measurement point under observation based on heat conductivity of rock, porosity, litology and geothermal flow [3]. The research was previously developed by Arif Ismul Hadi and Refrizon in 2005 [4], in their research measured subsurface temperature to produce distribution model but their system was manual, by measuring directly in depth of 75 cm. Based on the problems, than along with the rapid instrumentation technology advancement today, then it is developed instrumentation system by using distributed system architecture. The distributed system is a group of temperature sensors connected through integrated network system. The distributed measurement is an open system that can produce sensor in an umbrella, it means the system able to measure simultaneously [5].

In the instrumentation system, at least has four main parts, that is sensor, signal conditioning, data processor, and display. Sensor selection is important in the measurement, so it was expected the sensor able to detect subsurface temperature indications. For temperature measurement the LM35 sensor was used. The sensor was served to measure the subsurface temperature. LM35 was accurate sensor where the output proportional with the temperature in Celsius degree of 10 mV/°C [6][7]. The instrumentation system was constructed from two main unit, that was Remote Terminal Unit (RTU) as slave unit and Master Terminal Unit (MTU) as the master unit [8]. The slave unit was sensing unit at sensor unit that was equipped with microcontroller based data acquisition unit. Master unit was constructed based on PC, and install the application software for data logger, facilitate the user to know the subsurface temperature from the geothermal activities that was monitored in real time. The slave work function is fully controlled by master unit [9]

The serial communication is easier data transfer compared with the parallel one, because the parallel transfer is expensive. One of serial communication standard is RS-485, the technique is serial data communication technique that able to do at long distance about 1.2 km and an be used to measure 32 load units. RS-485 standard support half duplex data communication, means to send and receive data only using 2 cables [10][11].

### RESULTS AND DISCUSSION

Generally the subsurface thermal survey consist of subsurface temperature measurement at the observation hole with 2.5m in depth. The digging by using hand driller. The observation hole selection based on geology anomaly, geophysics, and manifestation of geothermal at the surface. From the survey, it was determined 12 observation hole points at 30 distance with 6 m in width.

#### System testing

A system can be said as success if the conducted test suitable with the planning. Although in various

cases, the system gave deviant results, the system can be said as success enough if the deviation in the certain limit. The testing were, temperature sensor testing. The temperature sensor testing is to test the output voltage resolution of the LM35, and also proving the sensor characteristic that has sensitivity of 10mV/°C [4]

**Temperature sensor testing**

In the testing, the main components including LM35 temperature sensor. While the additional tools in supporting the testing including:

1. Solder as the temperature sensor heater.
2. Digital multimeter to measure the output voltage at the sensor.
3. Digital thermometer to measure each temperature change.

Below in table 1 were data of LM35 measurement.

Table 1. The results of LM35 temperature sensor.

Suhu (°C)	Tegangan Output Sensor (mV)	Error (°C) Pengukuran
25	260	1
30	302	0,2
35	355	0,5
45	453	0,3
50	505	0,5
55	554	0,4
60	603	0,3
65	652	0,2
70	704	0,4
75	753	0,3
80	802	0,2
85	854	0,4
90	904	0,4
95	958	0,8
100	1004	0,4
Error Pengukuran Rata-Rata		0,42

Based on the test, showed the LM35 error about 0.42°C, the value was obtained by summing all obtained values by summing all error values from each test and divided by test amount. The LM35 sensor was tested by giving supply of 5V and giving direct heat , while the output voltage was observed directly by using voltmeter. Figure 7 was graphic of LM35 sensor test, from the results, it was known that the sensor output voltage increase in average of 50mV for each 5°C or 10 mV/°C, then the sensor work well.

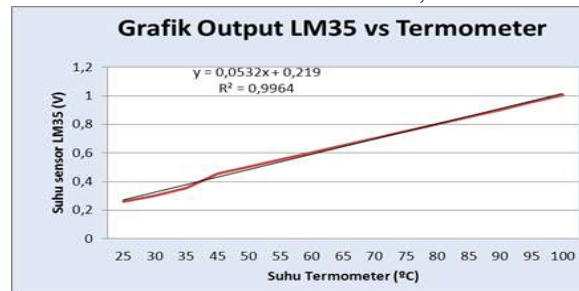


Figure 7. Testing of LM35 sensor

**The testing of data acquisition system at two measurement areas**

The system testing done at two area conditions, area without anomaly and area with anomaly. The meaning of area without anomaly is area without geothermal system, at the condition, the area only influenced by sun radiation, while area with anomaly is area that has subsurface physical rock properties , the rock physical properties can be used to asses ht subsurface geothermal. The sistem testing done at separate place. Area without anomaly at Brawijaya university football court, while area with anomaly at the



hot water spring of Cangar. The temperature measurement at the area with anomaly done after the hole considered as stable and measured in the morning to prevent the influence of sun radiation, especially at open area. The temperature measurement of the hole done in several stages 1) measurement when the sensors were sent down, 2) measurement when the sensors were entered into the hole until stable, and 3) measurement when the sensor probes were raised up.

**Area without anomaly**

The temperature measurement results when the sensor probes were sent down of 36.6°C up to 37.4°C, while then sensors were raised up of 30.8°C up to 34°C. The system test at area without anomaly done at 4 measurement points. But because the temperature at each point was same, then taken the average. Figure 8 showed the average temperature of Football court of Brawijaya University.

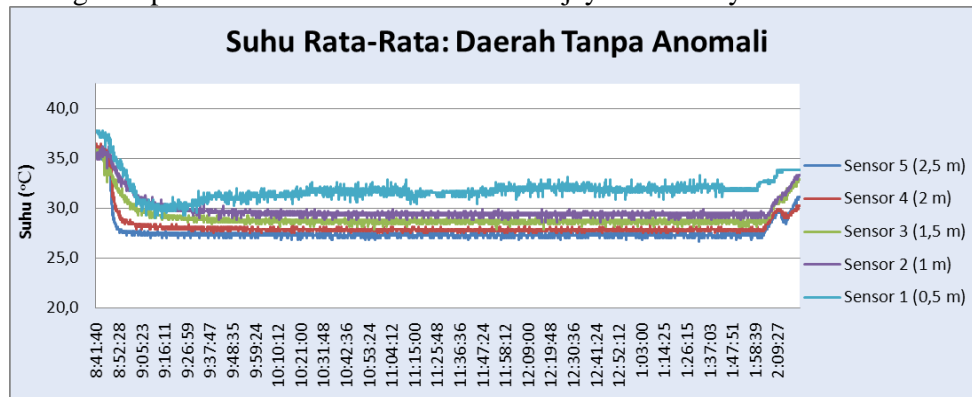


Figure 8. Graphic without anomaly at Brawijaya university football court

The measurement results at area without anomaly obtained the average temperature at table 3 below.

Table 3. Average temperature at area without anomaly

Sensor	Kedalaman (m)	Suhu Tanpa Anomali (°C)	Suhu rata-rata (°C)
1	0,5	30,8 – 32,0	31,5
2	1	29,0 – 29,7	29,3
3	1,5	28,4 – 29,0	28,6
4	2	27,5 – 28,1	27,9
5	2,5	27,0 – 27,5	27,2

**Area with anomaly**

System test at area with anomaly done at 4 measurement points. The hole determination as measurement point based on location point that nearest to the hot water spring to the furthest area. The measurement results average from, the four slaves, when the sensor probes were sent down of 23.2°C to 25°C, while when the sensors were raised up of 22.3°C to 23.7°C. Figure 9 showed the graphic of area without anomaly.



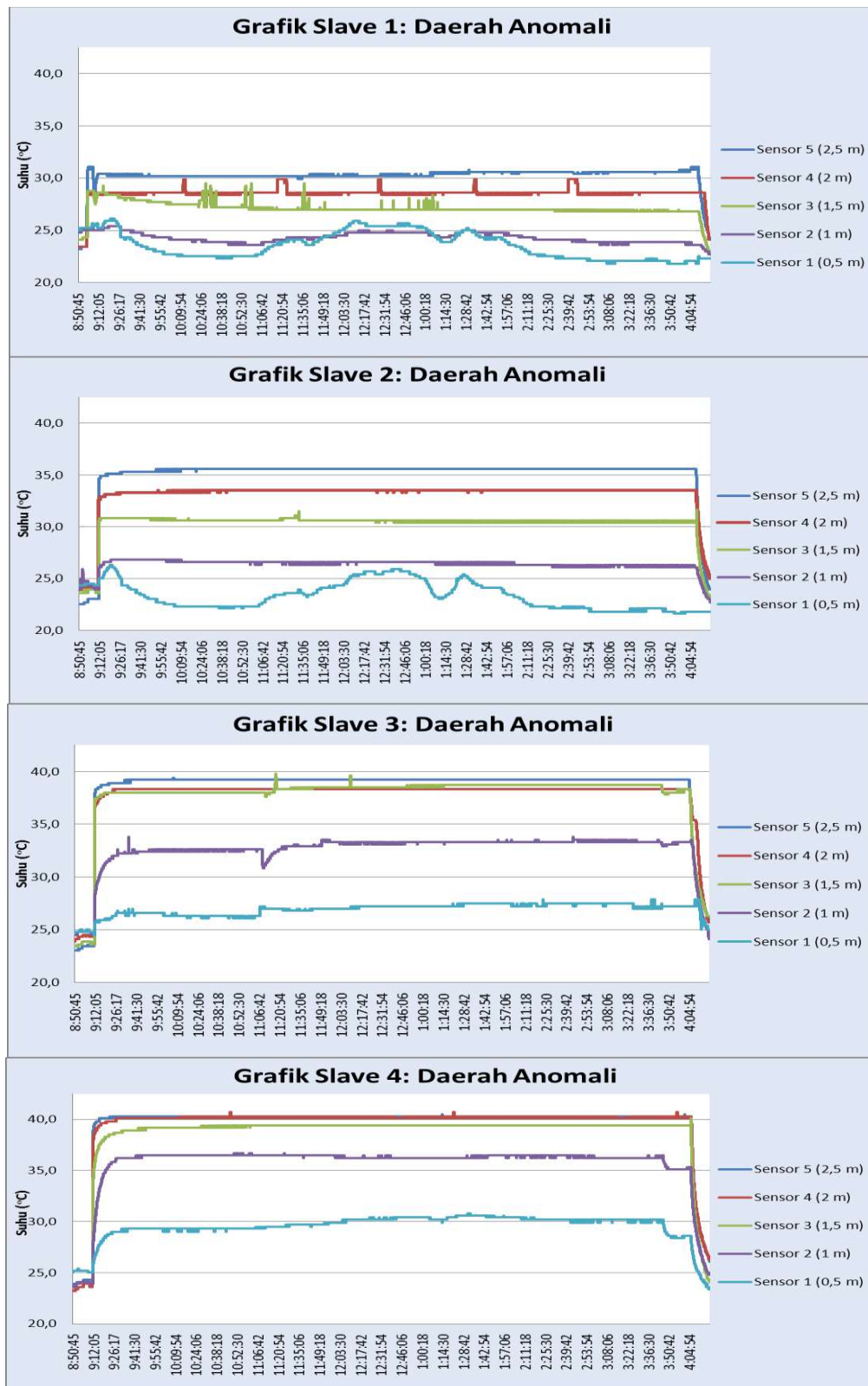


Figure 9. Geothermal anomaly graphic of Cangar hot water spring

The measurement results from each measurement point given in table 4 below.

Table 4. Measurement results of area with anomaly

Sensor	Kedalaman (m)	Slave 1 (°C)	Slave 2 (°C)	Slave 3 (°C)	Slave 4 (°C)
1	0,5	24,3	24,8	26,3	30,2
2	1	24,8	26,6	32,6	36,2
3	1,5	27,0	30,6	38,0	39,4
4	2	28,6	33,5	38,2	40,1
5	2,5	30,2	35,6	39,2	40,3

### Interpretation of subsurface temperature mapping and sounding

Data taking and data interpretation of the subsurface temperature was one of the research goals, so the instrumentation system tool development with sensor array to monitor subsurface temperature can be implemented, to know the geothermal spread at the hot water springs of Cangar. Data interpretation was done by mapping and sounding by using surfer software with the track of 30 meters, 6 m in width and 2.5 m in depth. The data taking location was made 3 grid (A, B, and C) along the track, each grid directly measure 4 measurement points.

### Interpretation of mapping data

Subsurface temperature distribution was figured in 3 dimensions (3D) as in figure 10. At the figure, there is 5 temperature contour that figure the subsurface temperature track, the 5 temperature contours were arranged in array. Sensor 1 at 0.5 m, sensor 2 at 1 m, sensor 3 at 1.5 m, sensor 4 at 2 m, and sensor 5 at 2.5 m in depth.

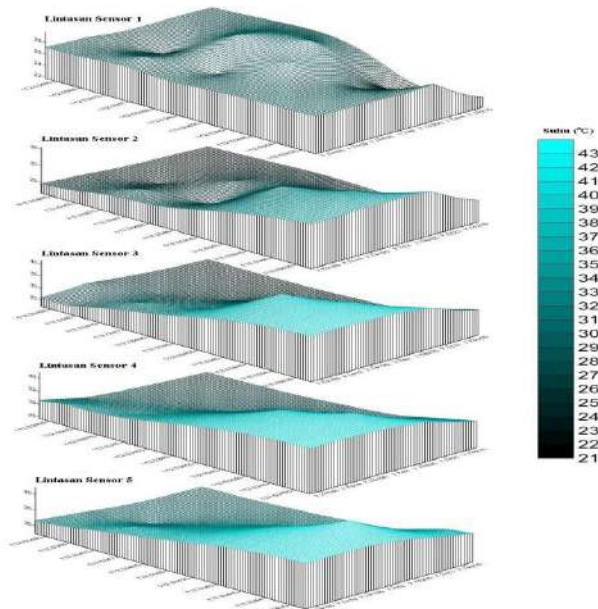


Figure 10. The 3 dimensional temperature changes

At the track of sensor 1 at the 0.5 m dept the temperature between 21.9°C to 29.6°C. Temperature spread at 0.5 m depth was monitored not uniformly because the subsurface temperature at this depth was influenced by sun. so at certain weather condition the temperature was fluctuating, the temperature change caused the sensor 1 track also changed. At the sensor 2 track at 1 m in depth, the temperature between 21.8°C to 35.6°C. The temperature change at the track was higher than at the sensor 1 track, the highest temperature spread near the hot water pool 1 of 35.6°C and the further, the lower temperature. At the sensor 3 track at 1.5 m in depth, the temperature among 24°C to 39.4°C. The temperature change at this track was higher than at sensor 2 track. The temperature change then followed by fluids flow that bring the heat. The highest temperature spread near hot water pool 1 of 39.4°C. At the sensor 4 track at the 2 meter in depth the

temperature between 24.8°C to 39.6°C. The temperature change at this track was higher than at the sensor 3 track. At the sensor 3 track, the temperature change was influenced by the fluid flows that bring the heat. The highest temperature spread near the hot water pool 1 of 39.6°C. At the sensor 5 track at the 2.5m in depth, the temperature between 27.5°C to 42.3°C. The temperature change at this track was higher than at the sensor 4 track. The temperature change was influenced by fluid flow that bring heat to the spring. It was proven by the water temperature that come from the spring, similar with the temperature at the depth of 2.5m. And also similar with measurement of Fajar Rakhmanto (2011) in his research at the same location, hot water from the spring of 36°C to 43° [13]

Enthalpy in simply was the energy content that can be in the form of heat, pressure (mechanic), or combination of both. But in the application, the heat that often be manifested in the temperature in measuring the enthalpy. The geothermal classification based on enthalpy as follows: low enthalpy (0 <90°), medium enthalpy (90>150°C), high enthalpy (>150°C) [5]. From the obtained temperature values in field, it was expected that the spring of Cangar can be categorized in the low enthalpy (near surface)

**Interpretation of sounding data**

The data interpretation was done at the track from south to east. The sounding measurement was done at 12 points, at grid A, B, and C. The distance between grid was 6 meter. The sounding measurement at grid A, B, and C done so the maximum spread distance of 30 meters and the depth of each measurement point of 2.5 meter. The sounding point measurement at Grid A at the south end of the spring, with 4 slaves, at the spread distance of 6 m x 6 m. The sounding point measurement at Grid B at the south between Grid A and C, with 4 slaves, while the sounding point measurement at Grid C at the east of Grid B, with 4 slaves. The temperature measurement results at each slave in the form of sensor array. From the measurement results at Grid A, B, and C, shown in table 5, 6, and 7.

Table 5. The sounding measurement results at Grid A

Sensor	Kedalaman (meter)	Suhu Rata-Rata di Grid A							
		TP 1 (°C)		TP 2 (°C)		TP 3 (°C)		TP 4 (°C)	
		Suhu (T)	T̄	Suhu (T)	T̄	Suhu (T)	T̄	Suhu (T)	T̄
1	0,5	25,4-35,9	25,6	21,6-26,3	22,6	21,6-22,3	21,8	27,2-38,4	27,9
2	1	32,4-32,6	32,3	21,4-24,3	21,1	27,2-27,5	27,5	34,9-35,6	35,2
3	1,5	39,0-38,2	38,0	24,1-25,2	24,9	30,2-31,4	30,2	37,1-39,6	39,1
4	2	39,2-39,4	39,4	27,2-29,5	29,1	32,6-39,9	32,6	37,4-39,6	39,5
5	2,5	38,7-41,4	38,7	31,5-32,0	31,7	35,8-36,0	35,8	38,0-39,6	39,5

Explanation: TP= measurement point, T = temperature average

Table 6. The sounding measurement results at Grid B

Sensor	Kedalaman (meter)	Suhu Rata-Rata di Grid B							
		TP 1 (°C)		TP 2 (°C)		TP 3 (°C)		TP 4 (°C)	
		Suhu (T)	$\bar{T}$	Suhu (T)	$\bar{T}$	Suhu (T)	$\bar{T}$	Suhu (T)	$\bar{T}$
1	0,5	24,8-26,3	25,4	29,3-31,1	30,3	29,3-29,7	29,6	28,4-29,9	29,1
2	1	24,5-24,8	24,5	24,8-26,6	26,1	25,9-26,1	25,9	30,6-31,7	31,5
3	1,5	29,9-30,2	30,2	25,2-25,4	25,1	26,3-26,6	26,4	38,3-38,5	38,5
4	2	34,0-34,2	34,2	27,7-27,9	27,7	29,5-29,7	29,5	38,0-38,2	38,0
5	2,5	34,9-35,1	35,0	30,8-31,0	30,8	31,5-31,7	31,7	38,0-38,2	38,0

Explanation: TP= measurement point, T = temperature average

Table 7. The sounding measurement results at Grid C

Sensor	Kedalaman (meter)	Suhu Rata-Rata di Grid C							
		TP 1 (°C)		TP 2 (°C)		TP 3 (°C)		TP 4 (°C)	
		Suhu (T)	$\bar{T}$	Suhu (T)	$\bar{T}$	Suhu (T)	$\bar{T}$	Suhu (T)	$\bar{T}$
1	0,5	25,7-28,8	27,4	24,3-26,8	25,9	23,4-25,9	24,9	25,4-29,0	28,1
2	1	24,8-27,0	25,7	23,4-23,6	23,5	23,0-25,2	23,2	26,8-27,0	27,0
3	1,5	25,7-25,9	25,7	26,3-26,6	26,4	25,0-25,4	25,3	29,7-30,0	29,7
4	2	30,8-32,9	31,6	27,7-27,9	27,8	24,8-27,7	27,6	31,5-31,7	31,6
5	2,5	33,1-34,0	33,1	30,2-30,4	30,2	27,5-28,8	28,8	34,0-34,2	34,0

Explanation: TP= measurement point, T = temperature average

**Keywords:** LM35 sensor, RS 485, Mapping, Sounding, RTU and MTU

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## **Antimicrobial Activity of Hexane, Chloroform and Methanol Fractions of Marine Organisms against *Escherichia coli*, *Staphylococcus aureus*, and *Candida albicans***

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### **ABSTRACT**

Marine invertebrates collected at Manado Bay, North Sulawesi were found to be a promising source of antimicrobial activity. The hexane, chloroform and methanol fractions of sponge *Theonella swinhoei* and ascidian *Herdmania momus* were evaluated for their antimicrobial activity against the growth of *Staphylococcus aureus* (Gram-positive bacterium), *Escherichia coli* (Gram-negative bacterium), and *Candida albicans* (yeast). The fractions showed antimicrobial activity against the all tested microorganisms. The hexane fractions showed the strongest antimicrobial activity with the value of 14 mm for sponge *Theonella swinhoei* and 27.9 mm for ascidian *Herdmania momus*.

**Keywords** : Antimicrobial activity, *Theonella swinhoei*, *Herdmania momus*.

## Chemical Characteristics Of Bakasang From Tuna Fish

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### ABSTRACT

Bakasang is a fermented fish sauce made of innerds of various fishes. It is a typical food of North Sulawesi. The variation of some parameters in the processing of fish fermentation will result in various characteristics of fish sauce and this will depend on salt concentration, processing method, fermentation time, and type of fish. This research was aimed at evaluating the characteristics of bakasang made from innerds of Tuna (*Thunnus* sp.) fish which is processed with temperatures 50 and 70°C for 10 and 15 days with the addition of 20 and 30% of salt. The property of characteristics include water content, ash content, protein content, carbohydrate content, crude fiber content, free fatty acid (FFA) level, peroxide value (PV) and thiobarbituric acid (TBA) level of the bakasang product. The results of this study indicated that moisture content ranges from 60,86 to 64,77%, protein content ranges from 9,01 to 12,66%, ash content ranges from 13,09 to 21,66%, carbohydrate content ranges from 3,06 to 4,3%, ash content 1,00%. FFA level ranges from 3,8 to 4,4%, PV ranges from 2,8 to 10,5%, and TBA level varies from 0,35 to 1,15 g/100g. Based on the results, it is known that Bakasang from Tuna fish which is processed with that various processing condition have good characteristics. The best product was bakasang produced using salt 20% at 50°C which was fermented for 10 days.

**Keywords:** bakasang, fish innerds, *Thunnus* sp.



## Behavior Of Hypertension Patients That Turn At The Community Health Center Of Manado City

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### INTRODUCTION

Hypertension is a disease that cannot be cured but can be controlled. According to WHO data, 7.9 million people die each year because of non-communicable diseases. Adults over 25 years in the world of hypertension are 36% .4 About 1.5 million people die from complications of hypertension each year. 1 in 3 people in Southeast Asia suffer from hypertension. In Indonesia, the prevalence of hypertension at > 18 years of age is 26.5% with the number of patients diagnosed by health workers as much as 9.4%. There were 9.5% of patients who were taking hypertension medication, including people who took their own medication without being diagnosed by health workers by 0.1%. The prevalence of hypertension increases with increasing age. With an increase in the incidence of deaths due to non-communicable diseases, especially heart disease in each decade increases with increasing hypertension. Hypertension has the greatest impact on global mortality compared to other risk factors. Adherence to treatment of hypertensive patients is important because hypertension must always be controlled so there are no complications that can lead to death. With treatment behavior, researchers can find out the description of hypertensive patients who seek treatment in their health.

This study uses a qualitative descriptive research method. The research was conducted at the Manado City Community Health Center. The aim of this study is to gain a deeper understanding of the principles underlying observed symptoms and facts that are not driven by the intention to apply them practically where the practical benefits to be gained are as input in improving health services to improve health promotion related to hypertension.

### RESULTS AND DISCUSSION

The knowledge of informants from the interviews showed that the answers were not complete, even though most of them mentioned definitions and symptoms. The attitude shown by the informants shows the need for treatment if you have hypertension and feel worried about the treatment obtained. At the end of the action they were seen actively seeking treatment and trying to obey doctor's recommendations even though they were still lacking in taking anti-hypertensive drugs.

In the interview, it is still very clear that a diet that is not in accordance with a healthy way of life after knowing that the sufferer has hypertension, even though on a daily basis still eating unhealthy foods but eating patterns on holidays or during events in Manado City show a risky pattern against hypertension.

From research conducted through the deepening of qualitative research obtained a deeper understanding of the behavior of hypertensive patients who seek treatment at the Manado City community health center which underlies observed symptoms and facts to apply it practically to achieve the goal of improving health status in the people of Manado City.

**Keywords:** Behavior, Community Health Center, Hypertension.

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## **Prevention of Nutrition Problems in the Development Stage of the First Thousand Days of Life in the City of Manado**

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### **INTRODUCTION**

In dealing with demographic conditions in the second and third decades of this millennium, Indonesia should intensively prepare its next generation. For this reason, one of the preparations is to provide good nutrition to produce a bright future and the quality of human resources that will be able to compete against the era of globalization.

The causes of malnutrition vary widely and are related to complications that can occur later on, therefore prevention and management of malnutrition by empowering the community by recognizing and handling malnutrition quickly and accurately to reduce the risk or long-term complications. Primary prevention can be adopted with two intervention modes, namely Promotion of Health and special protection. This is also the main level of prevention of this disease, but refers to non-communicable diseases, such as obesity, hypertension, diabetes, cancer, coronary artery disease, and others. Consists of elimination of "risk factor" modification of the disease. In such chronic and non-communicable diseases, etiologic agents (causes) are unknown (or not well established) and etiologies are discussed in terms of risk factors. They may act as contributing factors.

This research is expected to add and provide scientific information about the description of the implementation of the concept of family doctors on cadres of Integrated Service Posts at the Manado City Health Center. Where practical benefits to be gained include input in improving health services in health promotion efforts related to malnutrition.

How is the involvement of community empowerment by increasing experience and competencies, increasing group factors and capacities, eliminating social and environmental barriers, and increasing environmental and resource support can prevent and carry out malnutrition management in the first 1000 days of life?

This study uses a qualitative descriptive research method. Assessment through interviews using the mixed method adopted and expanded through Problem Structure Analysis, consists of 16 areas and carried out in 10 places in the community health centers in Manado City and uses a three-step model: 1: detection of problems and concerns; 2: explain the characteristics and seriousness of problems and concerns in dialogue with cadres and doctors; 3: analysis and decisions about what to do next.

### **RESULTS AND DISCUSSION**

After passing through the interview stage, problem detection using a three-step model provides results where most mothers who have babies under two years rarely get complaints for the overall assessment of the baby.

In the health of "growth and development" and the interaction of children with given parents, mothers who were interviewed experienced a few problems. As for questions in terms of family and environment, they stated that in general they never experienced problems at all.

This research is a community approach that needs to be applied by doctors who work in primary services by applying one of the concepts of family doctors as community leaders. Here the role of Community Health Center, community, doctors and their networks as institutions that provide health services at the first level that are directly involved with the community is very important.

The Community Health Center is responsible for organizing health development in its working area, namely increasing the awareness, willingness and ability to live healthy for everyone who lives in its working area so that the highest degree of health can be realized. This research is expected to be used as a reference in medical education and further education by doctors. Thus, access to quality health services can be improved through improving the performance of Community Health Center by involving the community in overcoming nutritional problems in the first thousand days of developmental stages of life in the city of Manado.

**Keywords:** Community Health Center, Family Doctors, First 1000 days of life, Nutrition, Prevention.

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## The Role Of Leptin As Immunomodulators And Vascular Regulatories In Patients With Dengue Hemorrhagic Fever

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**Preliminary.** Dengue virus infection is still a problem in the health of the world, especially in the tropics. Obesity is said to affect the severity of dengue virus infection so that the obesity hypothesis arises as a predictor of the morbidity and mortality of dengue virus infection. Assessing the role of leptin as an immunomodulator and vascular endothelial regulator for DHF sufferers. Method. A cross-sectional study with research samples was DHF patients aged 1 - 15 years who were treated at the BLU Hospital Child Health Department. Prof. Dr. R.D. Kandou, Manado. This research with the number of samples that meet the inclusion criteria are 82 children. Results. A significant relationship was found between leptin levels and initial TNF- $\alpha$  levels ( $r = 0.5$ ;  $P = 0.001$ ) and the level of TNF- $\alpha$  returned ( $r = 0.3$ ;  $P = 0.004$ ). The initial TNF- $\alpha$  mean in the hypereptinemia group (61.73 pg / ml) was higher than in the leptinnormal group (17.15 pg / ml) and there was a statistically significant difference ( $P = 0.005$ ). It was also found at levels of TNF- $\alpha$  returned but statistically there was no significant difference ( $P = 0.181$ ). There was a significant relationship between leptin levels and initial VEGF ( $r = 0.5$ ;  $P = 0.001$ ) but the relationship was not found at levels VEGF goes home ( $r = 0.087$ ;  $P = 0.220$ ). The initial mean VEGF in the hypereptinemia group (786.16 pg / ml) was higher compared to the normal leptin group (465.05 pg / ml) and there was a statistically significant difference ( $P = 0.02$ ). It was also found at the level of VEGF home but statistically there was no significant difference ( $P = 0.870$ ). There was a significant relationship between leptin and BMI levels ( $r = 0.606$ ;  $P = 0.001$ ). If leptin levels are divided into 2 categories (normal leptin and hypereptinemia) and nutritional status based on BMI divided into 3 categories (wasted, normal and over nutrition), the spearman rho correlation coefficient is 0.473 ( $P = 0.001$ ). The mean leptin levels in more nutrition (6441.45 pg / ml) was higher than in the normal nutritional group (1276.32pg / ml) and there was a statistically significant difference ( $P = 0.001$ ). In the X2 test between the relationship of nutritional status and DHF morbidity, the frequency of DBD with shock was not more prevalent in the over nutrition group compared to normal nutrition groups ( $P = 0.246$ ). Similar results were also found between groups with normal hyperleptinemia and leptin ( $P = 0.302$ ). There was a higher difference in TNF- $\alpha$  levels in the shock group (57.22pg / ml) compared with the group without shock (15.54 pg / dl) which was Different statistics are meaningful ( $P < 0.001$ ). The same thing was also found at levels of TNF- $\alpha$  returned but statistically not significantly different ( $P = 0.182$ ). There was a higher difference in baseline VEGF levels in the shock group (780.31pg / ml) compared to the group without shock (447.38 pg / dl) which was statistically significantly different ( $P = 0.003$ ). The same thing was also found in VEGF levels, but it was not statistically significant ( $P = 0.235$ ).

From the logistic regression test obtained the initial TNF- $\alpha$  regression coefficient = 0.333 with  $P = 0.001$  which had a positive effect on the incidence of DHF with shock ( $P < 0.001$ ). From the ROC curve, the initial TNF- $\alpha$  cutting value was 19.5 pg / ml with the value sensitivity = 100% and specificity value = 75.8%. Whereas for the levels of TNF- $\alpha$  returned, the regression coefficient = 0.086 with a value of  $P = 0.233$ . This means that there is no significant positive effect of TNF- $\alpha$  returning to the incidence of DHF in shock.

From the logistic regression test, it was obtained the initial VEGF regression coefficient = 0.003 with  $P = 0.001$  which had a positive influence on the incidence of DHF with shock ( $P = 0.001$ ). From the ROC curve the initial VEGF cut value was 411.15 pg / ml with sensitivity = 81, 3% and specificity value = 56.1%. While for the VEGF level, the regression coefficient = 0.004 with a value of  $P = 0.141$ . This means that there is no positive influence meaning that VEGF returns to the incidence of DHF in shock.

From logistic regression test involving the interaction of TNF- $\alpha$  and VEGF obtained regression



coefficient 0.0001 ( $P = 0.015$ ) so that it can be said that there are interactions between the two variables on the incidence of DHF with shock. The results of path coefficient analysis obtained direct and indirect relationships which stated that Leptin had a very significant direct effect on initial TNF- $\alpha$  and initial VEGF, leptin had an indirect effect (either through initial TNF- $\alpha$  or early VEGF) on shock events, initial TNF- $\alpha$  has a very significant direct effect on shock events, Early VEGF has a significant effect on the incidence of shock.

Analysis of Pearson correlation coefficient between leptin and albumin levels obtained correlation coefficient at the beginning of -0.060 ( $P = 0.297$ ) and at the time of return the correlation coefficient was -0.065 ( $P = 0.282$ ) this showed that there was no relationship between leptin and albumin levels both at the time of the patient enter or return home.

**Conclusion.**

1. Proving that leptin levels are associated with BMI, the higher the BMI the higher the level of leptin in the body. 2. Proving the role of leptin in influencing the initial levels of TNF- $\alpha$  and VEGF. In hyperleptinemia, high levels of TNF- $\alpha$  and VEGF are obtained, whereas in the normal state of leptin, lower levels of TNF- $\alpha$  and VEGF are obtained. 3. Proving that the initial levels of TNF- $\alpha$  and VEGF have a value limit that can predict the outcome of VD infection. The limit of TNF- $\alpha$  value that can predict shock is  $\geq 19.5$  pg / ml while the limit of VEGF value that can predict shock is  $\geq 411.15$  pg / ml. 4. Proving nutritional status does not directly affect DHF morbidity but through intermediate variables such as TNF- $\alpha$  and VEGF. 5. Proving that leptin has no correlation with blood albumin levels

**Keywords:** Dengue hemorrhagic fever, nutritional status, leptin, TNF- $\alpha$ , VEGF, albumin

## **Dietary Pattern of Pregnant Women and Blood Hemoglobin Level**

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### **ABSTRACT**

The World Health Organization (WHO) estimates that 293 children and 468 million women suffer from anemia, and an estimated of 50% have deficiency anemia. Iron is the most common micronutrient deficiency in the world. Large deficiency with cases of iron deficiency anemia is the largest micronutrient in the world. The research road map is in accordance with the UNSRAT Grant Research Plan, which is to improve the superior field of UNSRAT Research Institute in this case the field of health and medicine. For this purpose, research is carried out in the field of health and nutrition. Nutrition Problems in Indonesia and the world including anemia. Anemia can occur in children and adults, the most in pregnant women and toddlers and teenage girls. Anemia is characterized by a decrease in the quantity of red blood cells often associated with hemoglobin levels or impaired morphology of red blood cells. Estimated of 42% of pregnant women suffer from anemia in low and middle income countries. Objective: To analyze the relationship between dietary patterns and hemoglobin levels of pregnant women in health community center in Manado City. Methods: study design, cross-sectional study, with observational analysis. Population: all pregnant women registered in the five health community center of Manado City. Samples of all pregnant women were present during the interval study from April to July 2018. The study was conducted in the city of Manado in the area of the Manado City Health Center. The number of anemia cases was 10 pregnant women (22.7%). Statistically there was a relationship between the incidence of anemia and carbohydrate consumption pattern (0.018), consumption of animal protein (0.000) and consumption of vegetable protein (0.000).

**Keywords :** Dietary pattern, pregnant women, hemoglobin level.

## Leaf Nutrien Status and Growth of *Piper Aduncum* after NPK Fertilizer Application

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**Abstract.** *Sirih hutan (Piper aduncum L)* is one of group shrubs tropical species, has potential to be developed as raw material of biomass based electricity. The aim of this research is to know growth and leaf nutrient status of *P. aduncum* plant as the first step in cultivation of this plant The study used a randomized block design, NPK fertilizer treatment consisted of four levels, P0 = 40 g, P1 = 80 g, P2 = 120 g and P4 = 160 g per plant, each with 10 replications. The results showed that fertilization increased nutrient in leaves and plants growth. The best growth on P1 fertilizer treatment. This plant accumulated a lot of potassium, followed by nitrogen and calcium nutrient.

Keywords: Growth, leaf nutrient, *Piper aduncum*.

## Characterization of Transparent Bath Soap from VCO Containing Tomato Carotenoid

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### INTRODUCTION

This study was aimed to produce transparent bath soap by utilizing VCO containing tomato carotenoids (VCO+tmt), and to determine the optimum combination of glycerol, ethanol and sucrose reacted with VCO+tmt to produce transparent soap which meet requirements by Indonesian National Standard (SNI) no. 06-35321994 for bath soap. Transparent bath soaps were prepared according to Cognis (2003) method, by varying the concentrations of glycerol, ethanol and sucrose (formulas A, B, and C). Transparent soap products were characterized according to SNI method no. 06-35321994 for bath soap, and were observed for the color, transparency, hardness, stability of the foam and antioxidant activity with DPPH method.

### RESULTS AND DISCUSSION

The results showed that VCO+tmt could be used in making transparent bath soap, with saponizing number VCO tmt equal to 225,37. Soap produced had orange color, transparent, the texture of C was better than A and B, and the stability of soap formulas A, B and C were 89,29%, 96,88%, and 93,10%, respectively. Water content, the amount of fatty acids and free fatty acids from soap of formula A, B and C did not meet SNI requirements, but free alkali and mineral oil met the requirements. The activity of free radical scavenging of soap A, B and C were 9,83%, 11,95% and 11,55% respectively. It was concluded that the characteristics of transparent soap made from raw VCO+tmt formula C was better than formula A and B, but did not meet conditions required by SNI no. 06-35321994. The antioxidant activity of the soap in scavenging free radicals ranged between 9,85% - 11,95%.

**Keywords:** ethanol, glycerol, transparent soap, sucrose, tomato, VCO.

### Acknowledgment

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## Litter Production and Decomposition of Mangrove In The Northern Coast of Aceh Besar District, Aceh Province

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### ABSTRACT

Mangrove ecosystem is a productive ecosystem that provide nutrient to coastal area and its surrounding environments pass through litter production and litter decomposition. Mangrove vegetation play an important role and supplier of organic matter derived from the leaves, branches, twigs, flowers and fruits. Litter production is an important part in transferring organic material from vegetation into the soil and water. The purposes of this research was to obtain the productivity of mangrove vegetation by analyzing the litter fall and also the factors that affected the mangrove litter, decomposition coefficient, and percentage of litter decomposed in the northern coast of Aceh Besar District, Aceh Province. The research used purposive sampling method to determine the stations devided into 2 substations (landward and seaward). This research was conducted in July to September 2016 consisted of 6 stations. This research was placed at 6 stations, namely station 1 (Gampong Krueng Cut), station 2 (Gampong Ladong), stations 3 – 4 (Gampong Beurenut), station 5 (Gampong Lampanah) and station 6 (Gampong Leungah). Each substation was put of one litter trap. The litter trap method was used to know the mangrove litter production. Litter decomposition focused on *R. mucronata* leaves were studied by using litter bag technique. The litter bags were made of synthetic nylon which had size 20x30 cm and mesh size was 1x1.25 mm<sup>2</sup>. Senescent leaves were used because they are the majority of leaves on the forest floor and they started to decay. Leaf litter that had been collected were put in the litter bag, then placed on rooting of mangrove to observe the process of decomposition. The initial weight of litter used was 12 g per treatment. There were 3 types of mangrove found in study site, litter production of *Rhizophora mucronata* as much as 79.21 g/m<sup>2</sup>/day, *Avicennia marina* as much as 0.70 g/m<sup>2</sup>/day and *Sonneratia alba* was 17.46 g/m<sup>2</sup>/day. Based on the direction of the productivity, most of mangrove litters that were found on the seaward as much as 52.05 g/m<sup>2</sup>/day and only little found on the landward as much as 43.32 g/m<sup>2</sup>/day. Result of mangrove decomposition showed that the percentage of decomposition for the 49th day in the seaward sub station was 48.58 % and the landward was 41.53 %. Mangrove litter decomposition increased during the time at both sub station. The value of the remaining of the leaf litter on the last day for the seaward sub station was 51.42 % and the landward land was 58.47 %. Decomposition rate of litter for *Rhizophora mucronata* species classified very quickly where the substation on the Seaward was 0.012 (d<sup>-1</sup>) and the substation landward 0.010 (d<sup>-1</sup>). The half-time took in the leaf litter of mangroves for the landward substation was 69 days and seaward sub station was 57 days, it was concluded that *R. mucronata* leave letter decomposited in seaward substation was faster than landward substation and litter fall was more in seaward than landward substation.

**Key words** : Aceh Province, Decomposition, Litter production, Mangrove productivity, *R. mucronata*

### RESULTS AND DISCUSSION

The result show that there were three mangrove species found namely, *Rhizophora mucronata*, *Avicennia marina* and *Sonneratia alba*. In the observation area, the existing mangrove vegetation was dominated by *Rhizophora mucronata*, The dry weight average of litter fall from *Rhizophora*



*mucronata* was 37.44 g /m<sup>2</sup>/ day in seaward substation and in landward substation was 41.77 g/m<sup>2</sup>/day. *Avicennia marina* had weight average 0.70 g /m<sup>2</sup>/day in seaward substation and *Sonneratia alba* was 3.55 g /m<sup>2</sup>/day in landward and 13.90 g /m<sup>2</sup>/day in seaward substation (Table 1). According to Andrianto *et al.*, (2015) the shape and size of leaves of *R. mucronata* larger than the other species causing the leaves to fall easily when the wind blows and *R. mucronata* often appears in every station, it has a high density of 20 ind /100 m<sup>2</sup>.

Table. 1 Average of Mangrove Litter Dry Weight in Study Area

Species	Litter component	Average Litter dry weight (g/m <sup>2</sup> /day)		
		Landward	Seaward	Total
<i>Rhizophora mucronata</i>	Leaf	27.9	26.17	54.07
	Fruit	7.05	5.17	12.22
	Flower	2.55	2.77	5.32
	Twig	4.27	3.33	7.60
<b>Total</b>		<b>41.77</b>	<b>37.44</b>	<b>79.21</b>
<i>Avicennia marina</i>	Leaf	-	0.70	0.70
	Fruit	-	-	-
	Flower	-	-	-
	Twig	-	-	-
<b>Total</b>		<b>-</b>	<b>0.70</b>	<b>0.70</b>
<i>Sonneratia alba</i>	Leaf	2.79	9.51	12.3
	Fruit	0.76	4.39	5.15
	Flower	-	-	-
	Twig	-	-	-
<b>Total</b>		<b>3.55</b>	<b>13.90</b>	<b>17.45</b>
<b>Total</b>		<b>45.32</b>	<b>52.05</b>	<b>97.37</b>

In this research, mangrove litter production obtained in seaward was 52.05 g/m<sup>2</sup>/day, and in landward substation was 45,32 g / m/day. The productivity of mangrove litter found in seaward higher than landward area due to the mangrove density in seaward was 30 ind/100 m<sup>2</sup> and in landward was as many as 25 ind/ 100 m<sup>2</sup>. Salinity is one of aquatic parameters which is influence the litter production. Lestarina (2011) mentioned that the higher the salinity, the higher the productivity of the mangrove litter.

The dry weight of the mangrove litter during the decomposition process decreased from the initial dry weight. Dry weight was required to know the percentage of decomposition rate during observation. Where the initial dry weight of the litter was 12 gr. Dry weight of mangrove litter began to decline on the 7<sup>th</sup> day and continued to decrease with increasing incubation time. The highest reduction of mangrove dry weight on the 49<sup>th</sup> day with an average of 5.7 g.

Furthermore, the percentage of litter decomposed in seaward was higher than landward during the observation. On the 49<sup>th</sup> day, the percentage of decomposed litter was 41.53% (landward) and 48.58% (seaward) (Figure 1). Dewiyanti (2010) stated that the station towards the sea decayed faster than the station towards the land. Litter decay in the water is faster than inland areas due to biological decomposition. In waters, the decomposition process is also influenced by physical factors such as the movement of tidal currents and inundation by longer seawater. Sa'ban *et al.* (2013), stated that the mechanism of loss of soluble materials from litter is caused by rain or water flow. The decomposition of the litter can also be caused by the erosion of litter by the movement of waves. The moist substrate conditions of the water as compared to the mainland also play a role in litter decomposition, an environment that is always alkaline and moist causing the litter decomposition

process faster. According to Osono and Takeda (2006), the content of the compounds contained in the litter also affects the ability of a microbe to decompose complex compounds contained in the litter.

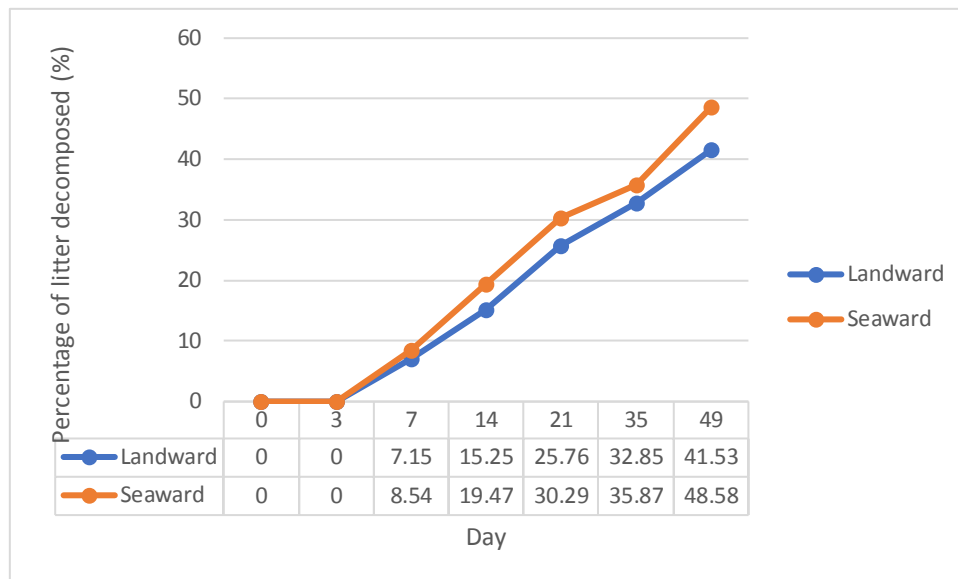


Figure 1. Percentage of Litter Decomposed During The Observation Period

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## Size Identification of the adult Sea Cucumber, *Holothuria Scabra* in Labetawi Village

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### INTRODUCTION

Sandfish, *Holothuria scabra* is elongated round with mouth and anus lying on both sides of the opposite body. Because of sandfish has high protein content and contain anti-bacterial compounds, it is widely caught and uses as a protein and medicine sources for human being. To maintain the availability of sandfish in a sustainable manner, it is necessary to do breeding. The availability of adult affects the success of breeding activities. One of the practical methods that can be used to determine the maturity of gonad sandfish is through spawning.

This research aims to determine the spawning time and body weight of sandfish, *H. scabra* which can be used as the adult. The research took place from March to April 2018 where the adult samples were collected about 30 individual from the coastal of the Labetawi village and breded in the Hatchery. Spawning stimulation was done by temperature fluctuation method. Each spawned sandfish, removed from the spawning container and measured body weight. While the eggs of spawning, collected and counted. All the sandfish are spawned, reared for a week in pen-culture for calculated mortality. During rearing, sandfish were fed ablibitum supplemental feed and measured water quality.



Figure 1. Spawning sandfish

### RESULTS AND DISCUSSION

Results shows that sandfish matured and spawned in the village Labetawi in March and April. The spawning adult has a body size ranging 80 - 205 g. Males are known to have a body weight 80 - 205 g and females size 103 - 128 g. It is also known that each female individual produces an average of 1,230,000 - 1,435,000 eggs and not obtained adult of sandfish experiencing death during rearing.

**Keyword :** *Sandfish, adult, spawning, Holothuria, Labetawi*

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## Relationship Of Primary Productivity And Phytoplankton Abundance In Muara Kuala Raja, Bireuen District, Aceh

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### INTRODUCTION

Kuala Raja is one of the beaches located in Bireuen City, Aceh. There are many activities in this area such as fishing activities, aquaculture, and marine tourism. Various activities can affect phytoplankton. The aquaculture area contributes nitrate and phosphate contents that can increase the growth of phytoplankton. Phytoplankton is a major producer in oceans which require the availability of nutrients, pH, temperature and light intensity to increase productivity. In otherwise, poor water quality and unbalanced nutrient availability will result in decreased productivity in phytoplankton. Although nutrient plays important role in photosynthesis of phytoplankton, the excess nutrient may not directly indicate high primary productivity. Therefore, it is necessary to study the presence of phytoplankton and its relationship with the primary productivity of Muara Kuala Raja Bireuen, Aceh. The purpose of this study is to figure out the value of primary productivity, the value of phytoplankton abundance and analyze the relationship of primary productivity and abundance of phytoplankton in the waters of Muara Kuala Raja Bireuen, Aceh. This study was conducted on May 2017. Location of sampling had 3 station points. The measurement of primary productivity was examined by a light-dark bottle oxygen method. The relationship between primary productivity and abundance of phytoplankton was analyzed by using Principal Component Analysis (PCA). The results showed that the highest average of gross and net primary productivity were found at station 1 of 209,12 mgC/m<sup>3</sup>/h and 172,00 mgC/m<sup>3</sup>/h. The highest abundance of phytoplankton was found at station 1 of 11477,76 ind/l. The result of PCA showed that each of the parameter spreads between the two axes indicates the data diversity value. The data diversity value on the 1- axis was 37% and the 2-axis was 59%, so the total of data diversity between 1-axis and 2-axis was 96%. Based on the PCA analysis, it can be concluded that primary productivity has a strong relationship with the abundance of phytoplankton.

### RESULTS AND DISCUSSION

Based on the results obtained primary productivity of the gross is the total of photosynthesis which includes the organic material used for respiration during measurement. While net primary productivity is the storage of organic materials during measurement. The value of primary productivity results can be seen in Table 1.

Table 1. Value of Primary Productivity in Muara Kuala Raja

No	Primary Productivity (mgC/m <sup>3</sup> /hour)	Station 1 mgC/m <sup>3</sup> /hour	Station 2 mgC/m <sup>3</sup> /hour	Station 3 mgC/m <sup>3</sup> /hour
1	Gross Primary Productivity	209.12	57.29	61.65
2	Net Primary Productivity	172.00	46.87	47.04

In Table 1 it is explained that the highest average gross and net primary productivity value is at station 1 which is 209.12 mgC/m<sup>3</sup>/hour and 172.00 mgC/m<sup>3</sup>/hour and the lowest gross and net

primary productivity value is at station 2 with an average value of 57.29 mgC/m<sup>3</sup>/hour and 46.87 mgC/m<sup>3</sup>/hour. The high value of primary productivity at station 1 is allegedly due to the high brightness influence at the station, thus affecting the intensity of the light entering the water column causing the temperature in the waters to follow high. furthermore, station 1 which is a river area and aquaculture suspected to be a nutrient trap and there are many deposits that help the phytoplankton concentration and support the occurrence of primary productivity. The aquaculture area contributes nitrate and phosphate content that can increase the growth of phytoplankton and support the process of primary productivity. At the station 1 the average nitrate level was 1.6 mg/l and the phosphate content was 0.11 mg/l. The high level of net and gross primary productivity at station 1 is caused by nutrient input from the aquaculture area, the sediment from the rocks that flowed from the aquaculture area is the source of the nitrate and the phosphate itself. According to research by Kaswadi *et al.*, (1993) in Bekasi coastal waters that productivity tends to be greater in coastal areas of 434.01 mgC / m<sup>3</sup> / h followed by middle area of 158.64 mgC / m<sup>3</sup> / h and sea area of 67.95 mgC / m<sup>3</sup> / h, so that the productivity of the sea is much lower and closer to the coast of higher productivity.

**Keywords:** Primary Production, Phytoplankton, PCA, Productivity, Diversity, Kuala Raja Beach

#### **Acknowledgment**

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## Analysis of Chemical Element Distribution on the Coasts in the Eastern Bolaang-Mongondow District, North Sulawesi Indonesia

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### INTRODUCTION

The chemical elements, such as *the rare earth elements* (REE) which have an atomic number from 57 until 71, are very essential for technological applications used by people. Those materials have a magnetic property and can be used as alloy substances as an energy storage. The REE are also useful for renewable energy technology, an electrical car, LED lamps, *wind power* as well as are important of weapon industry. They are deposited inside stones, sands, and crust expanding from zero to ten kilometers below the ground. The spread of those elements is not uniform depending on the geological age and volcanic activity[1].

The Indonesia country has the longest beach line in the world after Canada giving the unique landscape in which their appearances, such as colors and environments are significantly different each other that are indicative that chemical elements, compositions, and material structure are unique each coastal line. The coastal line latitude measured from the surface of seawater and beach profile influence the chemical elements compositions[2,3,4].

The Eastern Bolaang Mongondow District (BOLTIM) is consists of sub-districts which have coastal lines, Tutuyan, Kotabunan, Nuangan, Motongkat, Buyat, while Mooat has a beautiful lake. If they are watched physically materials, or minerals deposited in coastal lines are a uniqueness and are interesting to carry out a study and then are explored for supporting a regional development.

The study of the contents of the precious elements and minerals inside stones has been conducted for hundreds of years. The gold and cuprum materials were metal substances that the most explored and treaded for years. The materials, however, were mixed with other elements, such as iron oxide copper-gold (IOCG) as published previously[5]. The iron ores were found inside stones and to analyze them using Laser-Induced Breakdown Spectroscopy method[6]. The tungsten deposited inside rocks was characterized by utilizing a radioactivity of an isotope[7]. Meanwhile, silicon material widely used for semiconductor industry was discovered on crusts mainly in sands and soils called a silicate. The method to measure the Silicon content also employs Si isotope between silicate and iron[8] while, cuprum element was analyzed using methods INAA, ICP-MS, and LA-MC-ICP-MS[9].

The study and exploration of the minerals content on the coastal area are still limited in Indonesia because of environmental considerations. However, some coastal areas have been investigated of the minerals deposited inside rocks and sands. Authors[10] were successful to characterize of the chemical compositions on the coastal zones employing gamma-ray methods. It was found that the calcium element deposited inside calcium carbonate, or calcite dominated of the materials on the beach rocks. The method of computer Controlled Scanning Electron Microscopy (CCSEM) was applied to measure the chemical data and mineral ores of the coastal sediments[11]. While the rare earth elements have been discovered on the sands of a desert and beach using a spatial distribution whereby the results found that there was a correlation with inland and beach materials[12]. The radiometric technique was used in analyzing a sediment motion on the beach by detecting a gamma rays emmite[13].

The minerals deposited inside sands have been well mapped and classified[14]. Authors classified

simplicity of the minerals in sands with ratio  $\text{SiO}_2/\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3/\text{K}_2\text{O}$  and Ca content. The mineral investigation inside sands and sediment using a portable XRF (*X-ray fluorescence*) has been reported by authors previously[15]. The XRF was powerful to detect the chemical elements, K, Ca, Ti, Cr, Mn, Fe, Co, Cu, Zn, Rb, Sr, Zr, Pb, U, S, As, Br, Mo and Hg, but was not accurate for P, V, Cr, Ni, Se, Ag, Cd, Sn, Sb, I, Ba and Bi. Meanwhile, the combination methods, XRD, XRF, TG, and SEM were successful to measure minerals of titanium, quartz, and iron-rich structures and alloy iron-titanium[16].

As previously mentioned, it was found that the methods can be employed in analyzing the chemical elements deposited inside rocks, sands, and soils. This study was to map and to investigate the chemical elements deposited in rocks in some regions located on the coastal areas in the Eastern Bolaang Mongondow District, North Sulawesi Province, Indonesia by using XRF. The procedures conducted as follows: Collecting the rocks taken from the beach; milling the rocks until their size close to 120 mesh; and characterizing the samples.

## Methods

### *Material Preparations*

The rocks were obtained from four beaches in Motongkat, Central Buyat, Buyat and Jiko sub-districts in Bolaang Mongondow District North Sulawesi Province. Then the rocks were crushed using a heavy tool and then were milled and screened passing the particles with size 120 mesh.

### *Measurement*

The particles obtained were shipped to the Central Lab belonged by The State Malang University for a measurement. The characterization of samples using XRF (*Merk : PANalytical, Type : Minipal 4*) followed by methods previously reported[17,18]. The XRF employed was to know the element composition that made up the rocks as previous investigations[19,20,21]. The procedures as follows: The samples prepared were put inside the XRF instrument (The MiniPal 4) and then were rotated and the measurement of elemental compositions was conducted for 1200 seconds. The standard each element was available to find the sample content (in concentration) and the measured intensities and the data were obtained.

## RESULTS AND DISCUSSION

The data obtained are the percentage of elements which make up of the rocks in some beach areas as shown in Table 1. The chemical composition of elements is significantly different from each other.

Table 1. The element compositions deposited in rocks located in Motongkat, Central Buyat, Buyat and Jiko Beaches

No	Element	Symbol	Composition (%)			
			Motongkat	Central Buyat	Buyat	Jiko
1	Aluminum	Al	9.7	10.0	9.8	10.0
2	Silicon	Si	39.3	39.6	42.4	36.3
3	Phosphorus	P	0.57	0.68	-	-
4	Kalium	K	2.42	3.21	3.04	3.17
5	Calcium	Ca	21.4	18.4	17.3	18.1
6	Titanium	Ti	1.33	1.10	1.33	1.47
7	Vanadium	V	0.073	0.075	0.080	0.10
8	Chromium	Cr	0.072	0.068	0.071	0.078
9	Manganase	Mn	1.68	0.59	0.68	0.81
10	Iron	Fe	22.0	24.8	23.8	28.9
11	Copper	Cu	0.15	0.13	0.13	0.16
12	Zinc	Zn	0.03	-	0.01	-
13	Strontium	Sr	0.71	0.69	0.68	0.55
14	Barium	Ba	-	-	-	0.09
15	Europium	Eu	0.3	0.4	0.3	0.3
16	Rhenium	Re	0.3	-	0.2	-

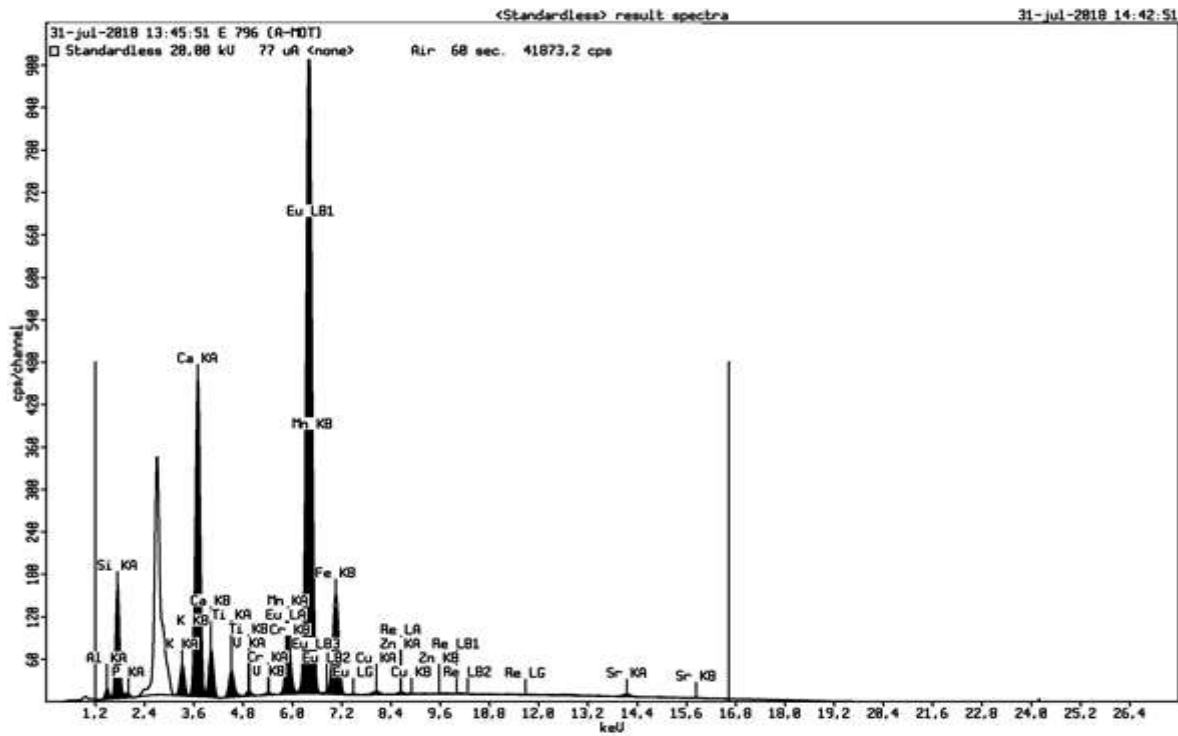


Figure 1. The element composition inside rocks obtained from Matongkat Beach.

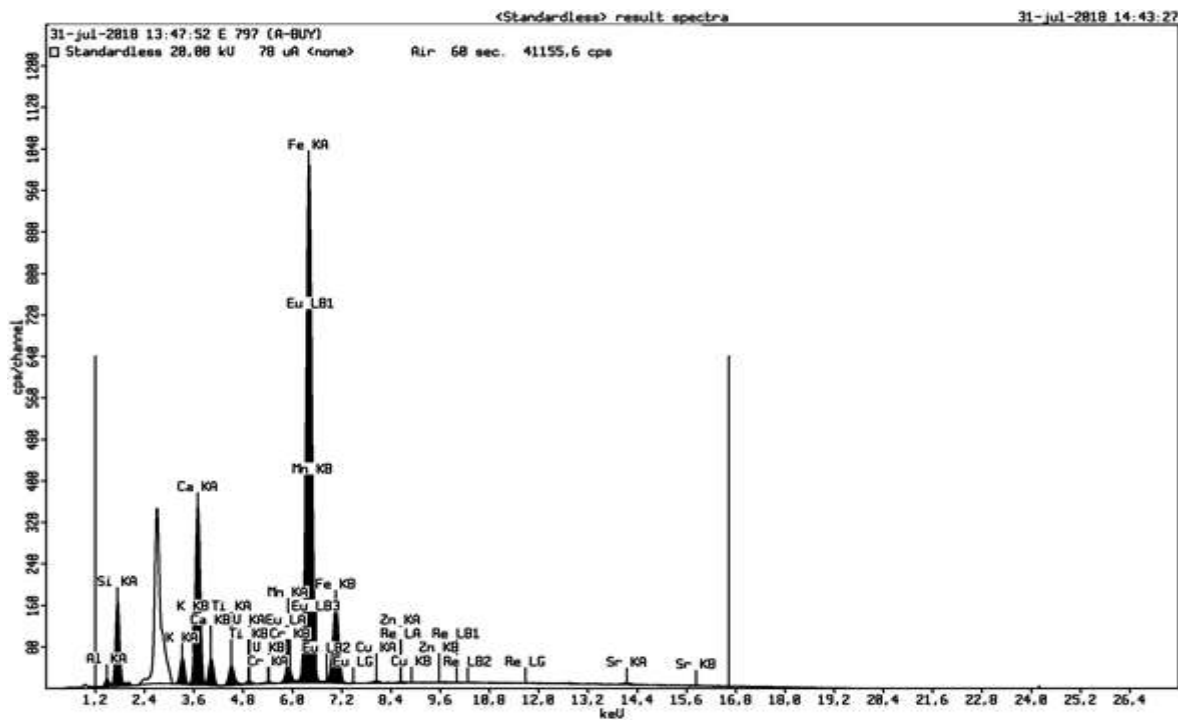


Figure 2. The element composition inside rocks obtained from Buyat Beach.

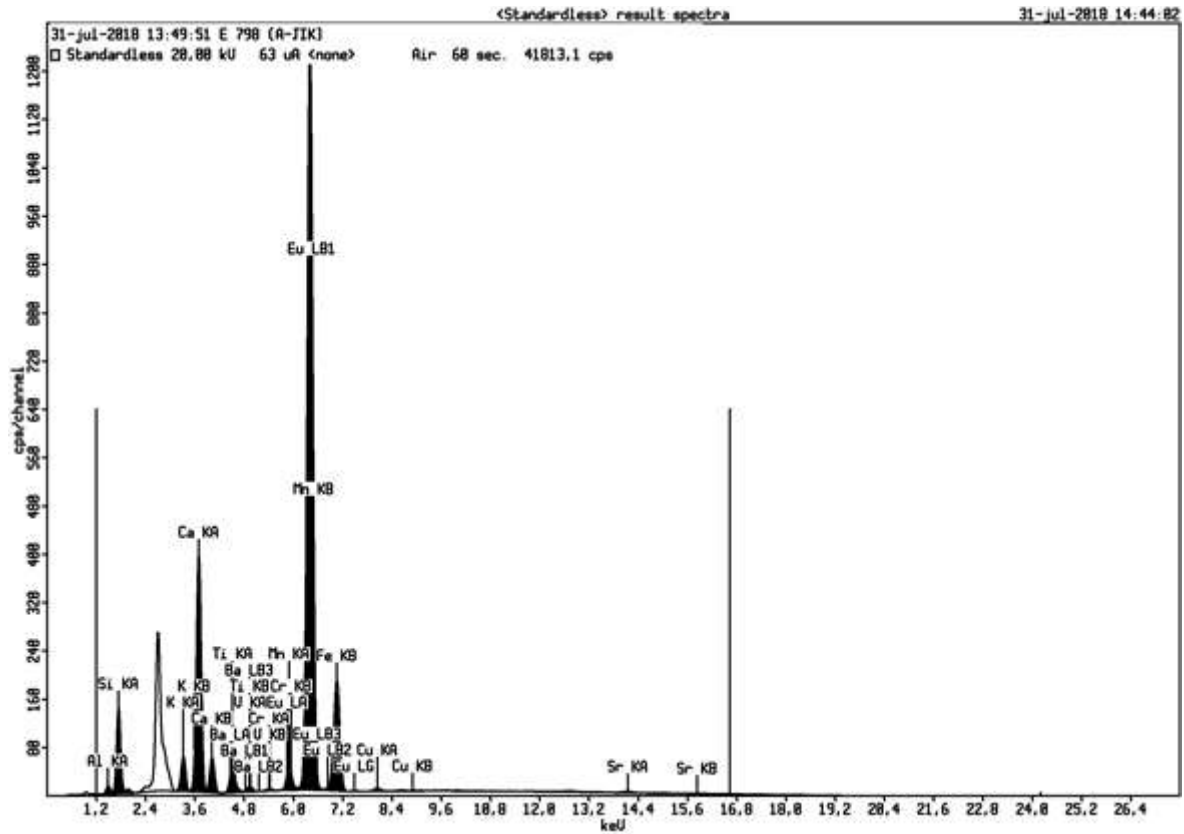


Figure 3. The element composition inside rocks obtained from Jiko Beach.

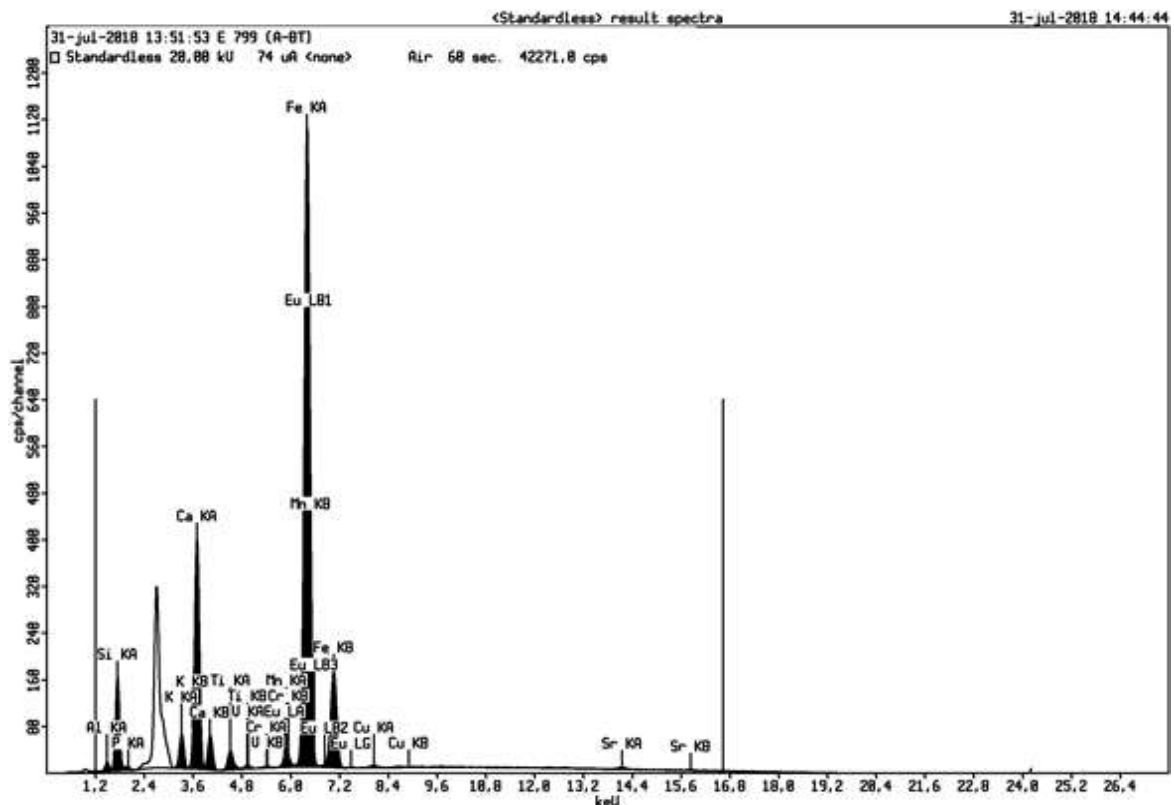


Figure 4. The element composition inside rocks obtained from Central Buyat Beach.

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## Growth Responses of Rotifer Fed with A Bacterial Based Diet Made from Fishery Industrial Wastes

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### INTRODUCTION

Rotifer is one of the live foods commonly used in larval rearing of marine fish, particularly during the onset of first feeding of fish larvae. The rotifer is mostly produced using microalgae as its diet, but mass producing the microalgae requires high investment and running expenses. Our previous results showed a possibility of replacing the microalgae to a bacterial based diet for the rotifer. Since the diet is made from fishery industrial wastes, it can be a low-cost diet for the rotifer. Protocols in preparing the diet are extensively described in an Indonesian patent with registration number: P00201609066.

The rotifers (10 ind/mL) were batch cultured in fifteen-25ml flasks containing sterilized seawater of salinity 22ppt. Growth responses of the rotifer on the diet was tested under different weights of the diet (i.e. 0.05, 0.1, 0.2 and 0.4 g/L in triplicates), different culture containers; ST (small tall: vol: 25 mL, length: 65mm and width: 30mm), SS (small-short: vol: 75ml, length: 95mm and width: 55mm), MT, (medium-tall, volume: 750ml, length: 181mm and width: 95mm) and LS (large-short polycarbonate tanks; volume: 30 l, length: 320cm and width: 350 cm), and under different initial densities of the rotifer (i.e. 10, 50 and 200 rotifers.mL<sup>-1</sup>) using 30 l transparent polycarbonate cylindrical tanks after the addition of 0.2g.l<sup>-1</sup> of the diet. Trials for mass culturing rotifer using bacterial based diet as food source was performed in two-750 L fiber tanks using outdoor-semi continuous culture method.

### RESULTS AND DISCUSSION

Growth response of the rotifer on the diet was significant. Its population densities increased significantly (ANOVA,  $p=0.001$ ) from 10 ind/mL as initial density to about 200-400 ind./mL in 3 days when providing 0.1 to 0.4 gr/L of the diet (Tukey HSD test,  $p<0.05$ ). Rotifer fed the bacterial based diet showed a trend of sharp increasing density on day 2 and 3 then followed by the sharp density decrease till day 5. In comparison, rotifer fed daily with microalgae *Nannochloropsis oculata* showed increased slowly at beginning then increased continuously till day 5.

Rotifer fed the bacterial based diet showed a significantly different response on culture containers (ANOVA,  $p=0.001$ ). The growths were significantly higher when the rotifer cultured using larger volume containers (LS and MT) than those cultured using smaller containers (ST, SS and MT) (Tukey HSD test,  $p<0.05$ ). Population densities of the rotifer at larger containers increased sharply to around 797 – 1176 ind/mL on day 3 or 4, while at smaller containers increased to about 178 to 399 ind.mL on day 2 or 3 of culture.

Responses of rotifer fed bacterial based diet when inoculated at different initial densities were almost similar. The rotifer grew slowly (or decreased) on day 1 and 2 (< 400 ind./mL) but then increased sharply on day 3 (around 900 – 1300 ind./mL) and decreased afterward (<600 ind./mL).

Mass culture trials of rotifer using the bacterial based diet as food source was successfully performed and the rotifer was continuously harvested for 15 and 30 days. The first trial (15 days culture), rotifer grew to about 2500 ind./mL and successfully harvested for 5 times at densities of about 1100 to 1300 ind./m, while rotifer at second trial (30 days) grew to about 3500 ind./mL and successfully harvested for 7 times at densities about 2500 to 3300 ind./mL



**Keywords:** diet, fish, growth, response, rotifer, wastes.

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## Blending Fishwastes And Chicken Manure Extract As A Low-Cost And Stable Diet For Planktonic Live Food Production

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### INTRODUCTION

The global increase of aquaculture activities has expanded the demand for the zooplankton as live foods, for larviculture. Although freshly cultured microalgae is the common diet for the zooplankton, the microalgae culture protocols are laborious and costly, thus limit continuous production of sufficient zooplankton and, sometimes disrupt fish seedling production programs in the microalgae-based hatcheries (Lubzens et al. 1995). Alternatively, cheaper diets e.g. baker's yeast has been used as live food diet but culture instabilities due to bacterial flora imbalance are common. Other products e.g. condensed microalgae and artificial diets such as Selco (Inve-Co. Ltd) are also commercially available but costly for most fish farmers, especially in the developing countries and some parts of Asia, which are potential future leaders in marine larviculture production. Therefore, research studies are needed to develop cheap and stable microalgal replacement diets, for profitable aquaculture. This study investigated the feasibility of a fishwaste diet (FWD) made of fishwastes (heads) and chicken manure extract (CME) at optimum carbon/nitrogen ratio, as a cost-effective and stable diet, for planktonic live food production.

### RESULTS AND DISCUSSION

In the outdoor experiment, there was significantly higher densities of each zooplankton taxa and SGR in FWD<sub>B</sub> than FWD<sub>A</sub> and control tanks ( $p < 0.05$ ). On day 7, the zooplankton densities in FWD<sub>A</sub>, FWD<sub>B</sub> and the control tanks, respectively were as follows: rotifers:  $100.6 \pm 14.8$ ,  $146.3 \pm 7.0$ , and  $60.0 \pm 7.9$  ind ml<sup>-1</sup>; the copepods:  $8.0 \pm 11.1$ ,  $12.6 \pm 13.6$  and  $4.3 \pm 2.1$  ind ml<sup>-1</sup>; the cladocerans:  $3.3 \pm 6.0$ ,  $8.6 \pm 8.7$  and  $3.6 \pm 2.5$  ind ml<sup>-1</sup>. The most abundant genera were *Brachionus* sp., *Cyclops* sp. and *Daphnia* sp. for rotifers, copepods and cladoceras, respectively. Highest SGR (day<sup>-1</sup>) were realized with FWD<sub>B</sub> for rotifers ( $0.48 \pm 0.01$ ), copepods ( $0.26 \pm 0.04$ ) and cladocerans ( $0.42 \pm 0.03$ ). FWD did not affect the CV%, which were  $13.74 \pm 7.73$ ,  $7.74 \pm 6.64$  and  $15.26 \pm 11.39$  for FWD<sub>A</sub>, FWD<sub>B</sub> and control cultures, respectively. The CME provided growth hormones (Yang and Snell, 2010), and facilitated phytoplankton growth, while the fishwastes aided the proliferation of microbial flora, thus expanded zooplankton forage base in the FWD<sub>B</sub> cultures.

In the laboratory cultures, there were significantly higher rotifer population densities and SGR in FWD<sub>2</sub> than FWD<sub>1</sub> and control tanks ( $p < 0.05$ ). About 1200 rotifers ml<sup>-1</sup> was obtained in FWD<sub>2</sub> between days 8-12. The FWD did not affect the CV. The SGR at different culture stages and the CV is presented in Table I. The FWD-cultured rotifers ingested bacterial species such as *Pseudomonas* sp., *Bacillus* sp., *Thiocapsa* sp., and *Shewanella* sp., while the control-rotifers mostly ingested *Micrococcus* sp. About 0.35 and 0.39 mg g<sup>-1</sup> of DHA and EPA, respectively was obtained in the FWD-cultured rotifers and 0.0 mg g<sup>-1</sup> of DHA and EPA in the control-rotifers. High rotifer growth in the FWD cultures is attributed to the ingested probiotic bacteria species, which have been found to increase rotifer growth rates and densities (Yasuda & Taga 1980; Hagiwara et al., 1994). Also, some species of *Bacillus* sp. have been found to produce chemical metabolites e.g. gamma aminobutyric acid (GABA) (Li and Cao 2010), an organic acid that stabilizes rotifer cultures and enhances parthenogenetic reproduction of rotifer progenies during sub-optimal conditions (Gallardo

et al., 2000). The FWD appears to be a nutritionally rich microalgal replacement diet with natural omega acids, probiotics and GABA enrichments that can be beneficial to the live foods and their predators.

**Table I:** The specific growth rate (SGR) as at day 4, 9 and 13 of the rotifer, *B. rotundiformis* cultured with the FWD and control diet and, CV (%) of the treatments. Partial harvesting (50%) was done on days 5, 10 and 14. Two-way ANOVA, Tukey HSD test, a>b; different superscripts each day indicate significant differences at  $p<0.05$ ;  $n=27$ . For CV (%), One-way ANOVA,  $p=0.43$ ,  $n=9$

Day	Treatments		
	FWD <sub>1</sub>	FWD <sub>2</sub>	Control
4	0.78 ± 0.04 <sup>a</sup>	0.81 ± 0.04 <sup>a</sup>	0.78 ± 0.04 <sup>a</sup>
9	0.60 ± 0.09 <sup>ab</sup>	0.69 ± 0.06 <sup>a</sup>	0.44 ± 0.02 <sup>b</sup>
13	0.61 ± 0.07 <sup>ab</sup>	0.76 ± 0.05 <sup>a</sup>	0.58 ± 0.07 <sup>b</sup>
CV (%)	11.43±5.18 <sup>a</sup>	7.47±1.68 <sup>a</sup>	8.01±3.72 <sup>a</sup>

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## Study on Existence of the Fisheries Resources Abundance By Using Environmental Deoxyribo Nucleic Acid (eDNA) Approach At Fishing Grounds in the Sulawesi Sea, Indonesia

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### INTRODUCTION

Indonesia is an Archipelago country are consisting of the 18.110 islands with a coastline length about 99,000 Km and consisting of about 9,900,000 tons of marine resources potency per year. This potency is distributing around the surface, middle and bottom waters layers. To monitor these marine resources existence abundance, the lots of the budget and times are needed. A new technology approach can be overcoming of this problem were available can be implemented at around Indonesian marine waters by using the environmental DNA approach. Environmental DNA (eDNA) in aquatic environments refers to genetic material found in the water column. In the case of multicellular organisms, eDNA originates from various sources, such as metabolic waste, damaged tissue or sloughed skin cells [2]. Ficetola *et al.* [1] was the first study demonstrating the use of eDNA for detecting an aquatic vertebrate species (invasive American bullfrog) from controlled environments and natural wetland, published in 2008. Here, we report the results of our preliminary study on deep sea eDNA at fishing ground to approach the fisheries resources abundance at Sulawesi sea.

Deep-sea water sampling was collected from 10 sites ranging from 110m-200m in depth at front side of the International Coelacanth Research Center and Museum Base at Lolak Waters and Manado Bay North of Sulawesi using Nansen Bottle Sampler (1500 cc) as shown in Figure 1. The positions were follows the discovered of coelacanth by Green Eye Project on 2007-2015 [3]. The collected waters were filtered using Power Water Sterivex DNA Isolation Kits and preserved with the DNAiso Reagent and kept in a deep freezer -25<sup>0</sup> C at Faculty of Fisheries and Marine Science, Sam Ratulangi University, until they were transported to Center for Strategy Research Project, University of the Ryukyus, Okinawa, Japan (Figure 2.) where eDNA analyses were conducted.

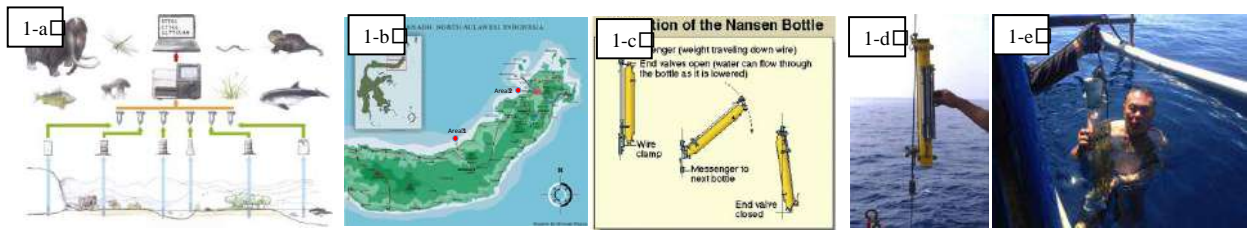


Figure 1. The concept of preliminary study of eDNA and the collections sites of deep sea waters sampling.

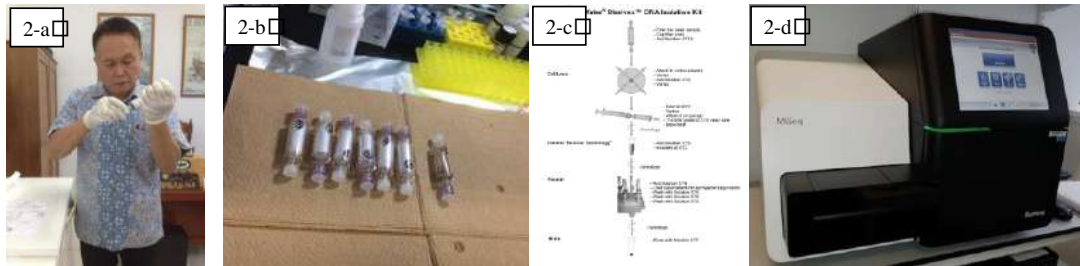


Figure 2. Laboratory Works on Deep-sea Environmental DNA Research at Unsrat and Univ. of The Ryukyus.

## RESULTS AND DISCUSSIONS

The preliminary results revealed that the concentrations of eDNA range from 1.8-12.6 ng/ul were measured with a NanoDrop Lite spectrophotometer and the quality range 1.63-3.39, indicating eDNA was successfully extracted. Therefore, by using universal primers for eDNA<sup>[4]</sup>, MiFish-U-F/R for the 1<sup>st</sup>-PCR (mt-12S amplification) and 2<sup>nd</sup>-PCR (tag-indexing) for library preparation to accommodate sequence variations and show that intense signal of MiFish eDNA amplification (Figure 3.). Using a high-throughput Illumina MiSeq platform for sequencing analyses, we detected eDNA from 40 fish species such as *Caranx sexfasciatus*, *Encrasicholina punctifer*, etc. In addition, to eDNA, this metabarcoding approach is applicable for species identification of the marine fisheries resources existence abundance in Sulawesi sea. Then this bioinformatics data was compared to the fish's distributions and ecological as reported from The Green eye project 2007-2015<sup>[3]</sup> where the site also known as fishing ground of those target fishes.

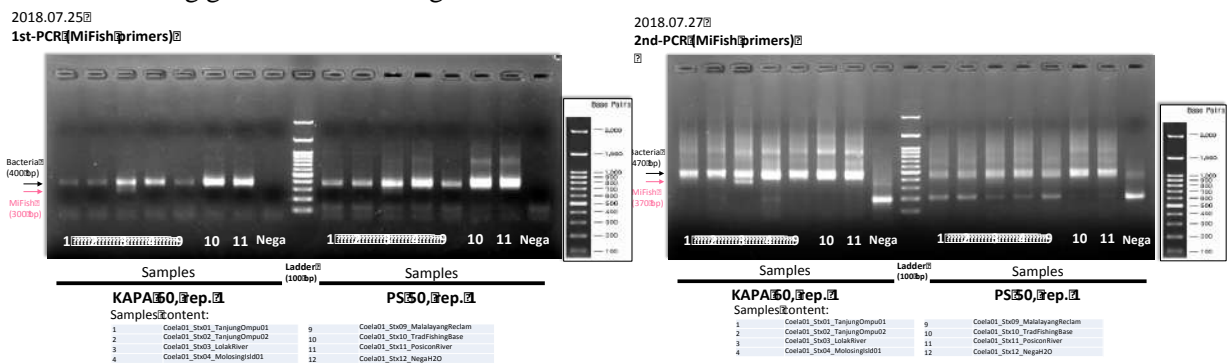


Figure 3. The 1<sup>st</sup>-PCR and 2<sup>nd</sup>-PCR shows intense signal of MiFish eDNA by using universal primers MiFish-U-F/R.

For the future this marine eDNA technology could be get fruitful if can be implemented to rare marine species as our next target Indonesian coelacanth and freshwater species.

## ACKNOWLEDGEMENTS

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## Assessment of Seagrass Meadows Condition in Sepanjang Beach, Gunungkidul, Yogyakarta, Indonesia

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### INTRODUCTION

Seagrass meadows is one of ecologically important ecosystem on Earth. It provides a number of ecosystem goods and services e.g. feeding ground and nursery habitat for marine animals, trapping sediment, protecting coastal areas against wave and erosion, and oxygen production [1,2,3]. Seagrass meadows also play a vital role on coastal biogeochemistry as it comprises up to 15% of ocean's total carbon storage [4, 5] thus has been proposed as efficient blue carbon sinks.

Globally seagrass meadows is now vulnerable and being lost at a rate of 1.5% per year due to human activities, e.g. pollution, boat anchor, dredging, reclamation, and tourism [6, 7, 8]. Thus, it is needed to measure seagrass condition in order to overview the extent of declines and identify the future trends of seagrass health from all over the world. This study was conducted in Sepanjang Beach, Gunungkidul, Yogyakarta, Indonesia on July 15, 2018 during the low tide, and aimed to assess the seagrass condition by analysed the percentage of seagrass cover.

### RESULTS AND DISCUSSION

#### 1. General habitat description

Table 1 showed that the types of benthic habitat in Sepanjang Beach were dominated by sand (40-84.8%) and reef (11-58%), while coral rubble accounted for small proportion (2-12%) along the transect line.

**Table 1.** Coverage (%) of benthic habitat types in Sepanjang Beach

Transect	Sand	Coral Rubble	Reef
1	40	2	58
2	48.6	2.4	49
3	54	12	33
4	84.8	4.2	11
5	78.6	2.4	19

#### 2. Percentage of seagrass cover

Sepanjang Beach has monospecific meadows that is consisted of *Thalassia hemprichii*. Figure 1 showed that seagrass coverage were 24-35% ( $\bar{x}$ : 28.32%). This result indicated that seagrass meadows in Sepanjang Beach were in fair condition.

*Thalassia hemprichii* is a very common, fast-growing and widespread seagrass species found on intertidal and lower subtidal zone [9,10]. This species can tolerate a wide range of water quality conditions and benthic habitat types [10]. In this study, *Thalassia hemprichii* favoured sandy substrate, followed by reef and coral rubble (Table 1; Figure 1) as it commonly form climax meadows on stable substrate.

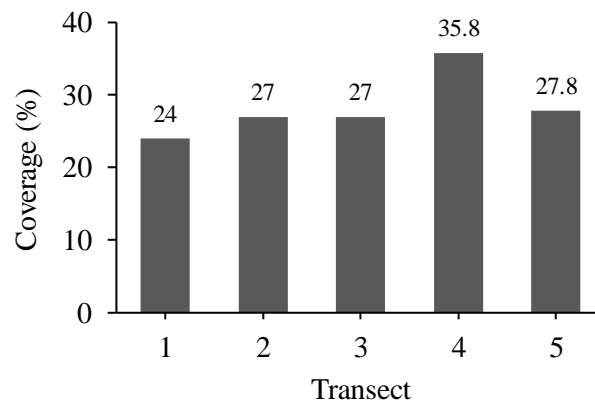


Figure 1. Percentage of seagrass cover on each transect in Sepanjang Beach

**Keywords:** seagrass ecosystem, ecological assessment, percent cover, seagrass condition.

### Acknowledgment

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## Stock Estimation and Economic Value of Mangrove Vegetation Carbon in Manalu Bay, Sangihe Islands, North Sulawesi

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### INTRODUCTION

Mangrove ecosystem has an important role for the fisheries sector, as well as contributing to climate change mitigation as carbon sinks. The purpose of this study was to estimate the amount of carbon stock and calculate the estimated economic value of mangrove vegetation in Manalu Bay. Data collection was carried out at three stations using 125 m transect method and every 25 m placed 100 m<sup>2</sup> squared placed vertically against the coastline. Measuring DBH is used to determine biomass and carbon storage, a CNS analyzer to determine carbon in sediments while estimating the economic value of carbon deposits using the mandatory market price approach of the Clean Development Mechanism (CDM). The analysis shows that the estimated mangrove carbon stock in Manalu Bay is an average of 189.44 tons. C.ha<sup>-1</sup>. The estimated economic value of the average carbon stock produced is Rp. 16,041,166,064 (CDM) or US \$ 1,083,862 for average carbon deposits in the mangrove area covering 109 ha. It is hoped that the results of this study provide information for the community and government in mitigating climate change.

### RESULTS AND DISCUSSION

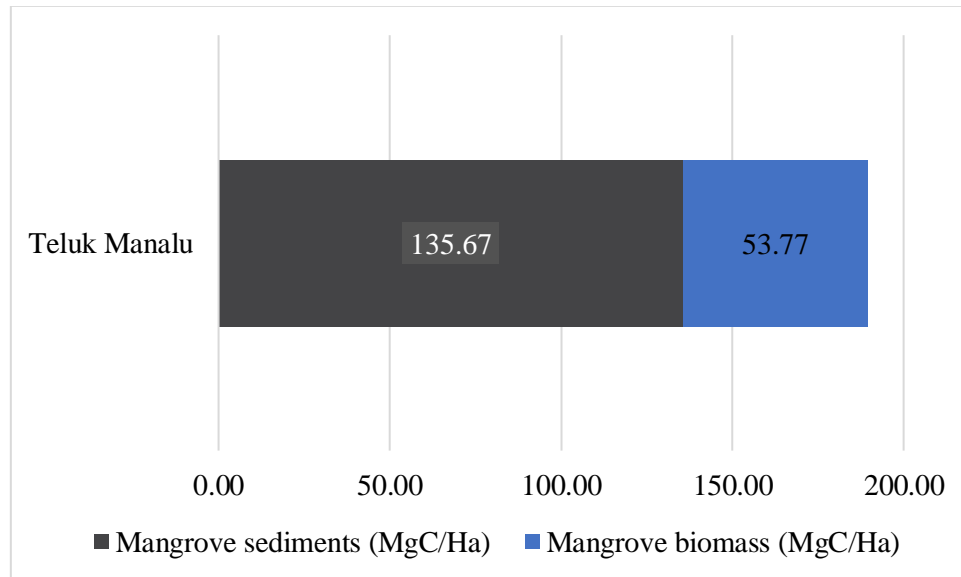
The important value index results of mangrove species in Manalu Bay showed the highest role of *Rhizophora mucronata* 177.76% while the lowest role was *Avicennia alba* 33.28% (Table 1). INP (Important Value Index) is a quantitative parameter that can be used to express the level of species domination in mangrove communities (Bengen, 2002). Furthermore, the Important Value Index (INP) reflects the existence of roles (dominance) and the structure of mangrove vegetation in Manalu Bay.

Calculation results, estimation of carbon stock from mangrove vegetation in Totok Bay can be seen in Figure 1. Carbon stocks in sediments averaged 135 tonCha<sup>-2</sup> greater than 252.3% compared to the average carbon stock in biomass of 53.77 tonCha<sup>-2</sup>. estimation of carbon stock from mangrove vegetation in manalu bay is 75,780.26 tonCO<sub>2</sub> for carbon storage in mangrove areas covering 174.92 ha. Nilai estimasi ekonomi rata-rata yang dihasilkan adalah Rp. 16.041.166.064 (CDM) atau US \$ 1.083.862. Economic estimation of carbon storage from mangrove vegetation in Kema is 174.92 ha with an economic value of Rp. 18,176,056,252 (CDM) or US \$ 1,357,131.6 (Kepel 2017). In addition, peatlands along the east coast of South Sumatra have a range of Rp. 14,002,162,211,645 calculated from sediment carbon stock 2,677,279 tons CO<sub>2</sub> / ha (Ulya et al., 2015).

These results indicate that carbon storage in mangrove vegetation turns out to contribute to a large economic value and is not inferior to the contribution of economic value to other ecosystem services. Therefore, mangroves are very important to maintain their sustainability because they provide many benefits to the environment.

**Table 1.** Results from the important value index of mangrove vegetation in Manalu Bay

location	Mangrove Species	Important Value Index values
Teluk Manalu	<i>Rhizophora mucronata</i>	177.76
	<i>Avicennia alba</i>	33.28
	<i>Bruguiera gymnorhiza</i>	88.96



**Figure 1.** Carbon stock of Mangrove vegetation in Totok Bay.

**Keywords:** Stock, Carbon, bay, Manalu, Valuation, Economics and Mangrove

### Acknowledgment

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## Coral Reef And Reef Fish Structure Community Assessment As Preliminary Study On Small Marine Protected Area Program In South Motandoi Village, South Bolaang Mongondow Regency, North Sulawesi Province

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### INTRODUCTION

South Motandoi village is one of site which the coral reef was found along the coastline of South Bolaang Mongondow Regency, has been threatened by destructive fishing activity. We report here, the present condition of coral reef and reef fishes through studying the structure community of coral reef and reef fish condition in South Motandoi Village. The aim of this study was determining the coral cover and reef fish condition which can delivered the information of a recently implemented management for marine component for local government.

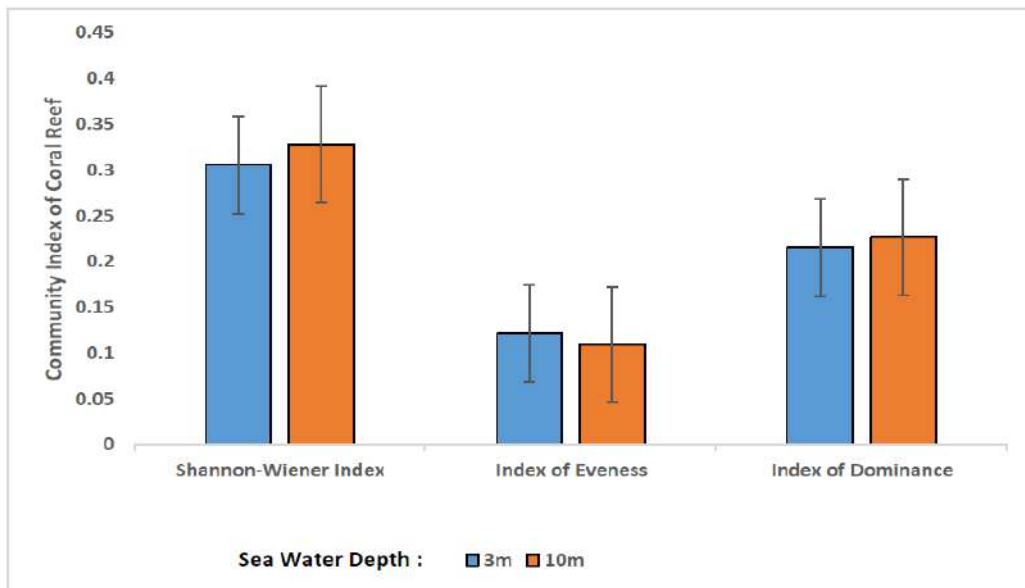
### RESULT AND DISCUSSION

The results of the study shown that coral percent cover was 17.67 % (3m), 6.29 % (10m) (Table 1) and categorized as critical. Shannon-Wiener Index ( $H'$ ) was 0.3059 (3m) and 0.3284 (10m). The evenness index ( $E$ ) was 0.1218 (3m) and 0.1097 (10m); the dominance Indices was 0.22 (3m) and 0.23 (10m); the  $H'$ -Indices of reef fishes was 0.79 (3m) and 0.43 (10m) (Figure 2). Since the value of all index measured showed under the recommended value, here we stated that the coral reef and reef fish condition in South Motandoi Village was on critically danger condition and need to focus as a site of Small Marine Protected Area.

**Tabel 1.** The Average Percentage Cover of Benthic Life Forms in South Motandoi Village, South Bolaang Mongondow Regency

Life Forms Categories	Depths	
	3 meters (%)	10 meters (%)
Acropora Branching	1.4	2.3
Acropora Encrusting	-	-
Acropora Submassive	-	-
Turf Algae	-	-
Algae Assemble	-	-
Coraline Algae	-	-
Acropora Digitata	5.1	-
Acropora Tubulate	4.2	0.5
Coral Foliose	0.3	0.5
Sponge	0.2	0.6
Others	0.6	0.3
Silt	-	-
Sand	20.6	24.0
Water	-	-
Rock	20.7	22.7
Coral Massive	3.3	0.4

Zoanthids	-	-
Coral Submassive	0.7	0.1
Coral Encrusting	0.2	0.9
Coral Mushroom	0.1	0.1
Coral Branching	-	-
Coral Helliopora	-	-
Death Coral with Algae	-	0.2
Death Coral	-	-
Coral Massive Encrusting	0.5	0.2
Soft Coral	1.1	0.4
Rubble	41.1	46.7



**Figure 1.** Community Index of Coral Reefs in South Motandoi Village Beach.

**Keywords:** community structure, coral reef, reef fishes, South Motandoi Village, South Bolaang Mongondow Regency.

#### Acknowledgment

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## Trophic Status Of Limboto Lake in Gorontalo Province

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### INTRODUCTION

Limboto lake is natural resources owned of Gorontalo province now. Limboto lake had engaged as a source of income fishermen, Flood tackle, Water sources and tourism. Limboto Lake are now languishing on condition that worst because subjected to the process and silting in the amount of shrinkage achieved as a result of sedimentation and waste disposal place which threatens survival their fate an example to ecosystem which is expected to happen. Decrease in the pattern in the waters of lakes cause to function as the area lake water collection systems and place the biota living waters so it has potential to the occurrence of floods and loss of organisms endemic that is in Limboto lake. Eutrophication and pollution problem of environment is that exert influence over the waters of lakes in general where its consequences will affect the survival of human life. Based on these problems, so did research with a title trophic status of Limboto lake in Gorontalo Province.

The measurement of the quality of water is done in some parameters insitu station in eight it will be done in the sampling method of and analysis laboratory some parameters the quality of water is carried on Manado Research and Standardization Reasearch Centre . o determine the status of trophic waters of lakes limboto calculated use of Trophic State Index (TSI) of Carlson (1977).



Figure 1. A map the collection locations a water sample

The formula of average Trophic State Index (TSI)

$$TSI-P = 14,42 \times \ln[TP] + 4,15 (\mu\text{g/l})$$

$$TSI-Cla = 30,6 + 9,81 \times \ln[\text{Chlor-}a] (\mu\text{g/l})$$

$$TSI-SD = 60 - 14,41 \times \ln[\text{Secchi}] (\text{meters})$$

$$\text{Average TSI} = \frac{(TSI - P + TSI - Cla + TSI - SD)}{3}$$

Based on the value of TSI obtained, trophic status of water classified into the ultra oligotrophic (<30), oligotrophic (30-40), mesotrophic (40-50), eutrophic (50-60), heavy eutrophik (60-70), hypereutrophic(70-80) and algae scum (>80).

## RESULTS AND DISCUSSION

The results of the study showing that the average *Trophic State Index* (TSI) of a Limboto lake range 50.3071 – 61.9297. This shows that the trophic status of waters in Limboto lake is considered to be eutrophic namely the lake water containing high to soil nutrients , this status show the water has been contaminated by elevated levels of nitrogen and phosphorus. This is consistent with opinion Horne and Goldman (1994) that waters eutrophic if it has been accused of nutrients high with the depth of less than 10 m. The womb nutrients that caused the number of abundant aquatic organisms , characterized blooming algae. Florida lakewatch ( 2000 ) stating that a eutrofik waters containing chlorophyll 25 mg/m<sup>3</sup> can disrupt the life of the organism other waters and can disrupt the designation the water.

**Table 1. TSI value of phosphorus, chlorophyll-a, and Secchi Disc at Limboto Lake**

Station	Location	TSI TP (µg/l)	TSI chlorophyll (µg/l)	TSI SD (m)	TSI Carlson
1	Tabumela Village	29.9872	53.5731	67.3610	50.3071
2	Hutuo Village	60.8469	58.9545	65.9876	61.9297
3	Dembe Village	41.1366	55.6864	69.9883	55.6037
4	Lekobalo Village	43.2001	55.5331	67.3610	55.3647
5	Lupoyo Village	35.8340	59.9881	71.1898	55.6706
6	Kayu Bulan Village	45.8292	58.1010	70.8799	58.2700
7	Hunggaluwa Village	42.2052	56.5590	70.2794	56.3479
8	Hunggaluwa Village	39.9824	62.6371	71.8303	58.1499

### Acknowledgment

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## Lenght-Weight Relationship and Condition Factor of Huluu Fish (*Giuris margaritacea*) in Limboto Lake

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### INTRODUCTION

Decline in the quality of the lake water, sedimentation lakes and eutrophication give bad conditions resulting to limboto lake. Diversity resources fishing lake has degradation. Population the fish original and important has decline, one of that fish is huluu fish (*Gurius margaritacea*) increasingly difficult to found. The types of agent biological protected, barred and invasive (JADDI) in lake limboto, and fish huluu (*Giuris margaritacea*) one of them [1]. Status Huluu fish (*Giuris margaritacea*) is least concern [2]. Research objectives that is, to know relations panjang- weight and factors condition Huluu fish (*Giuris margaritacea*) in lake limboto

Research was done in april until june in lake limboto with 7 points of sampling. Data analysis used to research is Model Allometric Linear (LAM) used to calculate parameter a and b through the measurement of changes in the weight and length [3]. Factors condition obtained through formula :

$$Kn = \frac{W}{aL^b} \dots\dots\dots(1)$$

### RESULT AND DISCUSSION

Based on the results of research conducted in lake limboto on 7 point of sampling there are Tabumela village , Hutuo , Dembe , Lupoyo , Lekobalo , Kayu bulan and Hunggulawa .As for point the sample collection can be seen in Figure 1. Fish huluu who caught at the station I is 66 of fish, station II is 55 of fish , station III is 55 of fish I , station IV is 35 of fish , station V is 46 of fish , station VI is 52 of fish and station VII is 54 of fish.

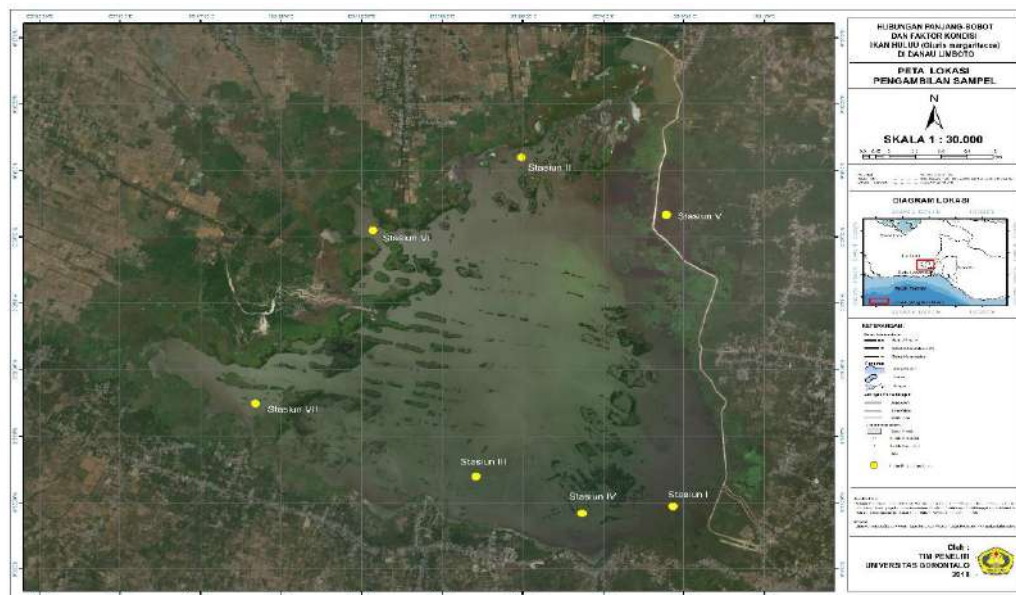


Figure 1 .Map the sample collection of huluu fish in lake limboto

The quantity of fish caught every month fluctuating. In April is the highest catches about 141 of huluu fish, in May that is 110 of fish and June that is 112 of fish.

Tabel 1. Relationship between the length - heavy and factors condition of fish Huluu (*Giuris margaritacea*) in limboto lake

Station	a	b	R <sup>2</sup>	L	W	Growth of pattern	Condition Factor
I	-5,70	3,35	0,93	14,58	37,7	Alometrik positif	0,14
II	-5,48	3,23	0,82	15,2	39,7	Alometrik positif	0,15
III	-5,27	3,13	0,96	15,3	41,5	Alometrik positif	0,16
IV	-5,51	3,25	0,76	15,6	42,2	Alometrik positif	0,15
V	-5,79	3,36	0,96	15,2	36,6	Alometrik positif	0,12
VI	-5,58	3,25	0,79	15,6	38,4	Alometrik positif	0,14
VII	1,1	1,21	0,74	14,6	37,3	Alometrik negatif	1,91

Based on analysis of the was done with length and weight that show fish huluu who caught at the station I until VI having a pattern growth allometric positive which means growth the weight of the faster than the length of the body. Fish huluu who caught at the station VII having a pattern growth different namely allometric negative means the development the length of the body faster than the growth weight. Fish are not always have a similar growth, relations length and weight is differently affected environmental conditions waters [3].

The results of the analysis condition factors were made Huluu fish discovered that the the range of condition factor between 0,12 - 1,91 whereby the meaning of the value a fish is categorized as fish flattened. Flattened of fish is result from the environment thick in the waters that is no longer support for fish to growth [4]. Factors that have brought about flattened of fish shaped in environmental factor thick in the waters, the availability of food and diseases [5].

**Keyword:** Allometric positif, Fish, Growth, *Giuris margaritacea*, Huluu, Limboto lake.

#### Acknowledgment:

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## Ekstrak Leaves Carambola As Antibacterial On Skipjack (*Katsuwonus pelamis*) Fufu In The Gorontalo

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### INTRODUCTION

Handling and processing fisheries reference the decision minister for fishery and maritime number 52A / KEPMEN-KP / 2013 about the requirements quality assurance and security fisheries to the process production processing and distribution, and decision head of national standardization no: 76 / KEP / BSN / 8 / 2009 on Standard National Of Indonesia 2725.3: 2009 handling and processing products fish smoke. The purpose of this research is restricting the growth of bacteria and prevent a fall in the quality of fish skipjack (*katsuwonus pelamis*) fufu in the province of gorontalo. Research methodology is the method his experiments with treatment extract leaves carambola as a preservative on fish skipjack of smoke (fufu) and long storage. Design used is a random complete.

### RESULT AND DISCUSSION

The research indicated that fish smoke who were given extract leaves carambola able to press the growth of bacteria to storage 4 days ( $4.2 \times 10^4$  colonies / gr ). This thing to see Figure 1.

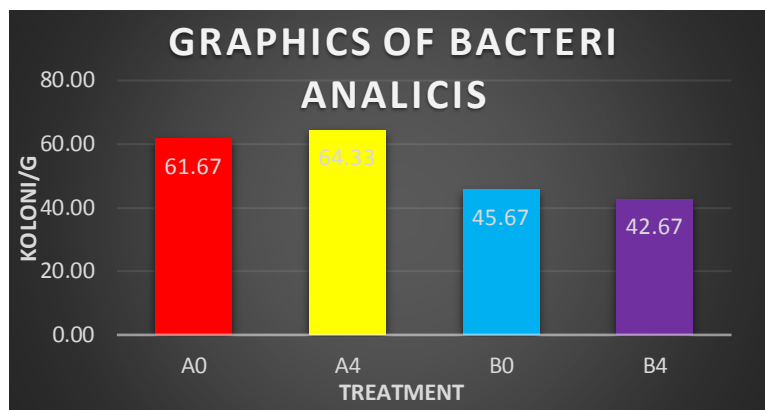


Figure 1. Graphics of bacteri analysis

Figure 1 .The fruits of their testing ALT in treatment A0 ( $6 \times 10^4$  kol / g ), A4 ( $6 \times 10^4$  kol / g ), B0 ( $4 \times 10^4$  Kol / g ) and treatment B4 ( $4 \times 10^4$  kol / g ). the result of this research menjelskan A0 that treatment with the highest number of bacteria colonies with the highest proportion of B0 treatment .This is allegedly affected by extract leaves the leatherback wuluh capable of bacteria on treatment B0 suppress the development. Did also the treatmen on A4 and B4. Total volatile bases also declined (8.71 mgn / 100gr) for storage four day.

The results of the Astuti ( 2014 ) stated that extracts leaves the leatherback wuluh can be inhibiting the growth of bacteria .Tannin extract leaves to fall from the leatherback wuluh is inhibitor to execute so that many microorganisms that growth could slow down its growth .An enzyme secreted by microbes is a protein and protein and by tannin so that the enzyme will not active (who , 1981 in Astuti , 2014 ). This thing to see Figure 2.

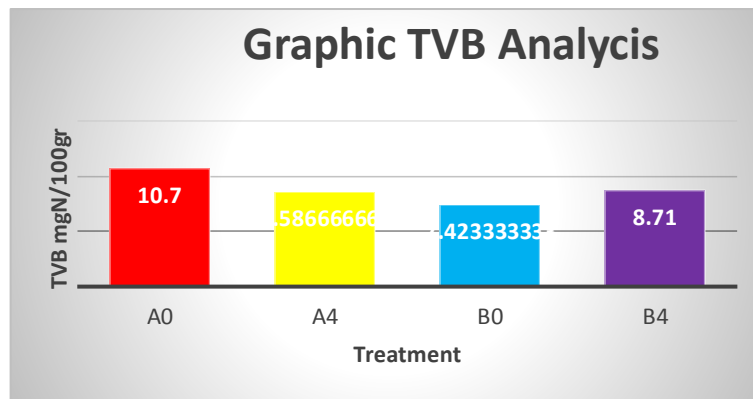


Figure 2. Graphic TVB Analysis

Figure 2. shows that total bases in volatile content of skipjack fufu is still below the threshold namely & it is; 30 mgn hundredths of g ( *zaitseve dkk 2009* ) .It looks on a chart to 4 treatment .The highest value is added to its treatment of 10.7 a0 ( control of ) mg n / gr , with the lowest in b0 treatment with an extract and without storage . In treatment A4 and B4 did not appear to be a significant difference. The results of the analysis variety of shows that treatment extract the leatherback wuluh leaves and long storage influence clear p & it is; 0.05 of tvb of skipjack fufu. The low level of the womb total bases in volatile treatment B0 is strongly influenced by extract leaves the leatherback wuluh used . Astuti (2018) stated that the low level of tvb on fish skipjack that is stored for 18 of the clock denote that extracts leaves the carambola who in use to reduce the growth of bacteria.

#### ACKNOWLEDGMENTS

Gratitude to University Gorontalo and KEMENRISTEK DIKTI writer thank you for the opportunity that had given them so that research lecturer novice can be done well.

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## Antihyperglycemic capacity of basil (*Ocimum basilicum* L.) leaves extracts coated with the marine fish scales derived nanochitosan

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### INTRODUCTION

A potential antihyperglycemic capacity in *Ocimum basilicum* has been reported in many studies caused by its active compounds. These compounds have been associated with the reduction of blood glucose level. However, the active compounds with pharmacological effects such as flavanoid and polyphenols compounds are easily oxidized in high temperature and light intensity condition. Therefore, these compounds could be more stable, when coated with nanoparticles. Nanoparticle is defined as a solid particle with size range of 1-1000 nm (Mohanraj and Chen, 2006). Nanochitosan which is derived from chitosan is more superior than the chitosan itself. Nanochitosan has more cellular absorbability into cell target, in addition to having chitosan properties as biocompatible, biodegradable, and non-toxic compound. Chitosan is obtained from the deacetylation of chitin, a naturally occurring and abundantly available polysaccharide.

There were five marine fish species have been recently exploited by Rumengan *et al* (2017) for chitin extraction by using their scales as raw materials. They found that chitin of parrot fish (*Scarus* sp) showed best performance in yield and characteristics. Therefore, in this study, nanochitosan was prepared by using parrot fish scales as raw materials. Luntungan *et al* (2017) has recently studied on the extracts of basil leaves that were obtained by maceration of the leaves in 96% ethanol solution. When the extracts coated with nanochitosan, concentration of total phenolic compound was increased. This study aims to evaluate the antihyperglycemic capacity of basil (*O. basilicum* L.) leaves extracts coated with the parrot fish scales derived nanochitosan.

As raw materials for chitosan preparation, the fish scales of parrot fish (*Scarus* sp.) were collected from local markets in North Sulawesi. Chitosan was then modified from chitin that extracted from fish scales using the modified method of Suptijah *et al* (1992), as described by Rumengan *et al* (2017). Preparation of nanochitosan from chitosan was conducted using the ionic gelation method (Suptijah, 2011). The basil leaves extracts were put into nanochitosan solution (2:1), homogenized with a magnetic stirrer, and then centrifuged. The pellets contained the extracts coated with nanochitosan were stored in temperature -4°C for 2 days. In this experiment, a total of 24 adult male wistar rats were used. All the animals were fasted for 12 h, but were allowed to drink. The rats were divided into 8 groups, 3 rats for each group. Diabetes mellitus was induced in overnight-fasted rats by single intraperitoneal injection of freshly prepared alloxan monohydrate dissolved in sterile normal saline. Diabetes mellitus was confirmed by measuring fasting blood glucose level after 3 days. Rats with fasting blood glucose of more than 126 mg/dL glucose were considered as diabetics and used for further experiment (American Diabetes Association, 2015). Treatment with the nanochitosan coated extracts was given immediately after the determination of diabetes in rats. Measurement of fasting blood sugar was carried out every 1 hour after treatment. All blood samples were collected from the tail artery of the rats at interval.

### RESULT AND DISCUSSION

As shown in Table 1, the fasting blood glucose (FBG) levels to all group were fluctuated among the groups, with or without coated with nanochitosan and glibenclamide drug during

five hours of observation. In the negative control group there was an increase in FBG level, while in the other groups FBG level decreased, even though the trend of decreasing were different among the groups. Based on One Way Anova analysis, the FBG levels were significant ( $<0.05$ ) among groups treated with the extracts alone and the extracts coated with nanochitosan. The extracts with nanochitosan has significant effects on reducing blood glucose of hyperglycemic mice.

**Table 1. Change in fasting blood glucose level after treatment for five hours**

Group	Fasting blood glucose post alloxan	Time (Hours)				
		1	2	3	4	5
Control (-)	140 ± 9.165	139 ± 19.553	148 ± 9.018	152 ± 6.110	153 ± 6.658	158 ± 26.633
Control (+)	136 ± 1.732	128 ± 6.807	119 ± 5.568	93 ± 2.887	90 ± 0.577	71 ± 8.544
BLE 1	137 ± 15.716	136 ± 14.526	137 ± 13.50	126 ± 2.039	102 ± 4.509	94 ± 3.786
BLE 2	136 ± 8.505	129 ± 9.018	104 ± 7.371	84 ± 5.132	91 ± 19.757	79 ± 1.000
BLE 3	139 ± 11.533	137 ± 6.928	101 ± 17.03	98 ± 9.000	84 ± 6.028	115 ± 15.011
BLECN 1	139 ± 35.726	128 ± 32.047	100 ± 10.44	89 ± 9.644	80 ± 2.000	73 ± 6.506
BLECN 2	136 ± 15.177	125 ± 18.028	142 ± 35.53	165 ± 44.44	130 ± 20.55	107 ± 12.014
BLECN 3	136 ± 6.506	132 ± 8.185	100 ± 9.609	87 ± 8.888	79 ± 8.327	72 ± 9.713

Control (-) : aquades; Control (+) : glibenclamid at dose 0.45 mg/kg BW; BLE 1 : extracts of basil leaves e at dose 400 mg/kg BW; BLE 2 : extracts of basil leaves at dose 800 mg/kg BW; BLE 3: extracts of basil leaves at dose 1000 mg/kg BW. BLECN 1 : extracts of basil leaves coated with nanochitosan at dose 400 mg/kg BW; BLECN 2 : extracts of basil leaves coated nanochitosan at dose 800 mg/kg BW; BLECN 3 : extracts of basil leaves coated with nanochitosan at dose 1000 mg/kg BW

The administrate of the extracys of basil leaves in hyperglycemic diabetic rats was shown to reduce blood glucose levels in all basil leaf extract group. The effectiveness of nanochitosan coating on basil leaf extract was shown at BLECN 1 at dose of 400 mg/kgBW ( $p = 0.023$ ). It is indicate that basil leaf extract has a antihyperglycemic capacity and its phytopharmaceuticals increased caused by coated with nanochitosan.

## CONCLUSION

Nanochitosan could increase the effectiveness of the extracts of basil leaves as antihyperglycemic. Using nanotechnological approach to chitosan has resulted in nanochitosan with low viscosity properties, allowing the compound become more easily absorbed by the the target cells.

## ACKNOWLEDGMENT

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## Analysis Of Water Quality In Relation To Plankton Diversity Based Ecotourism In Bahoi Waters, North Minahasa

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### INTRODUCTION

Bahoi waters is one of the conservation development areas developed into ecotourism village in west Likupang District of North Minahasa Regency as the spatial development of North Sulawesi Province. One area that has the potential is plankton diversity in relation to water quality. Plankton diversity is governed by certain aquatic environmental factors which collectively determine the health of the aquatic ecosystem. The increasing recognition of Bahoi water as a tourist destination, the suitability of Bahoi waters for ecotourism was studied for 7 months during February to August 2018 in 3 stations. This study aim was to use plankton diversity to analysis the water quality of Bahoi waters.

### RESULTS AND DISCUSSION

A total of 22 species belonging to 16 genera were recorded in this study. Diatoms made larger contribution to the total abundance followed in order by Cyanophyceae and Dinoflagellates. In our samples, the most prevalent diatoms and dinoflagellates were *Bacteriastrum hyalinum*, *Coscinodiscus granii*, *Eucampia zoodiacus*, *Leptocylindrus danicus*, *Nitzschia closterium*, *Odontella sinensis*, *O. mobiliensis*, *Pleruosigma affine*, *Rhizosilenia alata*, *R. imbricata*, *Prorocentrum micans*, *Protoperidinium depressum*, *Asterionella glacialis*, *Guinardia striata*, *Licmophora gracilis*, *Pleurosigma angulatum*, *Skeletonema costatum* and *Thalassionema nitzschioides*. The average value of each parameter of water quality is, pH (7.84), DO (6.44 mg/L), TSS (299.00 mg/L), TDS (182.00 mg/L) and Waters Temperature (28.21 °C). In our study, we did not observe any preponderance of harmful plankton in the Bahoi waters during the study. The waters showed no evidence of stress beyond that carrying capacity, and there neither any harmful environmental conditions that is detrimental to ecotourism activities in the Bahoi waters from the point of view water quality in relation to plankton diversity.

**Keywords:** Bahoi Waters, Ecotourism, Plankton, Water Quality

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## **Antioxidant And Anti-Diabetic Effect Of Ethyl Acetic Extract On Edible Marine Algae (*Halimena Durvilae*) Collected From North Sulawesi Coastal Area Of Indonesia.**

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### **ABSTRACT**

Numerous natural products such as crude extracts and isolated compounds from seaweeds appear to be applicable as antioxidant and anti-diabetes. Due to the potentially harmful side effects related with antioxidant and anti-diabetes drugs as long-term treatments, showing of natural sources with reducing minimal side effects has drawn much attention. The appearance of type 2 diabetes mellitus (T2DM) as the pre-eminent global non-infectious disease has motivated the search for new anti-diabetic strategies as well as utilising traditional food and herbs.  $\alpha$ -Glycosidase inhibitors are interesting source for the treatment of diabetes type II. In this investigation we describe the Total Phenol content (TPC), The 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging, Ferric reducing antioxidant power (FRAP), Ferrous Ion Chelating (FIC) assay were used to study the antioxidant activity, while and  $\alpha$ -glucosidase inhibition were used to determined the antidiabetic activity. The result showed that TPC was  $11.55 \pm 7.50$  mg GAE/100 g extract, the radical scavenging activity was  $IC_{50} 11.95 \pm 0.34$  mg/ml, FRAP was  $35.27 \pm 0.93$  mg GAE/ 100 g and FIC was  $31.52 \pm 2,903$  mg/ml and  $\alpha$ -glucosidase inhibition activity was  $IC_{50} 8.05 \pm 0.43$  mg/ml. Therefore can be concluded that *H.durvilae* exhibit potent be used as a source of natural antioxidant and anti-diabetic product.

*Key word:* Phenol, antioxidant activity , antidiabetes activity.



## **Accumulation Level of Heavy Metal Nickel in Antique Ark Shells (*Anadara antiquate*) in Dawi Dawi Sea Shore Pomalaa District, Kolaka Regency**

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### **INTRODUCTION**

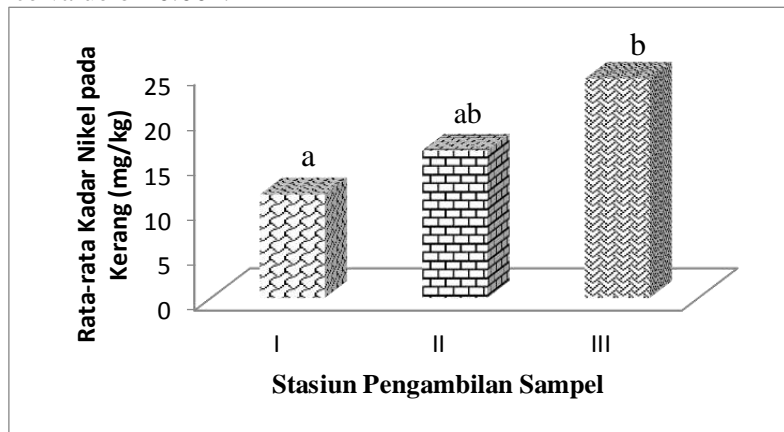
Heavy metals in the Pomalaa coastal waters originate from mining activities and coastal reclamation using smelter waste. Heavy metals from mining activities by the national mining industry enter through the river mouth into coastal waters, in addition to the presence of coastal reclamation using materials from mining waste. The purpose of this study was to determine the level of nickel in antique ark shells. This research was carried out in the coastal waters of Dawi-Dawi, Pomalaa Subdistrict, Kolaka Regency from December 2017 to January 2018. The analysis of nickel heavy metals was carried out at the Integrated Chemical Laboratory of Bogor Agricultural Institute using the AAS (Atomic Absorption Spectrophotometric) method. The results of laboratory analysis showed that nickel levels in the water column, antique ark shells and sediment ranged from 0.87 to 1.08 mg / L, 9.62 to 27.97 mg / kg and 325.55 to 359.54 mg / kg, respectively. The results indicated that the nickel levels have exceeded water quality standards for marine biota (0.05 mg / L. The nickel content in the sediment, the water column and the body of the shell was higher at the location near the site of nickel processing wastes.

### **RESULTS AND DISCUSSION**

Nickel measurement results in the water column at each station obtained nickel levels in the water column, ranging from 0.87 to 1.08 mg / L. Nickel levels at Station III is highest than other stations because at Station III it is near from the nickel management site as well as the waste disposal site for the smelter. According to Achyani et al (2013) that environmental pollution by nickel occurs anthropogenic, such as nickel mining, smelting and refining nickel.

Nickel on sediment measurements that have been carried out at each station obtained nickel levels in sediments, ranging from 325.55 - 359.54 mg / kg. Nickel levels at station III are higher than other stations. The high level of nickel in the sediment at Station III was caused by the proximity of the pollutant source where the station III was close to the nickel processing plant (smelter) compared to the other two stations. In addition, solid waste that has been processed using a smelter, then discharged into the water area of Station III in conducting coastal reclamation using the processed smelter residue in the form of these rocks. The results of research on nickel levels in sediments reported by Halidun (2014), which ranged between 13.52 - 19.21 mg / kg. Based on this research it can be said that, there was a very significant increase in the level of nickel in sediments in Pomalaa waters during 2014 to 2018, this was due to the mining and nickel management activities around the Pomalaa coastal. According to Hamzah (2009) that the parameters of heavy metals that contribute the most to the pollution load are nickel of 3.687 tons / month. The highest contribution was contributed by the factory outlet of 2.887 tons / month. The Huko-huko River is 0.548 tons / month and the Oko-oko River is 0.168 tons / month, while the assimilation capacity for nickel is 2.892 tons / month, so the concentration of nickel pollutant load has exceeded its assimilation capacity limit.

The results of nickel to shellfish measurements that have been carried out at each station with three repetitions were obtained for nickel content in anadara antiquate, ranged from 9.62 - 24.3 mg / kg. The results on Anova showed that the nickel levels in the anadara antiquate significantly different ( $p < 0.05$ ) with a significance value of 0.001 between stations. And the results of the Tukey test between nickel levels in anadara antiquate at station I with station III were significantly different with a significance value of 0.001.



Figur 1. Nickel content in antique ark shells on Dawi-Dawi Village, Pomalaa  
Description: The same letter shows not real difference

The maximum nickel content that can be consumed by every human being is only 2.45 mg / kg within a week, this is confirmed by the statement of Dimitrakakis et al. (2014) these values are determined according to the provisions of the World Health Organization (WHO), that as a safety metal quantity limit from eating fish the maximum weekly dose is 2.45 mg / person / week.

**Keywords:** *Anadara antiquate, Coastal waters, Heavy metal, Kolaka, Nickel, Pollutant,*

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## Development Model of Synergistic Sustainable Marine Ecotourism (Case Study in Pangandaran Region, West Java Province)

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### INTRODUCTION

Marine ecotourism has the potential to cause changes in community behavior, waning social values and norms, loss of identity, as well as social conflict, shifting livelihoods and environmental pollution. Coastal areas in the South Coast of West Java Province have the potential to develop marine ecotourism, one of which is the Pangandaran area which must be transferred into economic value by not damaging natural resources. The development of marine ecotourism in the coastal areas of the Pangandaran area directly or indirectly will have an effect on people's lives, especially for fishermen in the Pangandaran region. (Nurhayati, et.al. 2016).

The development of marine ecotourism in coastal areas will directly involve coastal communities, most of whom work as fishermen. The social characteristics possessed by fishing communities differ from other communities in general. This is caused by differences in the characteristics of the resources faced (Satria, 2002). The development of maritime ecotourism is not only intended to increase foreign exchange for local governments, but is expected to play a role as a national scale development building, so that research on development models of Synergistic Sustainable Marine Ecotourism (Case Study in Pangandaran Region, West Java Province).

The maritime ecotourism development has several advantages, namely diversification of work for fishermen, increasing employment opportunities for fishing families, increasing local tax revenues, accelerating the process of income distribution, increasing the added value of ecotourism products, expanding domestic product markets, and providing multiplier effect on regional economy. (Nurhayati, et.al. 2017). Marine ecotourism development is not only intended to raise foreign exchange for local governments, but are also expected to play a role in maintaining natural resources sustainably. This research aims to analyze the sustainable synergistic marine ecotourism development model.

The method used in this research using quantitative descriptive method. The Quantitative descriptive method is used to describe the general condition of the research area, using primary and secondary data. The technique of taking respondents using accidental sampling as many as 50 respondents consisting of tourists, public figures, fishermen who have side jobs as a provider of marine ecotourism services. The analysis tool used is through a Rapfish model approach to measuring the synergistic model of sustainable development of marine ecotourism.

Rapfish technique (a rapid appraisal technique for fisheries). This technique applies the multidimensional scaling (MDS) principles to assess the sustainability level of various dimensions of fishery resources. This technique is basically a statistical technique that performs a multidimensional transformation into is more simple dimensions (Pitcher, 1999)

In the MDS, two points of the same object are mapped in far-flung points. These points are very useful in regression analysis to calculate the "stress" that is a part of the MDS method [8]. Score on each attribute will form a matrix  $X$ , where  $x$  is the number of areas and  $p$  is the number of attributes used. A good model is indicated by the  $S$ -stress value smaller than 0.25 or  $S < 0.25$  and  $R^2$  close to 1. Index scales that assess the sustainability of the system have the interval of 0%-100%. In this research, there are four categories of status of sustainability, as seen in Table 1. In the MDS, two

points of the same object are mapped in far-flung points. These points are very useful in regression analysis to calculate the “stress” that is a part of the MDS method (FAO,1999). Score on each attribute will form a matrix X, where x is the number of areas and p is the number of attributes used. A good model is indicated by the S-stress value smaller than 0.25 or  $S < 0.25$  and  $R^2$  close to 1. Index scales that assess the sustainability of the system have the interval of 0%-100%. In this study, there are four categories of status of sustainability, as seen in Table 1.

Table 1 Category index and status of sustainability for marine ecotourism

No	Index value	Category
1.	0.0-25.00	Bad: not sustainable
2	25.01-50.00	Low: almost unsustainable
3.	50.01-75.00	Sufficient: simply sustainable
4.	75.01-100.00	Good: very sustainable

## RESULTS AND DISCUSSION

Pangandaran districts are bordered by Ciarnis in the North, Tasikmalaya in the West, Cilacap in the East and the Indian Ocean in the South. The coastal area surrounding this district belongs to six sub-districts. Utilizing marine ecotourism by enjoying coral reef ecosystems as objects in diving and snorkeling activities. The purpose of visitors in diving is not only limited to enjoying the hard coral, but soft coral is also an object in diving and snorkeling tours.

Based on the research ecological dimensions used to determine the suitability of marine ecotourism diving tourism categories, namely the brightness of the waters, coral community cover, type of life form, types of reef fish, current velocity and depth of coral reefs. The activity of utilizing natural resources for the fulfillment of social and economic systems will affect the environmental processes and ecological systems. The activity of utilizing natural resources for the fulfillment of social and economic systems will affect the environmental processes and ecological systems.

One of the efforts to balance natural resources as an object of marine ecotourism in Pangandaran needs to take into account the regional carrying capacity. Carrying capacity as a concept based on environmental approaches and an important part in the study of natural resource management. Carrying capacity is defined as the ability of nature to tolerate human activities. Calculation of the carrying capacity of the marine ecotourism area based on the characteristics of the resource and its designation. Carrying capacity as a level of sustainable use of natural resources or ecosystems without causing damage to natural resources and the environment.

Development Model of Synergistic Sustainable Marine Ecotourism (Case Study in Pangandaran Region, West Java Province) through a multidimensional scaling approach, namely economic, social, technological and regulatory ecology in conditions sufficient to support the sustainability of marine ecotourism in the Pangandaran region. The existence of coastal natural resources in the Pangandaran area needs to be repaired and maintained as well as good management. Strategies that can be done to increase the number of tourists include increasing access to transportation, information and accommodation that are adequate in accordance with tourism standards.

**Keywords:** costal management, marine ecotourism, sustainability

### Acknowledgment

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## **Rationalization Strategy for Floating Net Cage Density (Case Study in Public Waters Resources of Cirata Reservoir in West Java Province)**

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### **INTRODUCTION**

Cirata Reservoir has the main function as a hydroelectric power plant and derivatives, one of them as aquaculture land using Floating Nets cages.(Nurhayati.,et.al. 2014). Based on the Decree of the Governor of West Java Province No. 41 of 2002, the number of floating net cages (KJA) in the Cirata Reservoir is 12,000 plots, which are divided into three zones, namely zone 1 in the West Bandung Regency as many as 1,896 KJA plots, zone 2 in Purwakarta Regency as many as 4,644 plots, and zones 3 in Cianjur Regency, 5,460 plots (BPWC, 2012)

BPWC data on aquaculture activities of floating net cage system in Cirata Reservoir from year to year continues to increase, it can be seen from 2002 the number of floating net cages around 28,000, then in 2008 the number of recorded floating net cages was 51,418 plots, where the figure has exceeded the carrying capacity of 12,000 plots.(West Java Provincial Governor Decree No. 41 of 2002). In 2017 the number of floating net cages in the Cirata Reservoir reached 77,195 plots, with details of 30,008 plots in West Bandung, 34,081 in Cianjur and 13,106 in Purwakarta.

The strategy formulation that will be developed in this research is formulated based on scenarios that may occur in the future (prospective strategic), on the key factors that influence the rationalization strategy for floating net cage density (Case Study in Public Waters Resources of Cirata Reservoir in West Java Province). The data used in this research are primary data and secondary data. The data analysis method used in this research is a prospective analysis using Micmac software.

Prospective analysis is a method used to analyze problems in a system that can combine decision makers in order to reconstitute some planning with a different approach. Hardjomidjojo (2002), prospective analysis is used to predict the possibilities that will occur in the future.

### **RESULT AND DISCUSSION**

The waters of the Cirata Reservoir based on the government regulation are owned by PT Pembangkit Jawa Bali (PJB). This reservoir is one of three reservoirs built in the Citarum River Basin (DAS), West Java Province. The first reservoir was Jatiluhur Reservoir in Purwakarta Regency, the second reservoir was Saguling Reservoir in Bandung Regency, and the third reservoir was Cirata Reservoir, which inundated part of Purwakarta (27%), Cianjur (47%), and Bandung (26%) districts. Cirata Reservoir was built in the era of President Soeharto, namely in 1984 to 1987 (Maman 2009).

Based on the results of the literature study and in-depth interviews with relevant stakeholder rationalization strategy for floating net cage density (Case Study in Public Waters Resources of Cirata Reservoir in West Java Province). Quadrant I determinant variables (input) are factors that have a very strong influence and have properties not dependent on other factors in the system (independent variable).(Nurhayati.,et.al. 2014). Based on this research rationalization strategy for floating net cage density (Case Study in Public Waters Resources of Cirata Reservoir in West Java Province) no stakeholder occupies quadrant I or has a very strong influence this is because socialization involves all parties and is not dependent on individuals or one agency. (Nurhayati.,et.al. 2015).

Quadrant II connecting variables are key factors that have a very strong influence, but these factors have dependence on others. From the results of data processing using Micmac software in the



efforts of Cirata Reservoir, which has a key variable, namely Cirata Reservoir Management Agency (BPWC), Cianjur Marine and Fisheries Office (DKPP), military, police and Academy regional command Quadrant II connecting variables are key factors that have a very strong influence but these factors have dependence on others. From the results of data processing using Micmac software in the efforts of Cirata Reservoir, which has a key variable, namely Cirata Reservoir Management Agency (BPWC), Cianjur Marine and Fisheries Office (DKPP), military, police and Academy regional command

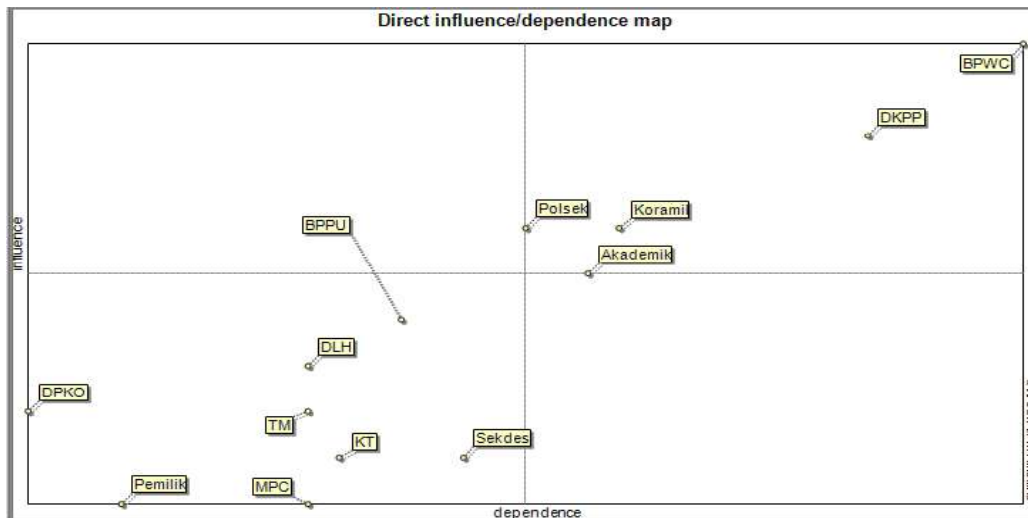


Fig 1. Micmac analysis of the role of stakeholders in the socialization of the reduction of floating net cages in the Cirata Reservoir

Quadrant III The dependent variable (output) is a factor that has a weak driving force and a strong dependence on other factors. In this research there were no results regarding factors or stakeholders that have weak drivers and strong dependence on the socialization of the reduction of the Floating Net Cages Reservoir. Quadrant IV Autonomous variables in this variable have weak driver power and dependence values or are also said to have a weak driving force and dependency in the socialization of the reduction in the number of floating net cages in the Cirata Reservoir. Factors included in this quadrant are the Environmental Service, the Public Fisheries Conservation Agency, Community Leaders, the Village Cirata Caring Society, the Tourism Office and the latter are floating net cages owners, according to the interview those factors are only participating in activities in accordance with the direction of the connecting variable or quadrant II.

The method of reducing floating net cages can also be done based on the ownership of the native or immigrant. The most influential stakeholders and dependency in the socialization of reducing the number of floating net cages is the Cirata Reservoir Management Agency, the Marine and Fisheries Office of Cianjur, the police and academics. The reduction in the floating net cages of the Cirata Reservoir is carried out in stages up to 12,000 plots in accordance with the policy of the Governor of West Java Province, BPWC has planned to conduct training on fish farming and will distribute farmers in accordance with the preferred choice as a substitute for floating net cages business so that no party is harmed. Floating net cages reduction methods that can be done include based on ownership, number, location construction, and condition

From the social and economic aspects there are disputes between farmers if viewed from the social aspect in an effort to reduce the number of floating net cages there are those who choose the pros and cons. Those who choose the pro are small farmers who have little floating net cages, then the cons are the skipper or large cultivator who has more than 100 floating net cages. From the economic aspect the floating net cages caquaculture do not really expect compensation because they realize that the Cirata reservoir is owned by PT PJB. Policy for Control and monitoring of Floating Cages in the Cirata Reservoir



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## Growth of symbiont microbe, *Prochloron didemni* away from the host *Lissoclinum patella* isolated from Manado Bay, North Sulawesi

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### INTRODUCTION

*Prochloron* is a photosynthetic cyanobacterium that inhabits symbiotically cellulose tunics of tropical didemnid ascidian (Schmidt & Donia 2010). It is thought that ascidian as host acquires photosynthetic metabolites provided by *Prochloron* as symbiont, while symbiont benefits from the host (Hirose and Maruyama, 2004). There has not been many efforts to cultivate *Prochloron* outside its host since its discovery in 1975 (Hirose et al. 2009). The only report for successful cultivation of *Prochloron* was from Patterson and Wither (1982) stating that cell division occurred under supplementation of tryptophan in acidic condition at pH 5.5 with low irradiance, since it lacked the ability to synthesize tryptophan.

The microbe associated with Ascidian *Lissoclinum patella*, was obtained from Manado bay by scuba diving. Previously it was identified by using CAO gene that this microbe is in fact *Prochloron didemni* that encodes the same CAO protein (unpublished data). The organism was taken away from coral by knives according to Donia et al., 2011. *Prochloron* cells isolated from *Lissoclinum patella* were poured into three types of medium: sterile seawater, seawater with host extracts, seawater with Hirata medium (Hirata 1975), and seawater with host extract and Hirata. Cultures were placed under 20 watt fluorescent (TL) lamp with aeration at 25-28°C.

### RESULTS AND DISCUSSION

Colonization of *Prochloron* and ascidian appears at the outer surface and upper tunic, inner cloacal cavities and peribranchial space of zoid (Kühl et al. 2012). In *L. Patella* (Figure 1), *Prochloron* is found at tunic and cloacal cavity. *Prochloron* associated with *L. patella* has empty chamber inside cell, no irregular granules, green color and ~21 µm in diameter (Figure 2). According to Kühl et al. 2012, *Prochloron* cells have diameter of ~7–25 µm, are bright green spherical cells with stacked thylakoids oppressed to the cell periphery.



Figure 1. *Lissoclinum patella*

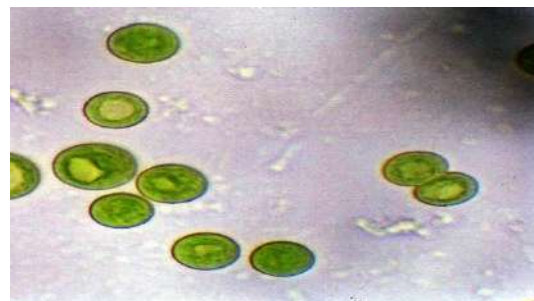


Figure 2. Individual *Prochloron* cells extracted from *Lissoclinum patella*

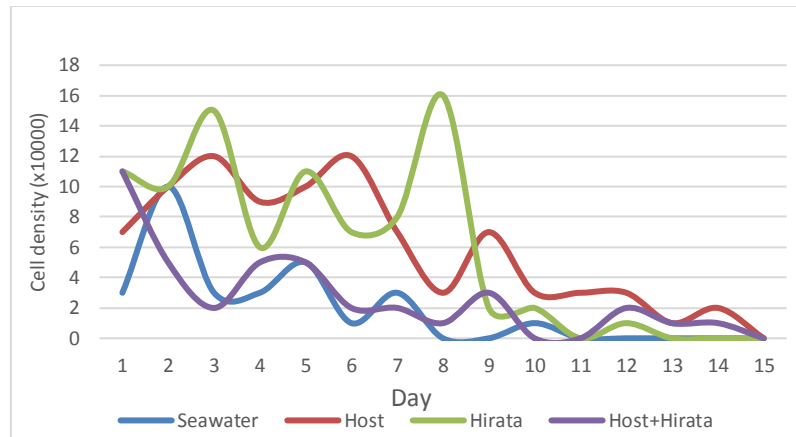


Figure 3. Growth profile of the microbial symbiont, *P. didemni* in laboratory cultivation

As shown in Figure 3 above, outside *L. patella* the microbe cells grew better in Hirata medium followed by that in medium of host extract. Previously there has not been any stable cultivation of *P. didemni* reported (Donia et al. 2011), and was only able to be cultured under acidic conditions (pH 5.5) in the presence of tryptophan (Patterson and Withers 1982).

**Keywords:** growth, symbiont microbial, *Prochloron*, host, ascidian

#### Acknowledgment

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## Phylogenetic Analyses of *Oryzias dopingdopingensis* a Riverine from Malili River System

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### INTRODUCTION

Ricefishes, family Adrianichthyidae, are also another representative freshwater fish group of this island<sup>(4)</sup>, Sulawesi. The new *Oryzias* was discovered in a river, which shares an estuarine region with drainage from the Malili Lakes. In particular, many of the recently described species are found only from a single small lake/pond<sup>(1, 2, 4)</sup> or a single river system<sup>(7)</sup>, suggesting that undescribed species are still present on this island, merely due to being undiscovered. In this study, we compared the new *Oryzias* not only with the Malili lacustrine *Oryzias* but also with all other congeners known from Sulawesi. We also sequenced a mitochondrial DNA region to estimate the phylogenetic position of the new species and to examine the possibility of hybridization with the Malili lacustrine species. Individuals of the new *Oryzias* species were caught from Doping-doping River in central Sulawesi, Indonesia (Fig. 1). Morphometric measurements were followed Kottelat<sup>(3)</sup>, therefore, we amplified and sequenced a mitochondrial region (ND2), using the methods and primers described in Mokodongan and Yamahira<sup>(5)</sup>. All sequences were aligned using ClustalW version 1.4<sup>(10)</sup>, and partial ND2 sequences (907 bp) were extracted. Unique haplotypes were then detected from among the 20 ND2 sequences using DnaSP version 5.10.01<sup>(6)</sup>. ML analysis was performed in raxmlGUI version 1.31<sup>(8)</sup> using codon-specific GTR+I+ $\Gamma$  models, where a rapid bootstrap analysis of 1,000 bootstrap replicates was conducted. The BI analysis was conducted in MrBayes version 3.2.4<sup>(9)</sup>.

### RESULTS AND DISCUSSION

Compared with the four lacustrine *Oryzias* species in Malili Lakes, *O. dopingdopingensis* can be distinguished. The phylogeny based on partial ND2 sequences revealed that Sulawesi adrianichthyids are monophyletic, which was supported by Bayesian posterior probabilities (BPP) 1/4 1 and ML bootstrap (MLB) 1/4 93% (Fig. 2). Notably, *O. dopingdopingensis* formed a monophyletic group with *O. sarasinorum* and *O. eversi*, both of which are known to be "pelvic-fin brooders".

### ACKNOWLEDGMENTS

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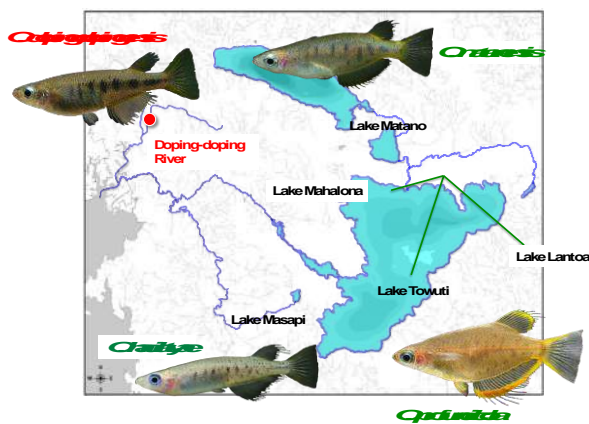


Figure 1. Map of Malili Lake System

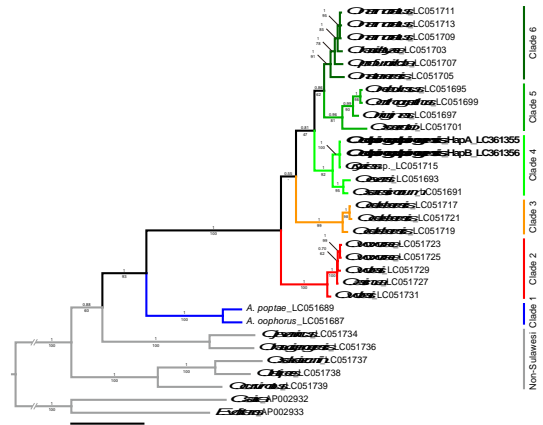


Figure 2. Phylogeny position of *O.dopingdopingensis* based on mtDNA ND2.

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## **Inhibition of Interleukin-8 Production in Interleukin-1-Stimulated Human Monocytic THP-1 Cells by *N,N*-Didesmethylgrossularine-1 Obtained from an Ascidian *Polycarpa aurata* Collected in North Sulawesi**

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### **INTRODUCTION**

In the previous paper (Oda *et al.* 2009), we described the inhibitory activity of *N,N*-didesmethylgrossularine-1 (DDMG-1) on the production of tumor necrosis factor (TNF)- $\alpha$  in lipopolysaccharide (LPS)-stimulated murine macrophage-like RAW 264.7 cells. To compare the difference in the response to DDMG-1 between murine and human immune cells, studies on the effects of DDMG-1 against the production of inflammatory cytokines were performed using human monocytic THP-1 cells, which produced large amounts of interleukin (IL)-8 (abt. 220 ng/ mL) by the stimulation with LPS.

THP-1 cells were derived from an acute monocytic leukemia patient and can be differentiated into macrophage-like cells by for example 12-*O*-tetradecanoylphorbol-13-acetate (PMA) (Tsuchiya *et al.* 1980), and, therefore, this cell line is used for the studies on monocyte/macrophage functions, immune modulations (Chanput *et al.* 2014). LPS is a component of the Gram-positive bacterial cell wall and frequently used as an inflammatory model because of its property to activate macrophages (Poltorak *et al.* 1998). Macrophages play important roles in immune reactions, inflammation, and allergy (Ross *et al.* 2002). In response to LPS and other stimulants, macrophages secrete many kinds of inflammatory cytokines such as IL-1 and IL-6, chemokines such as IL-8, and TNF- $\alpha$  via the activation of nuclear factor-kappa B (NF- $\kappa$ B) (Mendes *et al.* 2009). IL-8 is a member of the superfamily of C-X-C chemokines and is a chemotactic factor for T cells, neutrophils, and basophils. Expression of IL-8 has been detected in various human cancers and it has been suggested to be a factor in tumor progression and metastasis (Galffy *et al.* 1999; Green *et al.* 1997; Konig *et al.* 1999). Regulation of IL-8 production is, therefore, an important target for therapeutic research.

In this study, we found that DDMG-1 reduced the IL-8 production in LPS-stimulated THP-1 cells through the inhibition of the messenger RNA (mRNA) level of IL-8, NF- $\kappa$ B inhibitor (I $\kappa$ B)- $\alpha$  degradation, and binding of NF- $\kappa$ B to the target DNA site, which was specific to the IL-1 $\beta$  signaling pathway.

### **RESULTS AND DISCUSSION**

#### **Isolation of DDMG-1**

DDMG-1 was obtained as a yellow pigment from *P. aurata* collected in the coral reef at Manado, North Sulawesi. DDMG-1 was first isolated from *P. aurata* collected in Chuuk Atoll (Abas *et al.* 1996), and we isolated this compound from an Indonesian *P. aurata* and reported the inhibitory activity against the production of TNF- $\alpha$  in LPS-stimulated RAW 264.7 (Oda *et al.* 2009). Three  $\alpha$ -carboline alkaloids, grossularines-1 (*N,N*-dimethylamino derivative at C-11 of DDMG-1) and -2 (4-hydroxyphenyl derivative at C-13 of grossularine-1) (Moquin-Pathey and Guyot 1989) and DDMG-1 (Abas *et al.* 1996), have thus far been isolated from ascidians. Grossularines-1 and -2 showed the weak cytotoxicity against murine leukemia L1210 cells and more potently to human colon (WiDr)



and breast (MCF7) tumor cell lines (Moquin-Patthey and Guyot 1989, Helbecque *et al.* 1987). Interestingly, the mechanisms of cytotoxicity by these compounds were suggested to be different (Helbecque *et al.* 1987). On the other hand, the biological activity of DDMG-1 has not been reported, and we found for the first time the inhibitory activity of DDMG-1 against TNF- $\alpha$  (Oda *et al.* 2009).

### Inhibition of LPS-induced IL-8 production by DDMG-1 in THP-1 cells

We first examined the effect of DDMG-1 on LPS-stimulated THP-1 cells in order to compare the experimental results from the previous study using murine RAW 264.7 cells (Oda *et al.* 2009). In LPS-stimulated THP-1 cells, large amounts of IL-8 (ca 220 ng/mL) were detected in the culture supernatant, but the production of TNF- $\alpha$  was small. Therefore, the effects of DDMG-1 on the inflammatory cytokine production system were observed for the IL-8 production. The results of the quantitative analysis of IL-8 in the culture supernatant detected by ELISA are shown in Figure 1A, and Figure 1B shows the effects of DDMG-1 on the IL-8 mRNA expression detected by real-time PCR analysis. These results indicated that DDMG-1 inhibited the IL-8 production in LPS-stimulated THP-1 cells, although the inhibitory effects at lower concentrations of DDMG-1 were smaller than those in RAW cells (Oda *et al.* 2009).

Since the transcription factor NF- $\kappa$ B is also greatly involved in the production of IL-8, we examined the effects of DDMG-1 (10  $\mu$ M) on the induction of NF- $\kappa$ B using Western blot analysis (Figure 1C) and EMSA (Figure 1D). These experiments revealed that DDMG-1 suppresses the activation of NF- $\kappa$ B transcription factor. Consequently, DDMG-1 (10  $\mu$ M) had a very similar inhibitory activity against the TNF- $\alpha$  and IL-8 production in LPS-stimulated RAW 264.7 and THP-1 cells, respectively.

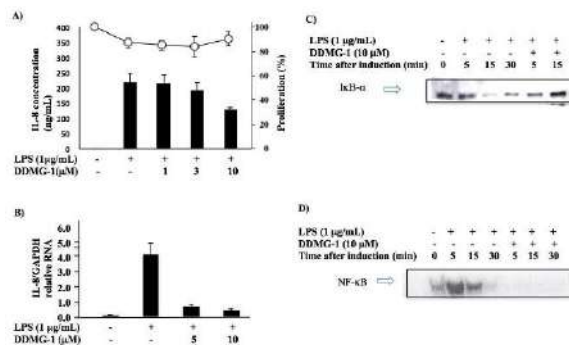


Figure 1. Effects of DDMG-1 on IL-8 production and intracellular signaling molecules in LPS-stimulated THP-1 cells.

### Effects of DDMG-1 on IL-8 production in THP-1 cells stimulated with IL-1 $\beta$ , TNF- $\alpha$ and PMA

Since the production of IL-8 is also induced in THP-1 cells by IL-1 $\beta$ , PMA, and TNF- $\alpha$  as similar to the stimulation by LPS, we examined the effects of DDMG-1 on the IL-8 production in THP-1 cells stimulated with IL-1 $\beta$ , PMA, and TNF- $\alpha$  (Figure 2). Interestingly, DDMG-1 showed the different effects on the IL-8 production in THP-1 cells with the different stimulants. DDMG-1 inhibited the IL-8 production in a dose-dependent manner in IL-1 $\beta$ -stimulated THP-1 cells (Figure 2A). On the other hand, an inhibitory activity of DDMG-1 on the IL-8 production in THP-1 cells stimulated with PMA and TNF- $\alpha$  was not detected (Figure 2B and C), and increased production was observed in PMA-stimulated THP-1 cells (Figure 2B). It will be suggested that DDMG-1 enhanced the activation of THP-1 cells by PMA.

These results indicated that the suppressive activity on IL-8 production by DDMG-1 will be specific to the IL-1 $\beta$  signaling pathway.

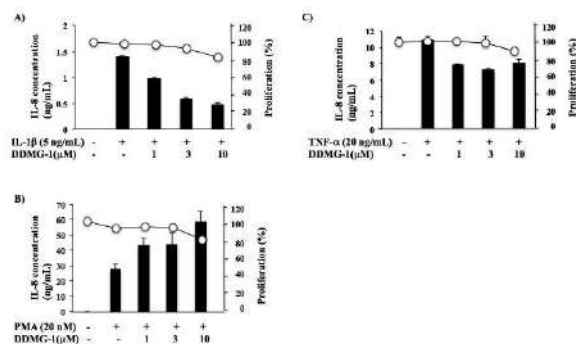


Figure 2. Effects of DDMG-1 on IL-8 production (solid bar) and cell proliferation (open circle) in THP-1 cells stimulated with IL-1 $\beta$  (A), PMA (B), and TNF- $\alpha$  (C).

## CONCLUSIONS

DDMG-1, a rare  $\alpha$ -carboline alkaloid, has been obtained from an Indonesian ascidian *Polycarpa aurata* as an active component against the production of TNF- $\alpha$  from LPS-stimulated murine RAW 364.7 cells (Oda *et al.* 2009). In this study, we examined the effects of DDMG-1 on the inflammatory cytokine production using human monocytic THP-1 cells to compare the results from RAW 264.7 cells. THP-1 cells used in this study produced large amounts of IL-8 by the stimulation with LPS, IL-1 $\beta$ , PMA, and TNF- $\alpha$ . DDMG-1 inhibited the excess production of IL-8 in LPS-stimulated THP-1 cells by the inhibition of the mRNA level of IL-8, I $\kappa$ B- $\alpha$  degradation, and binding of NF- $\kappa$ B to the target DNA site (Figure 1). These results were very similar to those obtained with RAW 264.7 cells. Therefore, the effects of DDMG-1 on the production of TNF- $\alpha$  in RAW 264.7 cells and of IL-8 in THP-1 cells were ascribable to the resemble mechanism. Furthermore, the inhibitory activity of DDMG-1 was specific to the IL-1 $\beta$  signaling pathway, because DDMG-1 reduced the IL-8 production in THP-1 cells by the stimulation with IL-1 $\beta$  but not with PMA and TNF- $\alpha$ .

## ACKNOWLEDGMENTS

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## The Size Variation Of Rotifer *Brachionus rotundiformis* Cultivated With Different Feed At 4 ppt Salinity

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### INTRODUCTION

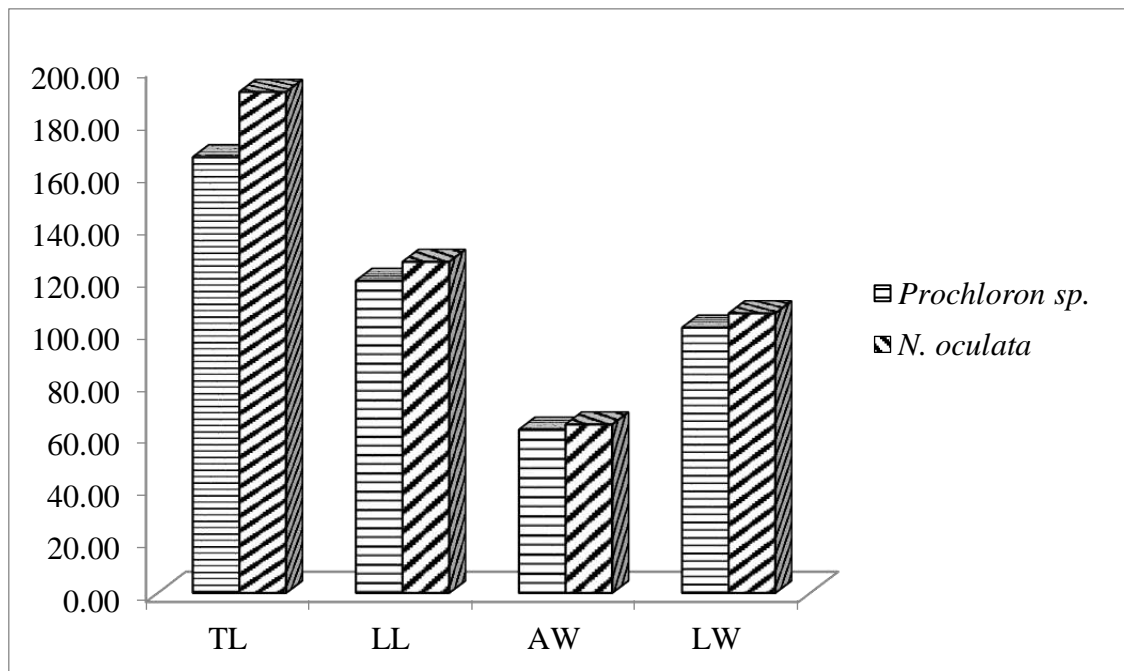
Marine potency resides not only on macro organism but also on microorganism. Plankton has two function in the marine food chain as a primary and secondary producer. Some zooplankton have been widely used as live feed for larvae, namely rotifer *Brachionus rotundiformis*. Rotifer *B. rotundiformis* has the potential to be developed for fish larvae feed in its early stage (1, 2) Rotifer *B. rotundiformis* is favored by a variety of marine fauna larvae because it is a relatively small in size and suitable for larvae mouth. Due to the rotifer characteristics, it is suggested that rotifer could be cultivated as natural food for fish larvae. In an attempt to identify the possibility of cultivating rotifer in a laboratory, this study aimed to determine the variation of rotifer morphometric size cultured with different feed with low salinity (4 ppt).

The study was conducted in Marine Biotechnology, Marine Biology, and Marine Chemical Laboratory, Faculty of Fisheries and Marine Sciences, Sam Ratulangi University. Micro algae used for feeding rotifers were *N. oculata* and *Prochloron* sp. with a density of  $3 \times 10^6$  cells/mL. Micro algae were cultured in Hirata medium. The culture container was equipped with an aerator to promote algal growth. The algae incubator had 20 watt lamps as source of light for algae. The room was set at 25°C. The micro algae used for feeding *B. rotundiformis* was centrifuged and the precipitate was stored in the refrigerator as feed stock. *B. rotundiformis* was cultured in a 1000 mL container. In the early stages, *B. rotundiformis* was cultured at optimum temperature (28 °C) and salinity (20 ppt). Furthermore, *B. rotundiformis* was adapted at 4 ppt salinity. The water was measured with a refractometer until a salinity of 4 ppt was obtained. The adaptation of *B. rotundiformis* in different salinity was done by decreased the salinity of the medium 2 ppt every two days in a 10 mL reaction tube containing 10 individuals. After adaptation, *B. rotundiformis* was transferred into a 1000 mL container with a density of 50 individuals and cultured at 4 ppt salinity with two different feed types (*N. oculata* and *Prochloron* sp.). The morphometric measurements were based on three parts, namely the length of the lorica (LL), the width of the lorica (WL) and the anterior width (AW) (3).

### RESULTS AND DISCUSSION

The study demonstrated that there are higher variation of rotifer *B. rotundiformis* morphometry with different feed treatment and cultivated at 4 ppt salinity. The study showed that the smallest rotifer *B. rotundiformis* morphometry was found in rotifer fed with *Prochloron* sp. (Figure 1). This phenomenon was likely due to the polymorphism of rotifer *B. rotundiformis*. Polymorphism was the condition where shape and size of the lorika undergoing changes to a kind of plasticity if the environmental conditions transformed (4). This polymorphism can lead to a considerable difference of 15% morphometric (5). The results showed that feeding *Prochloron* sp. to *B. rotundiformis* resulting in a smaller morphometric size when compared to *N. oculata* feed. This result was expected. Moreover, this results demonstrated this situation could be beneficial since marine biologist could manipulate the development of *B. rotundiformis* as a natural feed that fits different sizes of fish larval mouth. The morphometric of rotifer *B. rotundiformis* fed with micro algae *Prochloron* sp. at 4 ppt

salinity was smaller than that of the rotifer fed with *N. oculata*. Further investigations should be conducted on how to accelerate the cultivation of micro algae *Prochloron* sp. as feeding for *B. rotundiformis*.



**Figure 1.** Morphometry ( $\mu\text{m}$ ) *B. rotundiformis* with assorted feed  
TL= Total Length, LL= Lorica Length, LW= Lorica Width, AW= Anterior Width

**Keywords:** Micro algae, Morphometric, Rotifer

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## Ecological Suitability Analysis Of Ecotourism Mangrove Bay Labuan Uki Bolaang Mongondow Regency North Sulawesi Province

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### INTRODUCTION

The Bay of Labuan Uki area has a great potential mangrove ecotourism to be developed. This research aims to: 1) identify the potential of mangrove ecosystems in the bay of Labuan Uki, 2) analyzes the level of ecological suitability for mangrove ecotourism development in the bay of Labuan Uki. Research was done in the area of the bay of Labuan Uki, Lolak sub district, Bolaang Mongondow Regency, North Sulawesi Province from May until July 2018. This study used a survey method, measurement field and determination of the suitability of ecology. There are five parameters measured namely: the thickness of mangrove, density of mangroves, type of mangroves, tides, the object of biota, where each parameter is given more weight. The value of the field each parameter measured, categorized in four (4) classifications. Furthermore, the value of each parameter using the multiplication of field values of weights. To find out the index of mangrove ecoregion ecotourism suitability in Labuan Uki bay was calculated from the percentage level of compliance based on the summation of the values of all parameters.

### RESULTS AND DISCUSSION

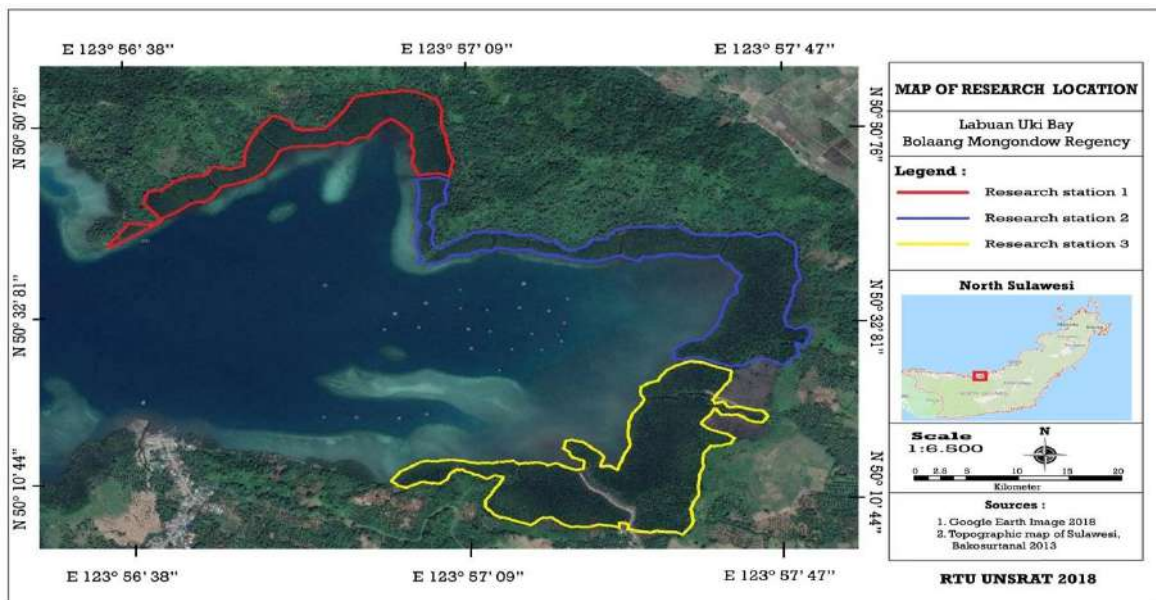


Figure 1. Map of research location

The results of research from 3 (three) stations observed, showed that the index suitability ecoregion are: station 1 = 78%; station 2 = 78%; and station 3 = 86% respectively This data shows that the station 1 and station 2 entered the category of suit, whereas the station 3 entry category which is very appropriate for the basis of the region's mangrove ecotourism (see table 1).



**Table 1.** The results of the ecological suitability assessment of mangrove ecotourism Labuan Uki Bay

No	Parameter	weight	Station					
			I		II		III	
			value	score	value	score	value	score
1.	The thickness of mangrove (m)	5	2	10	2	10	3	15
2.	density of mangroves (ind/100m <sup>2</sup> )	4	3	12	3	12	3	12
3.	type of mangroves	4	4	16	4	16	4	16
4.	tides (m)	3	3	9	3	9	3	9
5.	the object of biota	3	4	12	4	12	4	12
	<b>Total score</b>			59		59		65
	<b>index suitability ecoregion (%)</b>			78		78		86
	<b>suitability level</b>			suitable		suitable		very suitable

**Keywords:** *Ecotourism, Mangrove, Labuan Uki Bay, Bolaang Mongondow*

### Acknowledgment

Authors would like to thank Sam Ratulangi University for facilitating this study.

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## The Potency, Habitat and Distribution of Mud Crab (*Scylla* spp.) in Kahakitang Island, Tatoareng District, Sangihe Island Regency, North Sulawesi Province - Indonesia

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### INTRODUCTION

Mud crab is one of an important coastal fisheries commodity in North Sulawesi; however their existence is still unknown. There were many unidentified crabs found in Kahakitang Island, Tatoareng District.

The study aims to obtain data and information on the potency, habitat and distribution of mud crabs based on the existence of the species abundance, habitat characteristics and its distribution.

Sampling was done at 2 stations at Kahakitang Island; northern and southern coasts from July to August. Temperature (<sup>0</sup>C) and pH at the time of collection were measured using a thermometer and pH meter, respectively. Specimen collected were numbered, sexed and measured. Measurements were taken with calipers to the nearest 0.01 mm at the 2 positions, carapace width (CW) and chelae length (CHL). The methods used were survey and data analysis.

### RESULTS AND DISCUSSION

The result showed that mud crabs lives abundantly along Kahakitang Island. The area of the Northern Coast associated with mangrove forests and sandy stone while in the Southern Coast the area is covered with sandy mud substrate.

The average water temperature was (27<sup>o</sup>C) and pH (5.5 – 8.5). Both males and females were found during sampling. The average size of crabs collected was 69.5mm CW and 21mm CHL. The average sizes of collected crabs were below 130mm CW. A further study needs to be done in order to find the reason of the under size mud crabs.

### CONCLUSION

Mud crab could be found in the designated area of research. They were distributed mostly in the northern part of the island. A probably new mud crab species is found, however further investigation needs to be done.



Figure 1. Habitat and Distribution



Figure 2. Dorsal and ventral view of an unidentified mud crabs

**Keywords:** crab, *Scylla* spp, habitat, distribution, Sangihe Island Regency, North Sulawesi

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## **Transformation of tool and Equipment in Improving Production and Revenue sa well as Local Fisheries Welfare in Tabalanusu Village, Depapre District Jayapura Regence, Papua Province.**

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### **INTRODUCTION**

The use of local Fishing tool and equipment in Tablanusu Vellage, Depepre District, Jayapura Regence, Papua Province. The Title focus on the transformation process fishing toll equipment to be more innovative the productive is order increase capture production which effects income and increase the level of welwre families. This research has short term, long term and specific objectives can be explained as fallows.

The short-term objectives in this study are the process oof transferring the use of fishing gear ad fishing equipment from traditional type to use of more innovative and productive fishing tools and equipment. While the long-term goal is to change the thinking and behavior of local fishing community groups about life oriented of family needs to market social values among families to an econoic value.

This specific objectives in this study are as follows:

- 1). Knowing the knowledge of the fishermen related to method of finding and catching fish, icluding time, place and method of using fishing tools and equipment.
- 2). There ha been a change in the mindset of the activities of the capture fisheries fishing, community which was originally a gatherer and only fulfilling the needs of the family, will move to the market world
- 3). Transmarmation of the use of traditional fishing gear equipment to more innovative and produvtive tools equipment
- 4). The is an increase in catch production both quantitavely and qualitatively
- 5). Inceas income to meet basic need such as clotng, food, shelter, education and health for the local fishers captureas fishing community.
- 6). Inceasing the level of wealfare of localifisheries capture as fishing community.

### **RESULTS AND DISCUSSION**

In achieving the objectives stated above, this study iuses qualitative method of case study type with adescriptive approach. Case studies explain social phenomenon the occurs and develops among certain communities. Qualitative research emphasize research produser the produce qualitative or descriptive data, wich allows the researcher to understand the community personally and view them as they express their empirical worldview.

Quaalitative research produses descriptive words data in the form of words or impressions of the observed actors/informants. Qualitative data in this contex is needed, use and given meaning, the described so that the data gives meaning to what is the object of research.

**Keywords:** Transformation of Traditional Tool/Equipmen, Productive and innovative

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## Detection of Patellamide C, E, F and Ulithiacyclamide on Wild Symbiont Microbe of *Lissoclinum patella* from Manado Bay, North Sulawesi, Indonesia

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### INTRODUCTION

Colonial ascidians from the genus *Lissoclinum* are prolific sources of biologically active secondary metabolites. Over 40 compounds, including cyclic peptides, macrolides, thioalkaloids and diterpenoids have been reported from *Lissoclinum* species (Rashid *et al.*, 1995). Ascidians also produce a variety of bioactive amino acids derived secondary metabolites such as didemnins and lissoclinum peptides (Mc Donald and Ireland, 1992). Didemnin B, isolated from *Trididemnum solidum* is the first marine natural product evaluated in clinical trials as an anticancer agent (Chun *et al.*, 1986). The heptapeptide lissoclinamides and the octapeptide patellamides and ulithiacyclamides from *Lissoclinum patella* Gottschaldt (Didemnidae) are characterized by unusual thiazole and oxazoline amino acids and exhibit strong in vitro cytotoxicity (Mc Donald and Ireland, 1992).

Rumengan *et al.* (2009) has successfully isolated several species of symbiont microalgae from Ascidiacea including from the genus *Lissoclinum* collected from Manado bay waters dan also has cultivated those microalgal symbiont in laboratory. Further identification of those cultivated microalgal symbiont of *L. patella* as well as the wild ones using CAO primer was revealed the existence of *Prochloron didemni* both in cultivated medium and also inside its original host (Rumengan and Roring, 2015). This study was conducted to detect the existence of biologically active secondary metabolites derived from the lissoclinum symbiont microalgae isolated from Manado bay.

Detection and structure elucidation of lissoclinum symbiont metabolites were conducted on the basis of chemical analysis, spectroscopic methods and comparison with the reported data. The crude extract of wild microalgal symbiont paste was freeze dried, partitioned to Sep-Pack C18 followed by gradient elution Open column chromatography on Silica gel 60 and RP-HPLC on COSMOSIL 5C18-AR-II and then subjected to LC-MS using Capcell pack C18 UG120 to detect Patellamide C, E, F and Ulithiacyclamide.

### RESULTS AND DISCUSSION

Based on the chromatogram of LCMS (Figure 1) it can be detected the existence of Patellamide C, Patellamide F and Ulithiacyclamide m/z 763 as well as Patellamide E m/z 791. This study will be important to provide standard compounds as well as to become initial step for detecting bioactive compounds on cultivated sample.



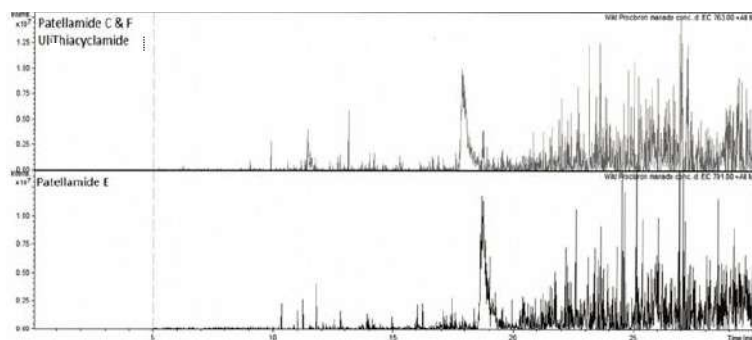


Figure 1. LC-MS Chromatogram of crude extract of wild symbiont microalgae

## CONCLUSION

There were four cyclic peptides namely Patellamide C, E, F and Ulithiacyclamides have been detected on wild symbiont microbe of *L. patella* collected from Manado Bay, by chemical analysis, spectroscopy method and comparison with reported data.

**Keywords:** wild symbiont microalgae, ascidiaceae, cyclic peptides

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## Structural determination with isolation of antioxidant component algae *Eucheuma spinosum* collected from Nain Island, North Sulawesi – Indonesia

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### Introduction

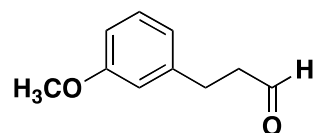
Algae are known as a very slow damaged marine organism since their cells possess antioxidative mechanisms and antioxidant components. Marine algae known as fisheries product has long been utilized as foodstuffs in some Asian countries especially China, Korea, and Japan [1].

Marine algae are considered as a source of bioactive compounds as they are able to produce a great variety of secondary metabolite characterized by a broad spectrum of biological activities [2]. Algae are known as a very slow damaged marine organism since their cells possess antioxidative mechanisms and antioxidant components [3]. They are rich in soluble dietary fibers, proteins, minerals, vitamins, antioxidants, phytochemicals, and polyunsaturated fatty acids, with low caloric value. However, like most flora their nutrient contents are affected by external factors such as the geographic location, environmental, season, sampling conditions. Usually they are only used as gelling agent and stabilizers in the food and pharmaceutical industries, but current research has revealed their potential medicinal uses against cancer, allergy, diabetes, oxidative stress, inflammation, thrombosis, obesity, lipidemia, hypertensive and other degenerative ailments. Although the majority of researches were on mammals, the trials on humans and epidemiological studies supported these findings [4]. In recent years, the continuous discovery of natural products with antioxidant activity from marine alga has attracted considerable attention.

In the course on the bioactive components from marine algae, we found that the MeOH extract of Indonesian red algae *Eucheuma spinosum* exhibit the antioxidant activity. Chemical study on the MeOH extract led to the isolation of 3-(3-methoxyphenyl)propanal (**1**, Figure 1).

We report herein the isolation and structure of 3-(3-methoxyphenyl)propanal (**1**), which had exhibit the antioxidant activity.

**Figure 1.** Structure of compound (**1**) isolated from *E. spinosum*.



3-(3-methoxyphenyl)propanal (**1**)

### Result and Discussions

The MeOH extract of Indonesian seaweed *E. spinosum* showed antioxidant activity and separated into twenty-five fractions (Fr.1–Fr. 25) by octadecylsilyl (ODS) column chromatography. 3-(3-methoxyphenyl)propanal (**1**) was isolated from the combination of fraction 6 and 7. The antioxidant activity was detected in fraction 6 and 7, and TLC separation of fraction 6 and 7 gave an antioxidant compound of **1**.

The <sup>13</sup>C NMR spectrum showed 10 resolved signals, which were classified into one oxygenated

methyl, two methylene, four sp<sup>2</sup> methine, one oxygenated sp<sup>2</sup> quaternary, one sp<sup>2</sup> quaternary, and one carbonyl carbon by the analysis of 1D and 2D NMR spectra (Table 1). The <sup>1</sup>H NMR spectrum displayed 12 proton signals, and one signal at δ 3.90 was assigned as methoxy protons (3'-OMe). The connectivity of carbons and protons was established by HMQC correlations.

**Table 1.** <sup>13</sup>C (125 MHz) and <sup>1</sup>H (500 MHz) NMR data for 3-(3-methoxyphenyl)propanal (**1**)

No	δ <sub>C</sub>	δ <sub>H</sub> (J = Hz)	HMBC
1	192.8	9.75 (1H; s)	5'
2	46.3	2.74 (2H; t; 3.25; 1.3)	3
3	30.1	2.10 (2H; s)	2, 6'
1'	133.2	-	-
2'	117.1	6.90 (1H; d; 9.1)	-
3'	156.7	-	6'
4'	116.2	6.68 (1H; d; 8.45)	-
5'	133.5	7.76 (1H; d; 8.4)	4', 2
6'	130.3	7.00 (1H; d; 8.4)	2', 1, 2
3'-OCH <sub>3</sub>	56.4	3.90 (2H; s)	-

The presence of aromatic ring was assigned by the <sup>1</sup>H-<sup>1</sup>H HMQC and HMBC correlations of the <sup>1</sup>H NMR signals.

Antioxidant assay showed different DPPH content in all samples condition (p < 0.05) in the three MeOH concentrations. The fresh *E. spinosum* has the highest DPPH content and the highest was recorded in 60 % methanol, 75.27 ± 0.29 (Table 2).

**Table 2.** DPPH content in different forms of *E. spinosum*

MeOH (%)	DPPH (%)	
	<i>E. spinosum</i> (fresh)	<i>E. spinosum</i> (dry)
60	75.27 ± 0.29 (b)	64.27 ± 1.44 (b)
70	65.19 ± 1.09 (a)	59.32 ± 1.20 (a)
80	66.77 ± 1.08 (a)	58.53 ± 0.61 (a)

A 1,1-diphenyl-2-picrylhydrazil (DPPH) compound is stable and actified radical by delocating the free electron on a molecule containing free radicals, so that the molecule becomes unreactive. The free radicals are highly reactive and unstable molecules since these have one or more unpaired electrons. Capture mechanism of DPPH radicals by the antioxidant occurs through proton donation to the radical. Therefore, the compound that enables to donate its proton contains strong radical capturing activity [5, 6]. The compounds belong to phenolic, flavonoid, tannin, and alkaloid groups, and the compounds with many sulfide groups. Proton donation causes the violet colored-DPPH radical to turn to colorless non-radical compounds. Thus, the radical capture activity could be counted from DPPH radical scavenging. The remaining DPPH radical content was spectrophotometrically measured at λ 517 nm [5, 7]. The inhibitory ability against the free radicals is affected by the extent of extract concentration. The DPPH activity generally rises with extract increment up to certain concentration. Then it will decrease with more concentration addition. The DPPH test was extensively used in natural product studies for antioxidant isolation and extract and pure compound ability to absorb the radicals [8].

The active fraction was purified with reverse phase TLC with 90% MeOH to give compound **1**.

3-(3-methoxyphenyl)propanal (**1**): <sup>1</sup>H NMR (CDCl<sub>3</sub>): δ 9.75 (1H, s), δ 2.74 (2H, t, J = 3.25, 1.3 Hz), δ 2.10 (2H, s), δ 6.90 (1H, d, J = 9.1 Hz), δ 6.68 (1H, d, J = 8.45 Hz), δ 7.76 (1H, d, J = 8.4 Hz), δ 7.00 (1H, d, J = 8.4), δ 3.90 (2H, s). <sup>13</sup>C NMR : δ 30.1, 46.3, 56.4, 116.2, 117.1, 130.3, 133.2,

133.5, 156.7, 192.8.

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## **A Pilot Study of Finding the Factors that Influence the Absence of Native Kupang be a Leader in Industrial Position at Kupang, East Nusa Tenggara, Indonesia**

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### **INTRODUCTION**

Kupang as the capital city of East Nusa Tenggara province, is a strategic region for economic growth that become primary foundation to the development of the industrial and other business sector. This industrial and business sectors growth has put Kupang as a developing region and become investment destination. Investors from all over Indonesia and even from overseas has open their business and representative offices in Kupang. For example the national automotive dealers, national and international-wide banks, hospitals, shopping malls, schools, universities, and so on. In fact, the human resource development growth left behind the growth of real sector in Kupang. As this research been done, we have noticed that all 34 companies from various type of organizations, there are phenomenon where all leaders of both business and industrial sector are coming from out side Kupang that drives the absence of native Kupang in certain strategic position. This is the main research question that needs an answer. This research aims to find the factors that caused this phenomenon where nearly no native Kupang in certain strategic positions in both industrial and business sectors. Through surveys from different respondents such as college students, both employed and unemployed, human resource departments, and companies leaders. This research focused on these variables: demography, moral, and work culture. Further more the author will compare the three variables questioned between group of respondent of non-organizational leaders and the expectation of those the organization leaders in Kupang. The outcome of this research is to find a solution in the form of proposal to the industrial sector, education, both regional and central government have a grand design of education programs and policies for native Kupang people to be more eligible and capable as a leader in business organizations in their own region.

### **RESULTS AND DISCUSSION**

Based on the result of this research, the authors come up with a summary that at least there are four reason that drives most company leaders in Kupang not choosing native Kupang people to fill the position as leaders. The main reason is they have lack of self emotion control, minimum loyalty level, minimum creativity, and no sufficient desire for self improvement, far from the baseline set by company leaders. This is why those four factors needs more attention than other factors, that should get immediate action to be improved so that they would have equality with others out side Kupang, for a chance to be leaders in business and other industrial organization. To enhance native Kupang people of their lack of self deficiency, there would be better to have a development programs for those students, college student and Kupang society in general, so that deficiency they have be diminished while capabilities and eligibly improved. The next step as the continuation of this research, a survey about factors that drives loyalties of native Kupang people would be conducted.

**Keywords:** demography, industrial in kupang, moralities, occupation, work culture

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## **THE PROFILE OF HEART ATTACK SYMPTOMS OF CARDIOVASCULAR PATIENTS AT XYZ HOSPITAL**

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### **INTRODUCTION**

According to the World Heart Federation research, cardiovascular disease has the highest mortality rate in the world. The WHO stated that among the 56.4 million deaths in 2015 due to the top 10 causes, about 54% were attributed to cardiovascular disease. The disease accounted for 15.54% of total mortality in 2017 according to the Agency of Research and Health Development Indonesia. In general cardiovascular disease is a silent killer. Heart attacks can come suddenly without showing symptoms. Some symptoms that may appear are like chest pain and short of breath but they often come too late.

Usually cardiovascular patients have abnormal ECG, heart noise, breath noise, blood pressure, pulse, sleeping problem and weight change. The variables are called health condition of the cardiovascular patients. Other than that, cardiovascular disease is influenced by age, gender, job and habit. The variables are called demographic status of the cardiovascular patients. If the profile of heart attack symptom based on these variables can be found, so the protection of cardiovascular disease can be increased by taking attention of the profile of heart attack symptom. The heart attack symptom consists of chest pain or short of breath.

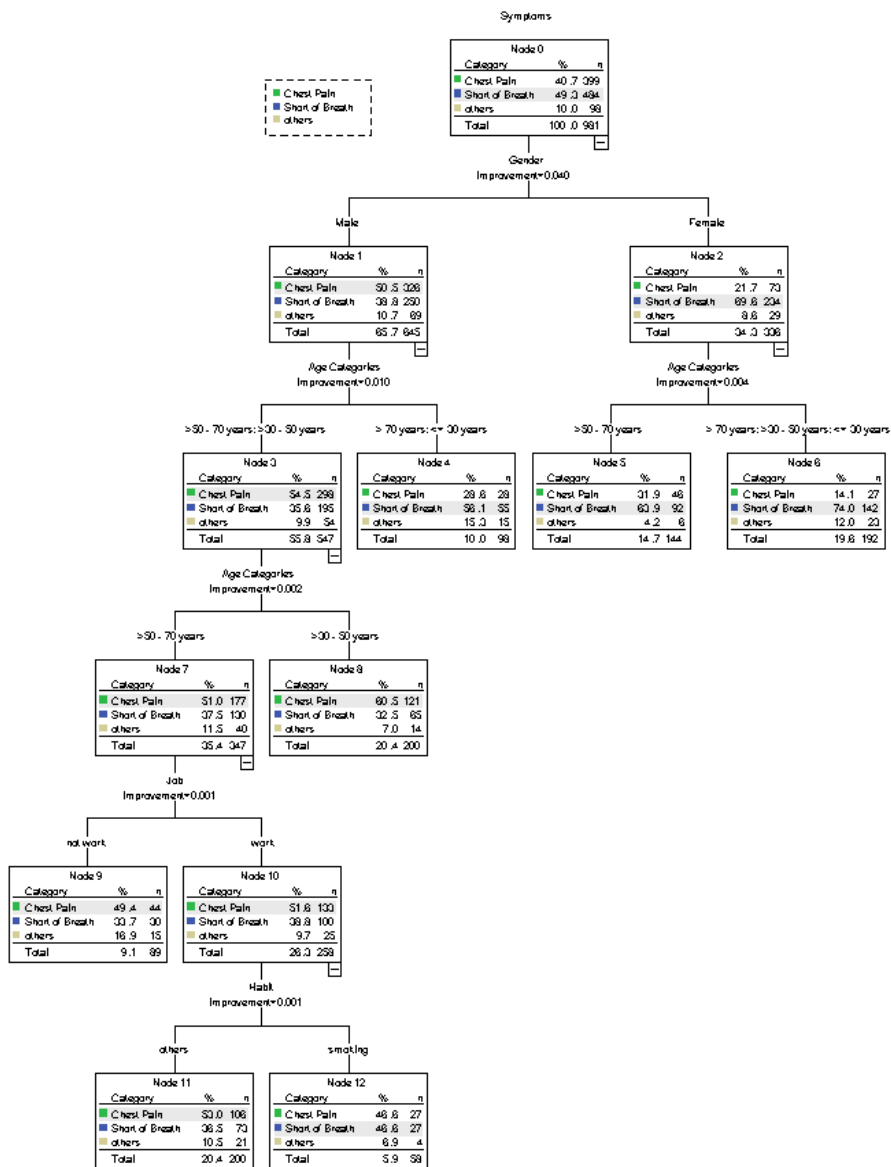
The study will try to find the profile of the heart attack symptom of cardiovascular disease (chest pain and short of breath) based on health condition of the patient (ECG, heart noise, breath noise, blood pressure, sleeping problem and weight change) and the demographic status of the patients (age, gender, job, habit). The data analyzes are made separately between demographic status variables and the joint of health condition variables and demographic status variables.

The study uses data 1076 cardiovascular patients at XYZ Hospital in Indonesia and the data analyses are made by using Classification Tree method.

### **RESULTS AND DISCUSSION**

**The profile of the heart attack symptom based on demographic status of the cardiovascular patients.**

The Classification Tree results Figure 1 below:



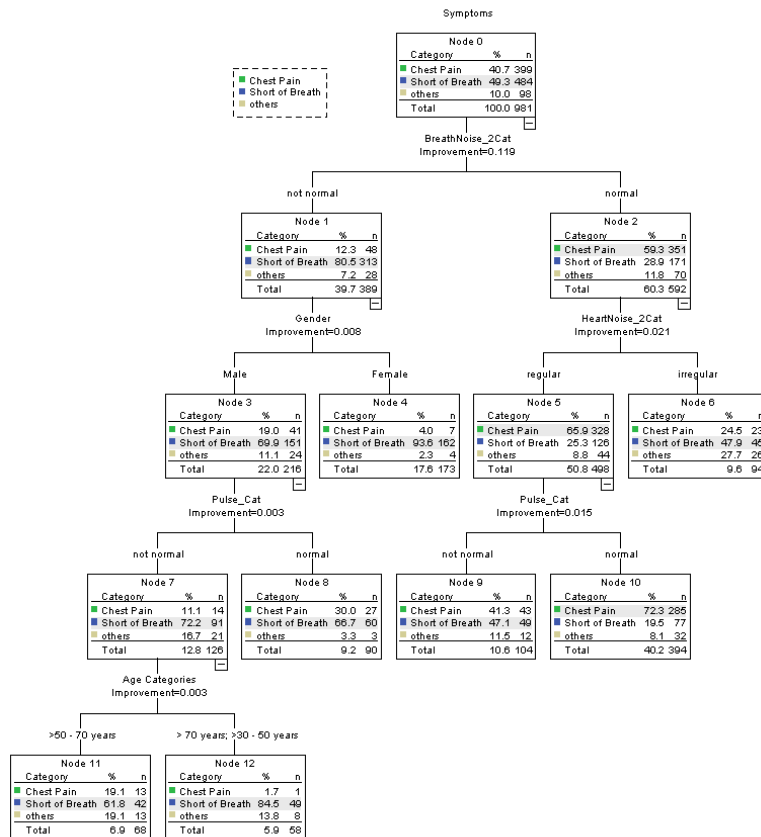
**Figure 1** Tree Diagram Demographic Status

From the Figure 1 above, the results are:

- The variable that most influence the symptom is gender, for male 50.5% will have symptom chest pain but for female 69.8% will have symptom short of breath.
- For male with age more than 70 years old or smaller than 30 years old, 58.1% will have symptom short of breath
- For male with age 50-70 years old, not working, 49.4% will have symptom chest pain
- For male with age 50-70 years old, working, smoking, 48.8% will have symptom short of breath
- For male with age 50-70 years old, working, not smoking, 50% will have symptom chest pain

**The profile of the heart attack symptom based on health condition and demographic status of the cardiovascular patients.**

By using The Classification Tree it found the Diagram Tree on Figure 2 below:



**Figure 2** Tree Diagram Health Condition and Demographic Status

From the Tree diagram Figure 2 above, the results are:

- The variables that most influences the symptom is the breath noise. If the breath noise is not normal, 80.5% will have symptom short of breath. If the breath noise is normal, 59.3% will have symptom chest of pain.
- If the breath noise is not normal, for female, 93.6% will have symptom short of breath. For male 69.9% will have symptom short of breath.
- If breath noise is normal, heart voice regular, pulse is nor normal, 47.1% will have symptom short of breath
- If breath noise is normal, heart noise regular, pulse is normal, 72.3% will have symptom chest pain.
- If breath noise is normal, heart voice irregular, 47.9% will have symptom short of breath.

**Discussion**

From the result above, people who do not check their health condition must be careful with their demographic status. Female must be aware with short of breath. It can be a sign of the appearance of cardiovascular disease. In general, male with age >70 years old or < 30 years old must be aware when they feel short of breath. Male who are 50-70 years old, working and smoking must also be aware with short of breath. Male must be aware with chest pain especially for men with age 50-70 years old, working and not smoking. If the sign of the profile appear, the patients must be careful and check their health condition.

When people check their health condition and combine the result with their demographic status they must be careful with breath noise especially when their breath noise is not normal. If the breath noise is not normal, they must careful when they feel short of breath though they have regular heart noise. When they have regular heart noise, not normal pulse they must also be aware with the appearance of short of breath. When their pulse is still normal, they must be aware with the appearance of chest pain.

**Keywords:** *Cardiovascular symptom, breath noise, chest pain, classification tree, heart noise, pulse, short of breath*

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## Development Of Physics Teaching Materials Based On Multimedia Software

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### INTRODUCTION

The use of information and communication technology in this era no longer knows the limits of space and time. The information can be obtained easily and quickly away in various parts of the world also human relations through various media such as mobile phones, radio, television, films and social media Internet like facebook, *Twitter*, *chatting*, *path*, e-mail ect always become presenters that are used by people including school-age children. In education's world, the learning process will take place well if the communication activities in question also run well. (Haryanto, 2010). Preliminary observations have been made at Tondano 1 Public High School as the object of research especially in X class found that students learning outcomes in odd semester 2014-2015 average score results 2,65 and have not expected result. Conventional learning methods and media still dominate the learning process and makes it monotonous so that is one reason students are less motivated by learning physics.

The education now currently requires teachers to be creative and innovative including teachers in physics. That mean the teachers must be able to use suitable teaching strategies including approaches, models, methods and learning media. Based on the description above, its seen necessary to conduct research about development of teaching materials physics based on multimedia software.

This research used by Research and Delevopment (R & D) method with design by subject of experiment and four-D-models of development by Thiagarajan, Semmel and Semmel. The independent variables studied were TAI models based multimedia software learning and the dependent variable was student learning outcomes. The purpose of this Development research is produce physics materials teaching based multimedia software that improve and facilitate the learning process and effect of the use of physics materials teaching based multimedia software to physics achievement. The subject of this research are X science 5 class with 28 numbers at SMA Negeri 1 Tondano. This models consist of 4 step that are 1) define 2) design 3) develop and 4) disseminate physics materials based multimedia software has been test by materials and media expert with questioner and has been revision. After that, the materials physics has been tested by students in small class to known the students respons and test by students ini real class to analysis physics achievement. In the real class, students has given two treatment also called one period and two period. One period, students has taught by conventional models by commonly media used and Second period, students has taught by team assested individualization (TAI) cooperative learning combine with physics materials teaching based multimedia software that is research produce.

### RESULTS AND DISCUSSION

Physics teaching materials based on multimedia software has been evaluated twice by media and material experts by comparing the total value achieved with the maximum value multiplied by 100%. The last evaluation was 97% and included in a very strong category.

$$\frac{N_{tercapai}}{N_{max}} \times 100 \% = \frac{97}{100} \times 100\% = 97 \%$$



Picture 1. Continuous evaluation by media expert

After the designed product development is complete, the product is used in the learning process and evaluates the learning outcomes of students using the analysis by experiment design on first period (conventional method) and second period (cooperative method).

This research through several analysis including normality test as a requirement for hypothesis testing. The significant of normality by first period is 0.297 and the second is 0.256 is higher than the 0.05 of degree so that we conclusion that both of period are normal distribution. Hypothesis test used by *paired-samples t-test* is an analysis involving two measurements on the same subject to a certain influence or treatment as in the case of this study. The test aims to examine the average difference between two paired samples test. The analysed of this research used by SPSS application like the table below.

**Paired Samples Statistics**

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Periode1	2.3857	28	.37289	.07047
	Periode2	3.1143	28	.30998	.05858

**Paired Samples Test**

Pair 1	Periode1 - Periode2	Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
		-.72857	.19787	.03739	-.80530	-.65184	-19.483	27	.000

$H_0 = \mu_1 \leq \mu_2$  : " Average learning outcomes of students taught with a TAI-based Multimedia software is lower or equal to student learning outcomes taught by conventional models".

$H_1 = \mu_1 > \mu_2$  : " The average learning outcomes of students taught by the TAI-based multimedia software is higher than student learning outcomes taught by conventional models".

Analysis results by SPSS test  $t_{count}$  output -19.483 while table statistics with  $\alpha_{5\%}$  significance,  $n-1$  degree of freedom and two tailed significant  $t_{tabel}$  -2.473. Because of  $-t_{count} < -t_{table}$  or  $-19.483 < -2.473$  and based on significansi  $< 0.05$  so that  $H_0$  is rejected. The conclusion said that physics achievement of students that teach by TAI models used physics materials based multimedia software is higher than physics achievement of students are taught by conventional model. So that, the teaching and learning process is better by using physics teaching materials based on multimedia software.

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## **Essence of the Transparency and Accountability of the Legal System of Land Registration In Indonesia**

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### **ABSTRACT**

This study aimed to analyse and explain the transparency and accountability of land registration in Indonesian and system How the land registration gives rule of law. Factor affects in the land in registration Indonesian.

Type of this study is normative and emnpirical research, sample is done by data collecting technique through interview and questionnaire.

The result of study indicate the essence of transparency and openness accountability and in land registration system because the community knows how far the procedure of land registration and how must cost will be charged to administer certificate and how long will be completed with the existing regulation to regulate the land registration that is Act No.45 Article 33 Paragraph 3 UUPA and No.5 of 1960 PP No.24 of 1997, then the community gets rule of and legal protection, factors affecting the land registration, namely legal purpose and culture, as determinant in the process of land registration .Legal substance does still much not know the process of land registration. Legal substance does still much not know the legal procedure with the land registration system.

Recommendation of this study is needed socialization of regulation in the land registration system to public. Therefore, it is expected for the government to change registration system in Indonesian from negative system tend to positive to system so registered land owner get prosperity and fair with the guarantee of legal protection and rule of law of government.

## Effects Of Edutainment Learning Based On Quantum Teaching To Improve The Learning Outcomes Of Plant Pests And Disease Materials In Grade VII Students SMPK Sint Aloysius Niki-Niki Academic Year 2017/2018

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### INTRODUCTION

Improving the quality of education and teaching must always be pursued and implemented by improving the quality of learning. Based on the results of observations and interviews with biology science teachers in SMPK Sint Aloysius Niki-Niki it is discovered that most students of class VII were passive and silent, it is associated with the understanding of the students towards the subject matter that is often not understood or not understood comprehensively upon the knowledge that is memorizing, students are not able to connect between what they learn and how the knowledge can be used or utilized so that the daily test results are well below the minimum mastery standard (Missa, 2017).

The success of the learning process is the main thing coveted in implementing school education. Therefore it is necessary that the learning method that can overcome the existing problems in SMPK Sint Aloysius Niki - Niki, by applying *Learning Edutainment* Based on *Quantum Teaching*. *Quantum Teaching* is a rousing alteration of learning, with all its nuances. In *Quantum Teaching* the aspects described are very interesting and lead to the concept of *Edutainment learning* (Sunarto, 2013). This can be seen from the arrangement of aspects before the learning process is a learning environment that must support and dynamic learning design. Aspects of the learning process include learning process while playing so that the learning atmosphere will be lively and exciting.

*Quantum Teaching* is an orchestration of the various interactions that exist in and around the moment of learning. These interactions include elements for effective learning that affect students' success. These interactions transform the ability of students' natural talents into light that will benefit themselves and others (Deporter, 2003). *Quantum Teaching* has five principles that can affect all aspects of *Quantum Teaching*, that is Everything speaks, Everything has purposes, Experience prior to naming, Acknowledge every effort, If it's worth studying, it's worth celebrating (Sunarto, 2002). Based on the above background, the research team was interested in conducting research entitled "The Effect of *Edutainment Learning* Based on *Quantum Teaching* to Improve Classroom Student Learning Outcomes Materials VII Plant Pests and Diseases in SMPK Niki-Niki Sint Aloysius School Year 2017/2018"

The purpose of this research is to know the Influence of *Edutainment Learning* Based on *Quantum Teaching* to Improve the Learning Outcomes of Class VII Students on the materials of Plant Pests and Diseases in SMPK Sint Aloysius Niki-Niki School Year 2017/2018.

The hypothesis in this study was that there was an effect of *Edutainment learning* based on *Quantum Teaching* to improve students' learning outcomes of class VII on the materials of plant pests and diseases in SMPK Sint Aloysius Niki-Niki School Year 2017/2018

### RESULTS AND DISCUSSION

This research begins by giving pretests to students in the experimental class and control class to determine the initial ability of the students' learning outcomes from each class. Pretests results show that students' initial ability in the experimental and control classes is not the same, or in other words,

different. The results can be seen from the average grade of experimental class is 38.39 while the average value of pretest control class is 46.07. However, this is not enough to know the significance of the comparison of students' pretest scores between experimental class and control class; therefore, it needs to be tested for normality test, homogeneity test, and average difference test. The significant level used is 0,05.

The results of the normality test showed that the students' pretest data in the experimental class and the control class had a p-value (sig.) of 0.200. This shows that p - value (sig.) from the pretest of experimental class and control class  $\geq \alpha$ . Therefore,  $H_0$  is accepted, which means that there is no pre - average difference test of experimental class student and control class average. Therefore, it can be concluded that the students' initial ability in experimental class and control class is the same or no difference.

To be able to improve student learning outcomes on science subjects of Plant Pests and Diseases in grade VII SMPK Sint Aloysius Niki-Niki academic year 2017/2018, then conducted *Edutainment Based Learning Quantum Teaching* activities in the experimental class while the control class uses the direct learning model. After the learning activity is done, post test is conducted to find out whether there are differences in the improvement of student learning outcomes after learning with prior learning activities.

The score for the posttest of experimental class student that is 80.36 while the mean value of the posttest for the control class i.e., 65.89, it shows that the final ability of students in the experimental class and the different control classes with 14.47 differences. Thus, the average posttest score of students in the experimental class is greater than the average posttest value in the control class, but, it is not enough to know the comparison of student learning result between experimental class and control class; therefore, hypothesis test from formulation of learning problem *Edutainment based on Quantum Teaching* can improve student learning outcomes of the class VII materials of plant pests and diseases in SMPK Niki-Niki Sint Aloysius School Year 2017/2018 significantly. To answer the problem formulation, hypothesis testing should be performed. However, previously had to perform data analysis results of pretest and posttest results for the experimental class students to figure out the presence or absence of improving student learning outcomes before and after the learning activities with *learning Edutainment based on Quantum Teaching*.

The results of the students' normality pretest test in the experimental class showed that the p-value (sig.) of 0.200, while for posttest the students of the experimental class have p-value (Sig.) of 0.005. This shows that the students' pretest in the experimental class is normal distribution while the students' posttest in the experimental class is not normally distributed. Based on the result of normality test of pretest and posttest data of experimental class, it can be concluded that pretest and posttest data of experimental class is not normal because there is one of the data is not abnormal distribution. Therefore, it did not proceed to test the homogeneity but directly to test the average.

Test the average of pretest and posttest value of experimental class students by using non parametric test because the sample is related to abnormal distribution while the result is p-value (Sig.2-tailed) of 0,000. But in this hypothesis test only measures one direction, so that the p-value (Sig) divided into 0,000. Therefore, p- value ( Sig.1-tailed)  $< \alpha$ , so  $H_0$  is rejected which means learning *Edutainment based on Quantum Teaching* provides improvements to student learning outcomes on plant pests and diseases. On average pretest score of 38.39 while the average post-test score of 80.36 so there is a difference of 41.97, thus the accepted hypothesis is learning *Edutainment based on Quantum Teaching* can improve student learning result of grade VII SMPK Sint Aloysius Niki-Niki academic year 2017/2018 .

### **Effect of *Edutainment Learning based on Quantum Teaching***

*Edutainment Learning based on Quantum Teaching* on plant pest and disease material is a learning model that involves the aspects that affect the learning process. Students' understanding of the learning net leads to the inherent knowledge of the students' minds as they gain the knowledge they experience directly. This is in accordance with the opinion of Hariyanti (2004) that by experiencing learning materials directly can be more to build meaning in memory.

Improved *Edutainment learning* model based on *Quantum Teaching* because it is supported by a dynamic learning design that includes growth aspects, naturally, name it, demonstrate, repeat, and celebrate. This can be seen from the success of student and teacher actions in Edutainment learning based on Quantum Teaching. The recapitulation of the comparison of the success of the action in terms of student aspects can be seen in Table 2 .1

**Table 2. Results of Student Learning in Experiment class and Control class**

No	Learning	Pre test	Post test
1.	Edutainment Learning based on Quantum Teaching	38,39	80.36
2.	Direct Learning	46.07	65.89

From Table 2 above shows the 1 percentage rise of successful action from the aspect of students from Pre test p Value No experimental class at 38.39 and pretest on control class was 46.07. This result shows that students are able to carry out the specified descriptors.

*Edutainment Learning* based on *Quantum Teaching* covers 6 aspects, as for the first aspect is to grow. At the growth stage the teacher attempts to cultivate students' initial knowledge by asking a few questions, exemplify in everyday life by using learning media and directing students to know the benefits of learning the material they learn so students know what the benefits are (what are the benefits for me/AMBAK) (Deporter, 2003). According to Hasibuan (1988), in the process of teaching and learning, the purpose of the questions posed by the teacher is for students to learn meaning to gain knowledge (information) and improve the ability to think. Studying means that the students are actively involved in the learning process and there are expected changes in students' behavior in accordance with the intended purpose. This means, by using the basic skill of asking questions, the process and learning outcomes of the students can be supported.

Then the teacher divides the class into heterogeneous groups. The heterogeneity of the groups was based on the learning outcomes from the pretest of heterogeneous group division aims to foster cooperation between students and the transfer of information from students who are smart students to those who are less intelligent or vice versa. These changes were proven to be quite effective in improving student learning outcomes and motivation. According to Arends (2008) in a heterogeneous group of students with less ability there is a tendency to learn more by working side by side with students who have more abilities. In these activities the students with more abilities to act as a peer tutor for students who have less capability. Thus it is expected that heterogeneous groups can facilitate the learning process.

The next stage is natural. In this case the students were directly involved in the learning process is through direct observation, environmental observation and group discussion. During the execution of the natural stage students appear to be active and enthusiastic, activeness and humanity can be seen with enough students asking the teacher either because of curiosity or because of the lack of clarity from the teacher. According to Hasibuan (2008) questions from students and feedback from teachers is one important thing in learning because every student's activity during learning will improve the outcomes of their learning process. Teaching activities will be interesting and constructive if the teacher is able to handle student reactions and activities carefully.

The natural stage proved to be effective for improving students' learning motivation, studies show that there is little we save from information taught by lecture. According to Deporter (2003) for the real learning process should occur students are actively involved in the learning process.

According to Hasibuan (2008) teachers should be able to make variations in learning because this has a positive impact for students because students will not get bored quickly and the learning process will run more efficiently. The presentation of monotonous learning activities will decrease the interest and attention of students to the learning activities that take place.

Naming is the third stage. This naming is built on knowledge and curiosity of students (Deporter, 2003). In this stage the naming of the concept by using tools or stationery so that students will understand the information more easily. At this stage students learn to understand the

concept through the media images that contain the concept or keywords of the material they learn. Naming stage can improve students' learning motivation because students are directly involved in the learning process. This is indicated by the number of students who are active during the learning, especially at the naming stage. In accordance with the statements of Walberg and Greenberg, 1997 in Deporter (2003) that classroom atmosphere is the main psychological determinant of students' academic learning.

The next stage is the Demonstration stage; teachers provide opportunities for students to show that they know (Deporter, 2003). Students present the results of group discussions related to the material being studied and also interspersed with a game. Thabrany (1994) states that the Demonstration method is a method of teaching by demonstrating goods, incident, rules, and sequence perform an activity, either directly or through the use of the media with the subject matter or material being studied by the student. Psychological benefits students gain from demonstration methods include a) more student attention can be centered, b) the learning process is more focused on the material being studied, c) more inherent learning experiences (Fitriani, 2005)

Repeat is the fourth stage. In the repeat stage the students do the repetition by recapitulating the material they have learned. It aims to strengthen students' understanding that they have learned related to Plant Pest and Disease material. According to Deporter (2003) that repetition is done to strengthen the understanding that has been formed in the brain of students. The repetition stage is done by the teacher asking one of the students to read the conclusion of the implementation of the learning that has been done.

The last stage is to celebrate. This celebration can be done by giving a round of applause, surprise, praise, recognition of strength, flick a finger, common posters (Deporters, 2003) Celebrations are carried out for example with praise will encourage students' motivation in learning. According to Fitriani (2005) the celebration process can also be used as a means to increase students' self-confidence in their own abilities. This is in accordance with statement of Pery DePorter (2003) that the granting of recognition will be able to make the students feel proud, confident and happy. Research supports the concept that students' abilities increase due to teacher's recognition. According to Dimyati (2002), giving out presents, encouragement, or enthusiasm triggers can be used to fire up the learning spirit of the students. In addition, giving rewards as a form of reinforcement in the form of applause for students' success can also increase students' motivation.

Edutainment Learning based on Quantum Teaching is a very effective learning model to be applied in schools because this learning model can help improve motivation and student learning outcomes. Increased motivation and student learning outcomes can be seen with liveliness, cheerfulness, and also the humanity of students in the classroom.

In carrying out Edutainment learning by Quantum Teaching researchers experienced several problems, especially in allocating time, sometimes the planned time allocation is not in accordance with the implementation. The main cause of the problem is mainly because students are not yet familiar with the learning used by researchers. So it is hoped that for teachers in the field of study who want to apply this learning model must really prepare properly and perfectly especially in terms of learning media that must be prepared in advance.

**Keywords:** Edutainment, Quantum Teaching, Learning Outcomes

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# Container Terminal Landside Operation Analysis and Discrete Event Simulation in Container Terminal in Port. A Case Study of Terminal 3 Ocean Going PT Pelabuhan Tanjung Priok

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## INTRODUCTION

Seaports are strategically crucial for industrial activity, trade, global production and economic growth. Compared to other countries in the same region such as Singapore and Malaysia, Indonesia's largest port rank much lower than both of the neighbor countries. Port of Singapore has a throughput of 30,9 million TEUs, become the second biggest port in the world based on throughput. Malaysia's biggest port and its second biggest port, which is Port Kelang and Port Tanjung Pelepas, have a throughput of 13,1 million TEUs and 8 million TEUs. Indonesia biggest port, Port Tanjung Priok has a throughput of 5,5 million TEUs, make it 26<sup>th</sup> biggest port based on throughput (UNCTAD, 2017).

This study aims to reveal the problems at Terminal 3 Ocean Going and analyze the current situation for viable improvement. Based on the analysis, this study demonstrates the implementation of a truck appointment system (TAS) as a recommendation to improve the performance of the landside operation in Terminal 3 Ocean Going. For this purpose, this study determines the activities and process required in landside operation in Terminal 3 Ocean Going. Those activities and process are translated into a discrete-event simulation using Arena simulation software. The simulation is used to assess the current situation at Terminal 3 Ocean Going landside operation and to implement an alternative scenario for a simulation.

This study utilized in-depth interviews with control and planning division of PT Pelabuhan Tanjung Priok and representatives of Terminal 3 operator division. Data related to the organization and business processes or activities are collected as well, such as truck arrival and distribution. The duration of each activity in landside operation are collected using observation method in the terminal area. This study focuses on simulation of the container truck operation process in the terminal regardless of its activity on the terminal (carrying or acquiring containers).

## RESULTS AND DISCUSSION

The simulation model highlights the process of container truck operation in the terminal. The model consists of a customs gate, a terminal gate, and a container handling process. The parameter used in this study is the total time needed in the system for a truck to complete container handling process in the Terminal 3 Ocean Going. Five alternative scenarios are developed to reduce the total time to complete the process. These scenarios are combination of truck appointment system (TAS) utilization and lanes segmentation, which is 15% TAS (Scenario 1), 15% TAS and one additional TAS arrival gate (Scenario 2), 40% TAS (Scenario 3), 40% TAS and one additional TAS arrival gate (Scenario 4), and 100% TAS (Scenario 5). For validation purposes, this study uses a Paired T-Test confidence interval (Law, 2015) to check whether each scenario is significantly different from the base case scenario.

**Table 1.** Summary of Base Case Scenario and Alternatives Scenarios Output Results

	Base Case	Scenario 1	Scenario 2 Non TAS	Scenario 2 TAS	Scenario 3	Scenario 4 Non TAS	Scenario 4 TAS	Scenario 5
<b>Mean</b>	10,98	7,54	8,05	7,3	4,19	4,82	4,16	1,85
<b>Std Dev</b>	1,58	0,77	1,24	1,37	1,66	0,51	1,39	0,13
<b>Upper Tail</b>		4,28	4,19	5,04	7,82	7,15	7,81	10,19
<b>Lower Tail</b>		2,59	1,66	2,32	4,88	5,15	5,82	8,05
		<b>Statistically Significant</b>						

From the table above, Scenario 1 shows that 15% TAS utilization will decrease total time by 31% and in Scenario 2, an additional terminal arrival gate will help to decrease total time by 33,5% for trucks using TAS and 26,7% for trucks not using TAS. Total time reduction is significantly higher in Scenario 3; this study shows more decrease in total time by 61,8%. Moreover, in Scenario 5 (100% TAS utilization), the total time is decreased by 83,2% from the base case scenario.

### Conclusions

The landside operation for container truck includes (1) document transactions at both customs and terminal arrival gate, (2) container handling process, and (3) document transactions at customs and terminal departure gate. A problem arises when the truck's volume increase at peak days and lead to congestion at Terminal 3 Ocean Going entrance which is the customs gate. At peak days, each truck needs 11 hours to complete its activity at Terminal 3 Ocean Going with around 10 hours in the queue line.

This study proffers the truck appointment system (TAS) as a viable solution for Terminal 3 Ocean Going and lanes segmentation. Base on the results of Scenario 1 through 5, this study concludes that truck appointment system and lanes segmentation can reduce congestion at the terminal significantly and demonstrates the Scenario 5 as the most significant improvement of reducing the total time in the system.

**Keywords:** Discrete-Event Simulation, Truck Appointment System, Landside Terminal Operation, Container Terminal

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## The Choice Of Infrastructure Project Financing Strategies: A Case Of Seaport In Indonesia

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### INTRODUCTION

Infrastructure is the priority of economic development in Indonesia for the next decades. Based on the National Development Planning Agenda 2015-2019, just sea transport infrastructure development alone would need an investment of about IDR900 trillion [1]. These projects will require considerably more funds than the government could provide, making the involvement of private investment indispensable. The implementation of this idea is not that simple as there are two perspectives involved. The public procurer's main objective is the value-for-money [2], while the private sponsors have two main choices of financing vehicle: corporate financing and project financing [3]. This paper aims to understand the financing decision for seaport project in Indonesia from various perspectives. An online survey and a focus group discussion are conducted to gain insights from the Indonesian seaport stakeholders on the issues, barriers, and improvement of port infrastructure financing and to find out ideas on the most effective financing vehicle for port infrastructure projects. Following the survey results, we present a case study of port infrastructure project financing strategy by constructing cash flow simulation model based on different financing scenarios to illustrate the effectiveness of the alternate ways to finance seaport projects.

### RESULTS AND DISCUSSION

In the survey, respondents were asked their opinion on the most effective vehicle or method of financing port infrastructure development, and indicate the relative effectiveness of the financing methods using a five point Likert scale (1= not at all effective, 5 = highly effective), as shown by Table 1. The survey finds that PPP with government guarantee has the highest mean score, while the Indonesian bank finance has the highest number of respondents who indicate it as either effective or highly effective vehicle. In reality, however, the domestic banks have limited capacity and the PPP schemes are still ineffective.

**Table 1.** Financing vehicle/method effectiveness

Rank	Financing Vehicles (FV)	% Agree that FV is either Effective or Highly Effective	Mean Score	SD of Score	Don't Know	No Answer
1	PPP Government guaranteed	65%	4.1	0.8	3	4
2	Indonesian bank finance	71%	4.0	0.8	1	2
3	Public private partnerships	62%	4.0	0.9	1	4
4	Availability funding	65%	3.9	0.9	1	2
5	PPP with 'in kind' – construction support)	62%	3.8	0.8	2	3
6	Arrangement of incentives to attract investment e.g. SEZ)	62%	3.8	0.7	3	4
7	Direct company facilitation	59%	3.8	0.9	1	2
8	World bank	56%	3.8	0.9	2	3
9	Private port operator finance	56%	3.8	0.7	2	3
10	Viability gap funding	53%	3.7	0.7	3	4

We then conduct a case study of the financing structure of a container terminal called the New Priok Container Terminal One (NPCT-1). The project company NPCT-1 is a joint venture between Indonesia Port Corporation (IPC), a state-owned enterprise, and Sea Terminal Management & Service, Pte. Ltd. (STMS). The project was financed under a unique clause of Preferred Equity Return (PER). This clause would prevent IPC to receive any dividend payment from NPCT-1 before STMS achieves a certain rate of return ( $IRR_{equity}$  threshold) from the project. With this clause in place, our cash flow simulation model shows that IPC would receive a better project value if the project company were leveraged. Figure 1 shows that at higher levels of  $IRR_{equity}$  threshold, the levered NPCT-1 would offer a higher project value to IPC.

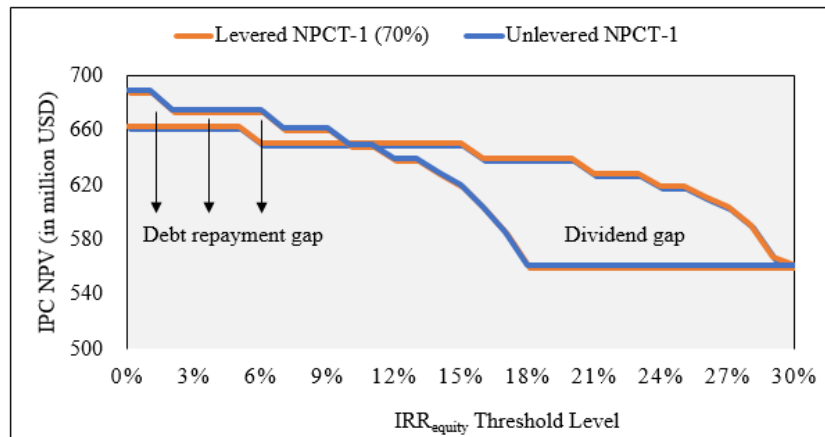


Figure 1. Project value under different  $IRR_{equity}$  threshold.

**Keywords:** financing; Indonesia; infrastructure; port.

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## **Cognitive Style In Computer-Assisted Problem Solving Learning Strategies**

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### **Abstract**

The cognitive style has two poles that show no superiority between the two poles, each pole tends to have a positive value in a particular field and otherwise tends to have a negative value in another field. The aims of this study to investigate the influence of cognitive style of students consisting of field-independent and field-dependent on the application of problem solving learning strategies computer-assisted in primary school mathematics learning 3. This research used experimental method with experiment class of 30 students who have a field-independent cognitive style and control class of 30 students who have a field-dependent cognitive style, and data were analysed by regression analysis. The implementation of problem solving learning strategy in elementary school mathematics learning 3 improves learning outcomes, but the most optimal improvement of learning outcomes is shown in groups of students who have independent cognitive styles, since problem-solving strategies focus on problem solvers that can stimulate students to build their own knowledge through processes learning that requires them to analyse, manage the problem to produce a solution, which is in accordance with the character of students with independent cognitive style.

**Keywords:** Cognitive Style, Problem Solving Learning Strategy, Learning Outcomes



## Quantum Teaching Model Improve the Learning Outcomes of Science

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### INTRODUCTION

Learning science in elementary school is very challenging because many introduce events that have not been understood students. The main principle of the quantum teaching model is "bring their world into our world and let our world into their world" is able to make the elementary school students interested to learn and understand some of the events that are new knowledge for grade 3 elementary students.

The purpose of this study is to analyze the application of Quantum teaching learning model to improve student learning outcomes in science subjects class 3<sup>rd</sup> elementary school. This research was conducted at 4/82 Walian Elementary School with research subjects of 3<sup>rd</sup> grade students. Technique of collecting data is done with result of learning test and analyzed with calculation of mastery learn.

### RESULTS AND DISCUSSION

In learning activities students are strived to achieve learning goals, but seeing the conditions that occur do not match as expected. In learning in the first cycle, student learning completeness only reached 64.29%. This is because researchers have not succeeded in implementing the steps of the model of quantum teaching and learning well, but the researcher does not control students in the classroom during the experiment so that many students are only playing with their group friends, and researchers have not understood the situation in classes with different student characteristics that have an impact on student learning outcomes have not achieved classical learning completeness that is  $\geq 75\%$ . The role of researchers is very important in pursuing a more meaningful learning process so that it can improve student learning outcomes.

In cycle II, student learning outcomes have increased from 64.29% in cycle I to 85.71% in cycle II. In the second cycle the achievement of learning outcomes has increased because researchers succeeded in making improvements to the application of quantum teaching and learning models, mastering the class, and understanding the conditions of students. This success was also achieved because researchers succeeded in correcting deficiencies experienced in classroom learning. This can be seen from the students who are very active when researchers give worksheets that are done in groups, as well as individual questions that the researcher gives at the end of the learning done by students seriously.

Research that uses the quantum teaching and learning model follows the step of learning barriers proposed by Deporter (2010: 37). In the first step that is growing, giving motivation with the statement "you can certainly" able to foster interest in learning so that students become enthusiastic in the ongoing learning.

The learning process that applies this type of quantum teaching and learning learning model, at the "natural" stage provides opportunities for students to express their personal experiences related to learning material. By involving experience, students are easier to understand and follow the lessons learned. This stage is part of the realization of the principle of the quantum learning model that is "bring their world to our world, and deliver our world to their world", but learning that involves the child's personal experience often has difficulties due to differences in each student, so sometimes the experience that is presented by the child is rather different from the concept of the material being taught (Budde et, al; 2002, 197). Therefore, learning difficulties

and student characteristics are very important to be considered and analyzed by teachers who apply this type of quantum teaching and learning. It was found in this study that in the first cycle the teacher had not mastered the class and understood the characteristics of students causing students not to focus on learning so that the achievement of learning cycle 1 was not optimal, while in the second cycle the teacher was able to master the class and understand the characteristics of students so that the application of the model quantum teaching and learning is able to make the achievement of science learning outcomes of material motion objects experience classical completeness.

Achievement of optimal learning outcomes can be achieved if the teacher is able to apply the learning steps from the Quantum Teaching and Learning type learning model correctly. In the step "naming" the teacher makes students curious about various questions or problems so that it stimulates students to think creatively. This is also a finding from research that occurs in the second cycle where when the teacher implements the concept by using the right learning media so that it attracts students' attention, they are able to demonstrate the material that has been taught and repeat and explain again the material that has been taught, namely the material motion of the object that finally become a new knowledge that has been built by the students themselves through their experience gained from the learning process. This is in line with the results of Johnston et al. (2007: 443) entitled "Student difficulties in learning quantum mechanics, which explains that knowledge is slowly built through the learning process of concepts that are experiences.

The last stage of learning from the quantum teaching and learning learning model is "celebrating" is a form of appreciation for every effort and enthusiasm of learning that students carry out by giving praise so as to develop enthusiasm and motivation to learn as explained by Burden (2000: 64) that students are motivated to learn when they expect to be successful, and student differences are so diverse that some students need more motivation and praise than others, while other students need more reinforcement and praise so that they are more motivated to learn than others.

The core of the success of the quantum model is the adult personality of the student himself or the student who has motivation and enthusiasm for learning. If there are students who lack motivation to learn in the learning process then they must improve it so that they can contribute to various problem solving and succeed in achieving the learning objectives (Selby 1999: 137). This has been proven by Sachs (2008: 21) in the Millennium Village Project where a high willingness to learn, practice, is able to make them work hard and improve skills through the learning process, so that now they have the ability to care for children and parents they did not previously have .

The results of these study is the application of the Quantum Teaching and Learning model can improve the learning outcomes of third grade elementary school students in Inpres 4/82 Walian Elementary School

**Keywords:** Science, Learning Outcomes, Quantum Teaching Model.

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## **Analysis The Effect Of Composition Feed Materials On Growth Of Nila In Dusun Ponggang, West Java**

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### **INTRODUCTION**

Fish food can be produced using simple method utilizing a relatively-cheap and available raw material, while also considering nutritional value the fish need. In addition, a good management is required in fish farming. All these things are required in order to obtain good-quality fish with the least cost as possible. This research takes place in Ponggang Village, Subang, West Java. Fish-farming activity has been carried out in this village, but needs improvement in feeding. Thus, a research is required. The objective of this research is to develop fish farming through fish food producing with the available raw material using simple techniques, so that villagers can easily apply the technique and the cost is relatively low.

### **RESULTS AND DISCUSSION**

The research methodology can be seen through the research flowchart or research methodology scheme used to see the overall picture of the research process carried out from beginning to end. This research use 2-factorial experimental design method, where the factors are used is rice field snails and bran, where each factor has 2 factor levels.

Four treatment items from a combination of factors and the level of factors that will be applied to the process of making pellets based on a combination of factors and factor levels are as follows:

1. 1st treatment: Tested in the first pool where the ratio between snails and bran is 1: 5
2. 2<sup>nd</sup> treatment: Tested in the second pool where the ratio between snails and bran is 1: 6
3. 3rd treatment: Tested in the third pool where the ratio between snails and bran is 2:5
- 3.4th treatment: Tested in the fourth pool where the ratio between snails and bran is 2:6

Observation was carried out for 2 months.

Based on the results of calculations with Anava, it was concluded that there was no effect between the snail factor or the bran on the weight of the fish, as well as the effect of the interaction between bran and snail on fish weight.

Beside anava, several method were also being used to process other parameters, such as Weight Growth, Daily Growth Rate, KH, Daily Food Consumption, and Cost Detail. Growth Rate is the difference between the fish weight after and before treatments, Daily Growth Rate is the percentage of daily weight growth. Result shows that Weight Growth and Daily Growth Rate is proportional to the amount of snail in the food.

From the data processing and analysis, some conclusions can be drawn as follows

1. There is no influence between the composition of feed ingredients on the growth of tilapia weight, either factors of snails, bran, or the interaction between snails and bran
2. The type of pellet that gives the largest daily growth in weight and growth rate is type III pellets, namely by the ratio of the composition of snails and bran is 2: 5.
3. The type of pellet that gives the largest KPH value is pellet with the second type, namely by the ratio of the composition of snails and bran is 1: 6

**Keywords:** Design of Experiment, feed materials, nila fish.

**Acknowledgment:** Dean of Engineering Faculty

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## Analysis of Supply Chain Management by Using System Dynamics Approach: Case Study ABC Poultry Farm

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### INTRODUCTION

Poultry sector is one of an important sector in Indonesia's food industries. Poultry is one of the cheapest protein source, and it's consumed by majority of Indonesian people that has low income. Poultry farming in Indonesia is dominated by broiler farm. Broiler meat is 66% of the national meat consumption. Broiler farming industry in Indonesia is dominated by multinational corporation about 80% of the market. These multinational corporations have technology, resource, and skilled workers. The Commission for the Supervision of Business Competition (KPPU) in 2016 suspected that 12 companies was involved in chicken cartel practices in day-old-chick (DOC) prices. Individual broiler farmers face the problems to acquire DOC supply with competitive prices and to produce more broiler in their farm.

This study discusses the impact of supply chain management decision in individual poultry farm in Indonesia using system dynamics. The study use ABC Poultry Farm in Bogor to be the case study material. There are four scenarios that can be chosen by the ABC poultry to increase its profitability:

1. Buying DOC from 3<sup>rd</sup> party suppliers and Increasing their farm capacity to rear more chicken with traditional type of farm (Opened-house)
2. Buying DOC from 3<sup>rd</sup> party suppliers and Increasing their farm capacity to rear more chicken with modern-type of farm (closed-house)
3. doing vertical integration to produce its DOC and increase their farm capacity without buying DOC from suppliers.
4. doing vertical integration to produce its DOC and increase their farm capacity with buying DOC from 3<sup>rd</sup> party supplier.

These scenarios will be simulated using system dynamics approach with Powersim Application and the reference is primary data of the ABC Poultry. The simulation is made based on several assumptions.

### RESULTS AND DISCUSSION

The result of this research is "The ABC Poultry is suggested to do 4<sup>th</sup> Scenario". In 5<sup>th</sup> year of production, 4<sup>th</sup> Scenario is expected to make most of NPV cash on hand compare to other scenario with 160.000 broilers production capacity, the comparison can be looked at Table 1 and the graphic of cash on hand growth can be looked at Figure 1.

Table 2. NPV calculation result from simulation (5 years)

Scenario	NPV of Cash on Hand (Normal Condition) (Rp)	Production Capacity (Broiler)
1 <sup>st</sup> Scenario	262.937.439	24.000
2 <sup>nd</sup> Scenario	1.005.656.132	160.000
3 <sup>rd</sup> Scenario	19.360.590.397	100.000
4 <sup>th</sup> Scenario	26.036.541.756	160.000

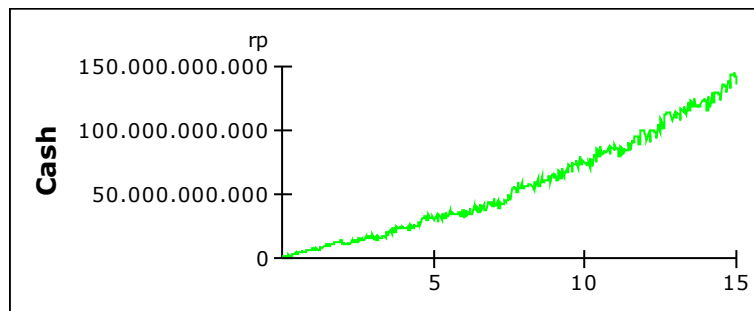


Figure 2. 4<sup>th</sup> Scenario's Cash on Hand Graphic

To Applying the 4<sup>th</sup> Scenario, The ABC poultry must prepare Rp 1.000.000.000,00 as working capital, 10 available land to increase production capacity by building farms and applying authorization to produce DOC to Indonesian Ministry of Agriculture.

**Keywords:** Poultry, System Dynamics, Vertical Integration

### Acknowledgment

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## **To Care and To Be Socially Responsible and Profitable: Developing A Financial Planning Model for CSR Activities**

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### **INTRODUCTION**

Corporate social responsibility (CSR) is a commitment of corporations to contribute to sustainable economic development as the impact of corporate activities on different social groups (or stakeholders), including employees, environment, local community and society at large. These social responsibilities have to be taken by companies as seriously as they pursue the economic objectives, such as profitability, and be incorporated in company's missions, visions, values and strategies. The necessity and importance of CSR makes managers need to highlight CSR elements in various strategies including financial management strategies in order to balance the social responsibility with the profitability objectives.

Sound financial management strategies are needed by companies to support the achievement of their short and long-term objectives. Those strategies will guide a firm in the decision making of three major policies: investment, financing and dividends policies. Theories and methodologies of financial management have been developed in these areas, acknowledging the interrelationships and simultaneous considerations of investment, financing and dividend options facing firms (Lee, Lee & Lee 2009, p. 668; Myers & Pogue 1974).

Good financial management is also essential to managing divergence of interests between shareholders and managers as the consequence of the separation of ownership and control posited in the classical work of Berle and Means (1932) and the agency theory of Jensen and Meckling (1976). A corporate governance concept was developed as a tool to manage conflicts of interest among parties as an internal and external control mechanism in a firm. Good corporate governance is beneficial not only for shareholders but also for stakeholders including investors, creditors, managers, employees and society as a whole, by resolving conflicts of interest, encouraging controls and a sense of ethics, and improving transparency as well.

Financial management strategies that are developed within good governance principles will normatively guarantee the value maximisation and long-term performance of all companies. As the strategies are derived into a financial planning model in this research, an ethical corporate governance practice will result in reliable accounting data as the sources or input for the model. Using this framework, the stakeholder model of corporate governance more resembles this objective and hence will become the theoretical framework in developing a financial planning model as part of financial management strategies. The stakeholder model of corporate governance will bring about the Corporate Social Responsibility (CSR) activities to satisfy not only the needs of stockholders but also other stakeholders'.

### **THEORETICAL FRAMEWORK**

Financial management is an integrated decision-making process concerned with financing, investment and operating decisions to achieve corporate goals and objectives. Managers are the parties who should manage the corporation to assure that the company's objectives of maximizing the owners' value is accomplished. Within this separation of ownership and control sphere, the notion of the principal-agent problem naturally comes to existence (as predicted by agency theory) and creates agency costs. Corporate governance is a tool to minimise the conflicts of interest including in the financial management area, by exercising control over financial decisions reflected in the financial management strategies.

Good corporate governance is also believed to play a significant role in reducing the information asymmetry which occurs when one party has better or more timely information than another. Since managers are parties inside the firm who have superior information compared to outsiders such as investors and other parties, a “signal” will be delivered by the former to the less informed group. Examples of such signals include the level of investment, the amount of debt issued by a firm, the size of dividends distributed and declared, and the type of financing used for a particular investment. The signaling mechanisms can be various, one of which can be in the form of the release of audited financial statements to the public. Managers’ information advantage can contrive them to do the earnings management which can result in the overstatement of earning power, which in extreme cases may lead to company failures once the investors and the other outside parties make a downward adjustment for the company shares after realizing the reported bogus profit. The corporate governance mechanism can assist in this matter by strengthening the function of the board and the audit committee, so that the published financial report contains useful information for management itself (as an input for the financial planning models) and for outside parties as well.

Corporate governance is a tool to minimise the conflicts of interest between managers and owners and other parties involved in the firm (conflicts between managers and directors, creditors and shareholders, shareholders and other stakeholders, etc.) by exercising control over managerial decisions. Rezaee (2009) mentioned the shareholder and stakeholder aspects of corporate governance to acknowledge the evolution of the corporate governance role from reducing agency costs to creating long- term shareholder value and, recently, to increasing value for all stakeholders.

The stakeholder model of corporate governance views the company in a broader perspective as the nexus of contracts among all corporate participants with the common goal of creating value. While the alignment of interests of management with those of shareholders as the investors is the focus of the shareholder aspect, the stakeholder model emphasises the value maximisation for all stakeholders, including the contractual participants and the social constituents. The stakeholders’ value maximisation objective is achieved through several policies such as minimising cost and waste while improving the product quality, enhancing the employees’ skills and satisfaction and contributing to the development of the community.

Even though the objective of maximising the shareholders’ wealth is believed not to disadvantage other stakeholders, it is believed that the explicit statement of company’s objective to maximise the stakeholders’ interest will be better to guarantee the consideration of business impacts on stakeholders in the decision-making process. The stakeholder-maximisation objective will also not jeopardise the interests of shareholders as found by Bird et al. (2007) and Godfrey (2005). Bird (2007) analysed the relationship between five corporate social responsibility (CSR) activities, namely, contributions to community, employment diversity policy, employee relations, environment protection and high product quality and future stock returns which represent market valuation. Using a statistical regression method, the author found a positive relationship which suggests that there is no conflict between various CSR activities and the stockholders’ interest. In line with this, Godfrey (2005) presents theoretical explanations of the relationships between corporate philanthropy and shareholders’ wealth. He argues that philanthropic activity will generate positive moral capital among communities and stakeholders which will contribute to shareholders’ wealth.

Increasing profits requires the acceptance and contribution from the other stakeholders with different and often contradictory interests. In the end, if we relate the objective of the firm with the corporate governance mosaic then we can find that ‘protecting the rights of shareholders and preserving important long-term relationships with external stakeholders are important fundamentals to good governance practice’, as stated by Dallas (2004, p.83) really resonate with the problem of determining the objective of a firm due to the controversy between shareholders and other stakeholders about the primacy of the company’s objective.

Beside the fulfilment of stakeholders’ interests, another challenge faced by companies adopting the stakeholder principle is the relationship between social responsibility and corporate economic performance. This relationship is crucial to maintain the sustainable operation of a business. Conceptually, Freeman and Velamuri (2008) stated that the stakeholder approach to business is able to integrate business, ethics and societal considerations. Technically, Ullmann (1985) hypothesises

an inverted U-shaped correlation between social and economic performance. To an optimal level, they are positively related. Conversely, beyond that level, the social activities will negatively affect the economic performance.

The relationship between CSR and profitability remains inconclusive as the results of empirical studies report positive, negative, and neutral results (McWilliams & Siegel 2000). The CSR program does burden the company with higher costs

The high up-front costs to become sustainable drive the necessity of financial analysis and planning to ensure that a company remains economically viable to avoid bankruptcy while continuing to be socially and environmentally responsible. Regardless of the inconclusiveness of the empirical results, it is not a zero sum game in the sense that the sustainability decisions come at a cost to profitability. Balancing the economic, social and environmental factors is necessary for the reason that if the company becomes too charitable by sacrificing its financial viability then the economic benefit will be less than the increased costs. This may lead to unsustainable business because the company cannot maintain its position in the market.

The extent to which a firm can follow pro-CSR policies should be determined at managements' discretion and be treated as any other investment. The optimum level that balances the need for maximising the benefit ("profit from CSR") and the "demand for CSR" from multiple stakeholders can be resolved by performing cost benefit analysis (McWilliams & Siegel 2001) and by implementing 'stakeholder dialogue and assessment of their expectations and, consequently, by translation of these expectations into the strategic plan of the organisation' (Castka et al. 2004, p. 222). In this study, the strategic planning is considered using the goal programming approach which will be discussed further in Research Method.

## RESEARCH METHOD

Mathematical programming or also known as optimisation, is an approach used to find the best possible solution (the optimal or most efficient way) of using limited resources (constraints) to achieve certain definitive objective(s) (Ragsdale, 2001). This project utilizes multicriteria decision making using the goal programming techniques to develop the financial planning model of a company. The approach is chosen because it can clearly incorporate the objectives statements of a company to satisfy stakeholders interests and the constraints that the company faces; and hence, it fits within the aim of this project.

Goal programming has been widely applied to solve multiple objective financial management decisions during the past 15 to 20 years (Lin and O'Leary, 1993). Application areas including corporate budgeting and financial planning, working capital management, capital budgeting, financing decisions, merger and acquisition, investment planning/portfolio selection, scheduling staff and accounting control.

Kvanli (1980) incorporated 19 goals in to the budgeting model at Texas Instruments Inc, including sales, profit margin, profit per employee, EPS, net fixed assets, capital expenditures to sales ratio, depreciation to sales ratio, sales per employee, payroll, and sales to payroll ratio. Zhang (2016) uses analytic network process within a goal programming model to weigh the economic, environmental and social implications of tourism development.

Goal programming approach is selected because decision making within an organization is characterized by efforts to satisfy a set of potentially conflicting objectives as completely as possible despite limited resources, divergent interests and priorities scale. The deviations between goals within a set of constraints are minimised. The objective function contains deviational variables represented in two dimensions, a positive and a negative deviation from each sub-goal. Zhang (2016) stated that there are two key elements of goal programming: the priorities of goals and the decision variables. Since there are often conflicts among the goals then it is likely that the optimal performance of one goal is obtained only at the expense of the others. Goal programming models have general linear formats in the objective and linear constraints.

### Proposed Model

The goal programming model for CSR activities in financial management model is as follows.

a. Objective function

Balancing interests of stakeholders is a continuing challenge for a company. Goal programming approach enable firms to set priority in satisfying several objectives. The guideline of stakeholder ranking provided by Engster (2011) is used in this study to develop the different objectives, referred to as goals, in the context of the goal programming approach. Suppose these are several objectives, listed in order of importance:

1. The company would like to achieve a satisfactory profit level of US\$ 19 billion (the average of attributable profit in the latest 5-year-period from 2011-2015).
2. The company would like to distribute dividends at least amounted to US\$ 5.9 billion (the average of dividends in the latest 5-year-period from 2011-2015).
3. To avoid layoffs, the company does not want to use fewer than 40 hours of labour per day.
4. The company would like to minimise the number of employees' injuries.
5. The company would like to contribute to the community investment at least in the amount of US\$ 219 million (the average of community investments in the latest 5-year-period from 2011-2015).
6. The company would like to have zero environmental incidents.
7. The company would like to reduce the customer complaints.

b. Decision variables

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#### I. Decision Variables

##### Decision variables in the objective function

- a. The amount of employee wages and benefits in particular year;
- b. Dividend amount in particular year;
- c. The amount of the contributions to community in particular year;
- d. The total environmental expenditure in particular year which comprises of:
  1. Environmental research expenditure
  2. Environmental costs
  3. Environmental program expenditure
  4. Biodiversity and land management
- e. The number of customers' complaints.

##### II.b Decision variables in the constraint functions

- a. After tax profit
- b. Investments in financial assets
- c. Investments in capital assets
- d. Total environmental fines amount
- e. Provision amounts related to sustainable activities
- f. Health, safety, environmental and community expenditure
- g. Research development expenses
- h. Costs of employee turnover

#### II. Constraints

##### A. Accounting definitional constraints

1. Payments to government

$$\text{Payments to government}_t = \text{Gross taxes}_t + \text{Other Payments}_t$$

2. After tax profit definition

$$\text{After tax Profit}_t = (1 - \text{tax rate}) (\text{EBIT}_t - \sum_{i=1}^5 i \times \text{Long Term Debt}_t)$$

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**B. Investment constraints**

1. Investments in financial assets  
**Investment in financial assets<sub>t</sub> ≥ Investment in financial assets<sub>t-1</sub>**
2. Investments in capital assets  
**Investments in capital assets<sub>t</sub> - ρ Investments in capital assets<sub>t-1</sub> ≥ 0**

**C. Company's policy constraints derived from the stakeholder model of corporate governance practices**

**C1. Corporations are webs of relations among stakeholders**

1. Payments to suppliers and contractors (PSC<sub>t</sub>)  
**Payments to suppliers and contractors<sub>t</sub> - δPayment to suppliers and contractors<sub>t-1</sub> ≥ 0**
2. Employee wages and benefits amount  
**Employee wages and benefits<sub>t</sub> - γ Employee wages and benefits<sub>t-1</sub> ≥ 0**
3. Dividends policy  
**Div<sub>t</sub> - θ Div<sub>t-1</sub> ≥ 0**
4. Total environmental fines amounts  
$$\frac{\text{Total environmental fines}_t}{\text{Environmental program expenditure}_t} \leq X$$
5. Provision amounts  
**Provision<sub>t</sub> = (1+ε) Provision<sub>t-1</sub>**

**C2. Corporations should thrive on chaos and environmental change (Social and environmental risk management)**

6. The interest coverage  
$$\frac{\text{EBIT}_t}{(\sum_{t=1}^5 i \times \text{Existing LTD} + \sum_{t=1}^5 i' \times \Delta \text{LTD})} \geq Y$$

7. Current ratio

$$\frac{\text{CA}_t}{\text{CL}_t} \geq \text{Average} \sum_{t=1}^T \frac{\text{CA}}{\text{CL}}$$

8. Environmental research expenditure  
**ERE<sub>t</sub> ≥ ERE<sub>t-1</sub>**
9. Environmental costs  
**Environmental costs<sub>t</sub> - φ Environmental costs<sub>t-1</sub> = 0**
10. The biodiversity and land management expenditures  
**BLE<sub>t</sub> ≥ BLE<sub>t-1</sub>**
11. HSEC risk management program expenditures  
**HSEC risk program<sub>t</sub> ≥ HSEC risk program<sub>t-1</sub>**

**C5. The voluntary or discretionary nature of the CSR activities**

12. Research and development expenses  
**R&D expenses<sub>t</sub> = ε Total expenses<sub>t-1</sub>**
13. Community contribution and environmental program expenditure  
**Community contribution<sub>t</sub> ≥ Z% Pre - tax profit<sub>t</sub>**  
**Environmental program expenditure<sub>t</sub> ≥ Z% Pre - tax profit<sub>t</sub>**
14. Cost savings from decrease in employee turnover  
**Costs of employee turnover<sub>t</sub> ≤ Costs of employee turnover<sub>t-1</sub>**

Since the model required some actual pertinent data which is not available from the company's disclosure in the Annual Report and Sustainability Report, the actual applications are not conducted here.

## CONCLUSION, IMPLICATIONS, AND RESEARCH LIMITATIONS

Despite the limitation in accessing the unpublished data, the model presented in this research provides an example of a systematic financial planning model for CSR activities. Once the data can be accessed and/or available from the accounting system specifically designed under the proposed model, the limitation can be overcome to provide better estimations and analysis in the future.

Another limitation is that the financial planning model developed using the goal programming approach follows a deterministic approach assuming that the future financial condition can be predicted with a certain degree of accuracy. In reality, the dynamics of the business processes and operations contain a degree of uncertainty which might not be captured in the current proposed model. A more dynamic model is required to reflect better the reality.

This research has several implications, including the necessity of an accounting system designed in a company to capture and record the required data input such as the externalities amount and the extensive communication with stakeholder's amount.

**Key Words:** Corporate Governance, CSR, financial planning

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## Marine Tourism Benefits from an Economic Perspective (Case in Pari Island, Indonesia)

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### INTRODUCTION

Marine tourism can be seen as new emerging economic icon and had potential economic growth resources to promote Indonesia's economic development (Dahuri, 2009). For Indonesia, advancing maritime tourism is something that needs to be supported considering that Indonesia is a very strategic and large archipelago. One of the island that are attract by people who want to enjoy marine tourism is Pari island which is in the Thousand Islands cluster in the waters of the North Coast of the Java Sea to the north of the Bay of Jakarta.

Other problems faced related to the sustainability of marine tourism in Pari Island due to abrasion, suctioning of sand for reclamation, dredged corals, depletion of mangrove forests in the coastal areas of Pari Island (LIPI, 2015). This article aims to explain the benefit of marine tourism in economic perspective by taking an example on Pari Island at Thousand Islands, Jakarta.

The study was conducted in June 2017 until October 2017 on Pari Island, Thousand Islands, Jakarta. The research method used is qualitative descriptive. Sample was tourist from domestic as well as foreign countries who travel to Pari island. Data collection uses survey techniques, which are complemented by observation, and interviews. For data collection using survey techniques, only respondents who were willing were given a questionnaire to fill out the questionnaire. Data was analyzed using descriptive and PCA.

### RESULTS AND DISCUSSION

There were five statements that explained benefit marine tourism from economic terms. The general response from the perspective of tourist/traveler that they were strongly agreed that tourist arrivals had a positive influence especially on the economic sector of the community on Pari island. These positive influences of the presence tourists included such as gives the additional income, provides business opportunities, shows economic independence, and the emergence of small-scale businesses means empowering the small micro enterprise (SME) sector. According to Putranto (2015), socioeconomic conditions of the community before there were tourism development in general are based on seaweed cultivation and fishermen, in addition the level of education of the population is still low, and health facilities inadequate.

Table 1 described Total Variance Explained Economic Factors that were analyzed using the PCA (Principal Component Analysis) on the economic factors of the results as follows:

**Table 1. Total Variance Explained Economic Factor Using PCA**

Components	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1. Give a positive impact on the economic sector	3,418	68,351	68,351	3,418	68,351	68,351
2. Provide additional income	,708	14,150	82,501			

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3. Empowering the Small Micro Enterprise (SME) sector	,382	7,638	90,139
4. Giving economic independence to the population	,314	6,272	96,412
5. Business opportunities	,179	3,588	100,000

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Extraction Method of Principal Component Analysis

The output here is defined as component 1 and column variance % is 68,351 which means the factors (dimensions) used in factor analysis are able to explain the variation of 68,351%. This number is quite large because it is proven to explain more than 50% of the variance of variables.

**Keywords:** economic perspective, marine tourism, PCA

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## Factors Affecting The Efficiency Of Indonesian Public Listed Firms: The Effect Of Size And Global Financial Crisis

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### INTRODUCTION

This study examines the technical efficiency of the Indonesian publicly listed firms. The motivation for this investigation are: to determine the technical efficiency and total factor productivity of individual listed firms from all industrial sectors; and to identify whether the size of the firm and global financial crisis have a significant impact on the firm's efficiency. The novel idea of this study is to use technical efficiency measures derived from the Cobb-Douglas production function, instead of the traditional financial performance measures. In particular, unlike traditional financial performance measures such as the ratio analysis, the efficiency measures the firm's performance by considering all the possible outputs produced by using all the possible input factors. In addition, this study also examine the effect of size and crisis period on technical efficiency.

Considering the important role of the capital market, this study examine the technical efficiency and productivity growth of listed Indonesian firms, since there still a few studies that incorporate all industrial sectors, except for banks and financial institutions since most of the study only examined the manufacturing sector. Findings from the previous studies show that the average technical efficiency of the manufacturing industry in the period over 1993 to 2000 were only 55.87 percent. The study also found that the most efficient sector was the metal product sector, whilst the least efficient was the food sector (Margono & Sharma, 2006). In addition, Setiawan, Emvalomatis, & Lansik (2012) found that industrial concentration negatively affects the technical efficiency of the food sector.

The technical efficiency measure is a type of efficiency measures using data envelopment analysis (DEA) method which part of total factor productivity (TFP) measures. Other approaches to measure TFP are a stochastic frontier analysis; the growth accounting approach; and the least square econometrics production models. This study employs DEA which generally measure the relative efficiency of different decision business units (DMUs). A DMU is considered technically efficient if it can produce the maximum possible outputs using a certain amount of inputs, or to produce a certain quantity of outputs by employing a minimum number of resources. Therefore, by measuring the level of the efficiency of a DMU, it can be determined whether it operates at the optimal level or not (Farell, 1957).

Charnes, Cooper, and Rhodes (1978) introduced the DEA constant returns to scale (CRS) for measuring efficiency of US non- profit organization. This approach takes into account the contribution of all production factors that generate outputs. Using the DEA approach, the TFP score can be estimated either input- oriented or output-oriented. The input-oriented, the DEA approach determines the frontier by seeking the maximum possible contraction in the input usage, with the output held constant.

### RESULTS AND DISCUSSION

This study applies a two steps approach. In the first step, I estimate the individual firm's level of technical efficiency, and the total factor productivity (TFP) growth and decompose it into technical efficiency change (EFFCH), and technological change (TECHCH). In the second steps, this study also examines the effect of a firm's size and crisis period on technical efficiency, using random effect multiple regression method. This study also takes into account the effect of

different industrial characteristics of the sample. Furthermore, to check the consistency of the variable used, a robustness test is conducted by replacing the number of employees with total assets as a proxy for the firm's size.

The data cover 94 listed Indonesian firms from all industrial sectors, except for banking and other financial institutions with the total of 1222 observations from 2004-2016. In the second step, I investigate factors that affect technical efficiency including the firm's size and the global financial crisis periods.

The results show that the average technical efficiency of the listed firms was 98.5 percent, which means that there is still a room for improving it by 1.5 percent to be efficient. Furthermore, on average the Malmquist TFP for all firms was 1.003. This result indicates that there has been only a 0.3 percent gain in productivity. Further statistics show that the TFP growth driven by 1 percent through technological change. It means that technological change is the main contributor to the productivity growth of the Indonesian listed firms rather than the 'catching up' through efficiency change. These indicate that these firms have used more advanced technology to enhance their productivity. Also, this study found that larger firms are more able to manage their asset efficiently to attain the target output produced compared to small firms. Furthermore, crisis drives the firms to be more efficient. This finding implies that during the crisis, all the listed firms can manage their input efficiently to produce the target outputs.

**Keywords:** Efficiency, data envelopment analysis, Indonesian public listed firms

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## **Synergistic Developing Model of Ecotourism-Settlement Region in Bunaken Island of North Sulawesi**

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### **Abstract**

Bunaken Island in global constellation as a destination of nature tourism which has been famous worldwide has its own unique with potential Marine Park with conservation status. The famous tourism icon of Manado and North Celebes in Bunaken National Park needs extensive attention. The development of tourism in Bunaken is hindered by many problems such as unoptimized management of the Marine Park, water pollution, coral reef damage, and the lack involvement of the community. The paradigm of tourism development should not only limited in creating high quality tourism product, but also in the total development of tourism product, including the settlement region as a part of Bunaken Island's development as tourism destination. According to zoning directive of Bunaken National Park, the settlement region that can be developed is limited, and it must support the tourism development in the region that still has pure environment, appreciate its cultural and natural heritage, support the conservation efforts, give social and economic benefits, as well as respects to local community participation.

The purpose of this study is to develop the Bunaken Island settlement region as a total quality product, sustainable and competitive globally with ecotourism approach, while observation purpose is to identify settlement characteristic, analyze development concept and find synergistic development model of ecotourism settlement. Research method used the qualitative approach and collected the secondary and primary data in the form of physical basic aspects in form of land and building, demography and social culture, economy, and also settlement's infrastructure. The data are compiled in form of data processing, map imaging using GIS method and analyzing method of basic components in forming ecotourism which are accessibility, attraction, and amenity. Research result is the development of settlement region which is structured in cluster and between clusters spatially, with synergizing sustainable space region that supports Bunaken Island as a sustainable small-island tourism destination.

**Keywords:** Synergistic Developing, Model, Ecotourism, Settlement

## **Maritime Tourism Development Based on Human Capital and Structural Capital in Likupang Timur**

**Tinneke E.M.Sumual, Arie F. Kawulur, Johnny Manairongsong**

### **ABSTRACT**

This study aims to analyze the direct and indirect effects of human capital, structural capital on the development of marine tourism. The method used is an explanatory survey and data collection techniques is questionnaire distributed to 125 tourists with accidental technique sampling technique. Data analysis technique uses a path analysis regression model. The results showed that between human capital and structural capital had a significant effect on the development of marine tourism. Next finding that the human capital has a significant effect on tourism development through structural capital.



## **Assessing Ecological Integrity of Panasen Upstream, Tondano Watershed, North Sulawesi by Using Aquatic Insect Larvae Communities**

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### **INTRODUCTION**

The Tondano's Watershed including Lake Tondano in Minahasa District is currently experiencing significant problems such as reduced forest area, declining quality and quantity of lake water, clove and coconut plant dominance in land use, flooding, erosion, eutrophication and sedimentation in water bodies, which have not been concerned with the principles of soil conservation and sustainable forest clearance (Anonymous, 2001). Beside of its beneficial for people in 3 districts namely Minahasa, Minahasa Utara and Manado, Lake Tondano is a popular tourism destination for Ecotourism in North Sulawesi Province. Unfortunately, Lake Tondano is included as one of 15 Indonesian lakes that prioritized for handling environmental problems as Priority I in Indonesia by Decree of Minister of Forestry No. 284 / Kpts-II / 1999 (Anonymous, 2001).

The Panasen Stream as one of Lake Tondano inlet directly contributes to the quality and quantity of lake water. However, the studies of aquatic insect larvae in this area are very rare and there is no published data. Despite the fact that changes in the stream ecosystem are continuous and biological data can be a reference in conducting conservation measures. The aim of this study was to evaluate the condition of the Panasen Stream by determining the distribution and abundance of aquatic insect larvae based on differences in land use in the Tondano watershed; and determining environmental parameters that affect the presence of insect larvae communities.

### **RESULTS AND DISCUSSION**

The study was conducted in 5 segments of Panasen Stream in different altitude from Soputan Mountain headwater to the mouth of Tondano Lake (Fig.1, Table 1), as a part of Tondano watershed. The five segments are comprised by agricultural land (Station Ranolesi, namely P1), farming dry land and paddy fields (Station Tonsewer, P2): paddy fields and undeveloped land (Station Tempang, P3): dry-land agriculture/ combination farms (Station Panasen, P4) and paddy fields (Stasions Talikuran, P5). Especially at stations Ranolesi and Talikuran, sampling be done only in dry season, because at the beginning of the rainy season the stream water diverted into the fields for irrigations; and at Stasions Talikuran the water height was reached more than 1 meter and was not eligible for sampling site. Furthermore, observations were also conducted on three other streams namely the Makalonsow Stream, Noongan Stream and Ranoyapo Stream as reference sites. The Tondano's sub-watershed is dominated by dryland farming, mixed gardens, rice fields, and secondary forests (RTRW North Sulawesi 2010-2030). Changes in land cover within twenty years from 1990 to 2011 were dominated by changes in forest and bush areas, each of which decreased by 44% and 28%, and changes in residential and ladang areas increased by approximately 12% and 33 respectively % (Nugroho, 2005; Kartika et al., 2012).

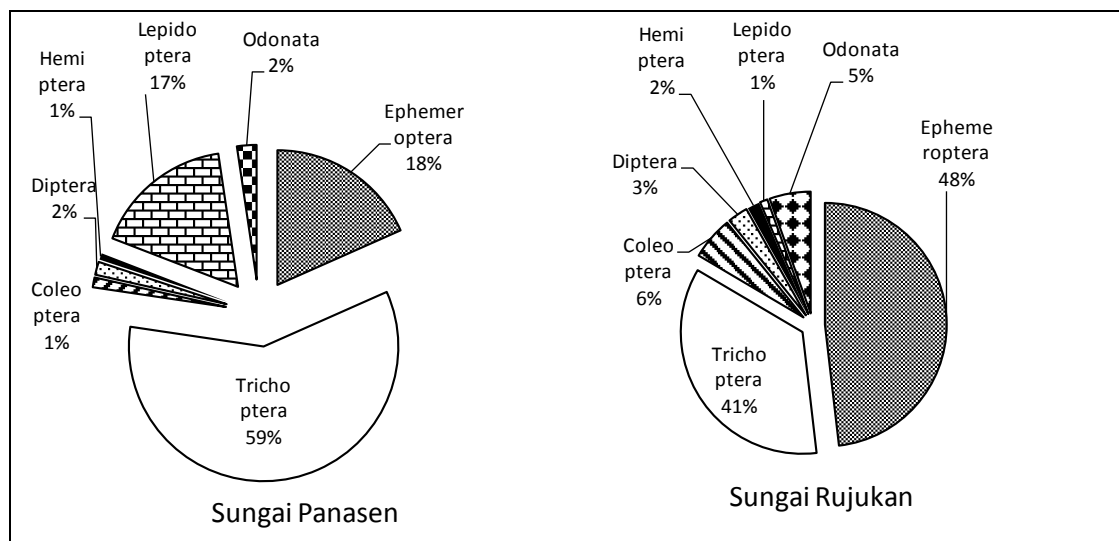


Figure 1. Proportion of aquatic insect's orders

The result show that ecological integrity of the Panasen Stream is relatively low, due to the small number & species of aquatic insect larvae found (13 species, most are tolerant), compared to the reference streams 22, 17 and 25 sp (Makalonsouw, Noongan, Ranoyapo) most are sensitive. The sand substrate and TSS affect the Panasen in the dry season, while the temperature, conductivity, hardness, turbidity, Ammonia and Total Phosphate, contribute in the early (rainy) season. The current, the depth and width of the stream as well as substrate, contribute to the reference streams. Factors that affect locally are physico-chemical parameters; while regionally is human activities (anthropogenic pressure) along with natural disasters impedes the stability of the stream ecosystem.

**Keywords:** Ecological Integrity, Aquatic Insect, Tondano Watershed, Ecotourism

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## Fish Diseases of Mariculture of North Sulawesi, Indonesia

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### ABSTRACT

Monitoring of fish diseases is important in reducing the losses in fish farming caused by the diseases. This study aimed to identify the type of pathogens that found in mariculture in regencies/cities in North Sulawesi Province, Indonesia. The survey was done from 2015 - 2017. The species of fish examined in this survey were the most common cultured marine fish species in North Sulawesi aquaculture including Trevally (*Charanx ignobilis*), grouper (*Epinephelus* sp.). The fish were randomly sampled from each farm at every sampling time, from selected farms in each regency/city. The pathogens examined were parasites, bacteria and virus. The fish body surfaces and gills were checked with naked eyes and/or by using loops for larger ectoparasites, followed by an examination under a dissecting microscope (10X). Scraped mucus from the body surface of the fish was also examined for parasites by scanning through 10X and 100X. Gills were removed using scissors and studied for attached parasites. Preservation of all parasites collected for identification and future study was done by both permanent mounts and 95% ethanol-fixed specimens. The results were compared to Parasites Identification Manual. Bacteria were isolated from head kidney of the fish samples, and the isolates were identified and classified using a combination of recommended methods. Analysis of the virus using gill organ as samples was carried out using Polymerase Chain Reaction (PCR) method. The results show that there were several types of pathogens including parasites, bacteria and virus. Bacteria that were identified are as follow: *Flavobacterium* sp, *Streptococcus* sp., *Vibrio* sp, *V. anguillarum*, *V. alginolyticus*, *V. harveyi*, *V damsela.*, and *V. mimicus*. *Vibrio* sp. was found in all sampling locations. Parasites identified from sample fish were monogenean *Pseudorhabdosynochus lantauensis*, the nematode *Spirophilometra endangae*, the digenean *Didymodictinus* sp., and the isopod *Cymothoa exigua*. The type of virus that infected fish samples were Viral Nervous Necrosis (VNN) identified in grouper (*Epinephelus* sp).

**Keywords:** Mariculture, Pathogen, Parasite, Bacteria, Virus

## Urban Tourism Concept Approach To Economic Space On The Malalayang Coast.

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### ABSTRACT

Coastal area in the Malalayang is an area developed as a tourist area in the city beach, because it has a natural scenery. In terms of accessibility, Malalayang beach location is very strategic, so it can be accessed easily. In accordance with the function of the region as a tourist area, tourism activities in this region can be found in coastal areas, where this area is an open space area. Tourism activities found in the area occurred partially or clustered, and temporarily because it is not contained and does not have clear space in territory. This tends to bring adverse impacts on the visual aesthetic condition of the coastal area as a tourist area. This study aims to analyze the characteristics of organic open space on the coast based on the concept of urban tourism. The method used is qualitative-descriptive. The research location is located on the coast of Malalayang which is a tourist area. Data were obtained through site surveys and in-depth observations. Based on the method, the analysis is related to: coastal area characteristic in Malalayang, analysis related to the specification of coastal tourism activity, analysis of specific zone utilization in coastal area, and analysis of element of public organic space in the coastal area. The results of this study are expected to be used to improve the function of the coastal area as a tourist area of the city, as well as the uniqueness of coastal tourist areas can be achieved. In addition, the quality of tourist areas can be improved through the open public organic space.

**Keywords:** Coastal, economic space, malalayang, open public, urban tourism.

## Can regenerated Mantle Tissue from *Pinctada maxima* be Used as Saibo in Cultured Pearl Production?

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### ABSTRACT

Prior research has shown that using appropriate anaesthetics, mantle tissue can be removed from the silver-lip or gold-lip pearl oyster, *Pinctada maxima*, to allow mantle excision. It has also shown that excised mantle tissue can regenerate with secretory functions within 3 months of excision. On this basis, it may be possible to obtain graft tissue ('saibo'), used for cultured pearl production, from living anaesthetised donor oysters and from regenerated mantle tissue. However, no prior study has investigated whether regenerated mantle has the ability to secrete the same quality nacre as normal mantle or whether anaesthetised and regenerated mantle were able to proliferate to form a functional pearl-sac when implanted into a recipient oysters. Regenerated mantle from *P. maxima* was shown to produce shell material with the same structure as normal mantle. The nacre produced by both types of mantle appeared identical in both the size and structure of nacre platelets. Regenerated mantle tissue appeared to secrete nacre at a more rapid rate than normal mantle tissue which was indicated by the greater thickness of nacre adjacent to the mantle wound site. The ability of saibo from anaesthetised oysters and from regenerated mantle, to form a pearl-sac following implantation into a host oyster was investigated in a second experiment. Survival of recipient oysters implanted with relaxed, regenerated or normal saibo ranged from 90% to 100% and did not differ significantly between treatments (p-value= 0.2333). Nucleus retention was much poorer than expected with only 15 oysters retaining nuclei and showing pearl-sac development. Eight nuclei (53% of the total) were retained by oysters in the control treatment (normal saibo x normal recipient), 4 (26.7%) were retained by the anaesthetised saibo x anaesthetised recipients oysters, and 2 (13.3%) by the anaesthetised saibo x normal recipients treatment. Pearl-sacs from seven of these were used for histological analysis. The six-week duration of this study allowed complete pearl-sac development in oysters implanted with relaxed, regenerated or normal saibo. However, the thickness of the pearl-sac epithelium varied, indicating differences in the degree of pearl-sac maturity. Pearl-sacs in all treatments had cell accessories: epithelium and mucous cells. In the control treatment which used normal saibo, greater nacre deposition was evident compared to that produced by both relaxed and regenerated saibo. Despite variation in the thickness of the epithelium produced by each type of saibo, each pearl-sac produced approximately the same thickness of matrix or mineral deposition. Our findings indicate that both saibo from relaxed oysters and from regenerated mantle tissue has similar potential to normal mantle for use as saibo in cultured pearl production.

**Key words:** pearl oyster, *Pinctada maxima*, regeneration, mantle tissue, nacre, nacre secretion, pearl-sac