Security in food, renewable resources, and natural medicines

SFRN 2019

PROCEEDING

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3rd INTERNATIONAL CONFERENCE ON SECURITY IN FOOD, RENEWABLE RESOURCES, AND NATURAL MEDICINES 2019 (SFRN 2019)

Convention Hall Politeknik Pertanian Negeri Payakumbuh

INDONESIA

hosted by,
Politeknik Pertanian Negeri Payakumbuh

co -Hosted by,
Universitas Andalas (UNAND)

QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND DELIVERY OF SUSTAINABLE DEVELOPMENTS GOALS (SDGS)

September 25-26, 2019

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Politeknik Pertanian Negeri Payakumbuh
Jl. Raya Negara Km. 7 Tanjung Pati Kec. Harau, Kab. Limapuluh Kota, Sumatera Barat 26271, Telp: (0752) 7754192, Fax : (0752) 7750220, Email: p3m@politanipyk.ac.id

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Welcome Message
Executive Chairman of The 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019

Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikum wr.wb

On behalf of the SFRN 2019 organizing committee, I am really honoured and delighted to welcome all of you to the 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the State Polytechnic of Agriculture Payakumbuh, West Sumatra Indonesia

Our technical program is rich and varied with 8 keynote speeches and 4 invited talks and more than 170 technical papers split between 8 parallel oral sessions and 1 poster sessions. The speakers and participants came from 8 different countries, consist of Academicians, Scientists, Researchers, Practitioners, Professionals, and Government Officialsin multidiscipline branch of knowledge, who gathered here today to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and HealthCare Free for All, in particular for those who in needs. As the chairman of conference 2019 SFRN, I know that the success of the conference depends ultimately on the how many people who have worked in planning and organizing both the technical program and supporting social arrangements. This year, the conference is jointly organized by the Payakumbuh State Agricultural Polytechnic and Andalas University. We also thank to the steering committee fortheir wise and brilliant advice on organizing the technical program; and also to the the Program Committee, both from the Payakumbuh State Agricultural Polytechnic and Andalas University , for their thorough and timely reviewing of the papersand to the Directorof Payakumbuh State Agricultural Polytechnic and the rector of Andalas University, and the Head of the Institute forResearch and Community Service of Andalas University, and Payakumbuh State Agricultural Polytechnic. Our recognition should go to the Organizing Committee members who have all worked really hard for the details of the important aspects of the conferenceprograms and social activities, and then we extend our gratitude to our students who bore the arduous burden for preparing this event.

We hope this event is also a good step in gaining strengthenn cooperation between our universities as we know that the State Agricultural Polytechnicof Payakumbuh is part of the Andalas University previously, of course the psychological relationship between the State Agricultural Polytechnicand the Andalas University is really close.

Finally on behalf of the committee, we apologize profusely for all the shortcomings and everything that is not properly in organizing this event and hopefully AES-Network contributes significantly to the research and technology for the good of humanity.

Thank you

Fithra Herdian, S.TP, MP

Message from Afro-Eurasia Scientific (AES) Network
3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019

Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

On behalf of the AES Network, I am honored and delighted to welcome you to the 3rdInternational Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the Agricultural State Poly Technique of Payakumbuh, Indonesia. I believe we have chosen a venue that guarantees a successful technical conference amid the culture, delicacy and scenery of Payakumbuh, the city of "Rendang".

The AES-Network aims to Promote Livelihood Through Food Security, Promote Future Smart and Green Mobility by Using Renewable Energy, Promote Prosperity by Equally Managing and Distributing the Sustainable Resources and Promoting Enjoyable Long-Life by using Natural Medicines With Free Health Care For All. The AES-Network was established in 2018 and already have memberships from 12 countries. Our members consist of Academicians, Scientists, Researchers, practitioners, professionals, and government officials from multidiscipline branch of knowledge, who gathered and contributed their expertise to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All.In particular, the network aims to alleviate the condition of those who in dire needs. In the future, we also expect to provide technical demonstrations, and numerous opportunities for informal networking for Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All. In this opportunity, we invited you to become our members and join our efforts for a better life to all of mankind.

As a team, we acknowledge the existence of mutual interest among university and college educators, researchers, activists, business sector, entrepreneurs, policy makers, and all society members. We must promote the need to strengthen cooperation for establishing Security in Food, Renewable Resources, and Natural Medicines in Africa, Europe, and Asia.

The AES-Network believe, a firm foundation for mutual collaboration with the spirit of equality and partnership and thereby contribute towards sustainable development in these three regions.

Therefore, through networking, friendships, and joint efforts, the capacity of our network can be enhanced to address major challenges in securing the Food, Renewable Resources, and Natural Medicines in Africa, Europa, and Asia.Our Network goals areto increase the awareness of educators, researchers, scientific community, business sector, entrepreneurs, and policy makers in Africa, Europa, and Asia, that the future of a better world, lies within their responsibilities, and to improve the networking, mobility and mutual collaboration of scientific community, business sector, entrepreneurs, and policy makers in Africa, Europe, and Asia to energize the delivery of Sustainable Development Goals.

Finally, I hope that, by registering our network, you will be provideda common platform and support the exchange of knowledge, while at the same time, we offer constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrived at the best solutions to our terminal goal, Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care based on scientific evidence in Africa, Europa, and Asianregion.

Thank You for Joining us!

President
Assoc. Prof. Dr. Eng. Muhammad Makky

Welcome Message
Head of Institute for Research and Community Service
Universitas Andalas

Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

It is with great pleasure that I welcome the participants of the SFRN 2019 in Payakumbuh, the city of "Rendang", the prime of Indonesian delicacy.

In this esteem event, we share the knowledges, and imparted it to the people. The quest for knowledge has been from the beginning of time but knowledge only becomes valuable when it is disseminated and applied to benefit humankind. It is hoped that this conference will become a platform to gather and disseminate the latest knowledge which can be adopted for securing the food, resources, and health for mankind, in Asian, European and African region.

Academicians, Scientist, Researchers and practitioners from multidiscipline branch of knowledge who gathered here today will be able to share and discuss new findings and applications of innovations for ensuring food security, in particular for those who reside in developing countries. It is envisaged that the intellectual discourse will result in future collaborations between universities, research institutions and industry both locally and internationally. In particular it is expected that focus will be given to issues on environmental and sustainability. Therefore, we urge to all participants, to establish a scientific network that will voice the needs

Researchers in the multi sectoral aspects related to the benefit of mankind have been progressing worldwide. Food is a basic right, while energy drive the world. Human need a lot of resources so the civilization can be flourished. But human is not immune, and thus, ones need to take care of their health regularly. Modern Agri-food systems is the foundations of a decent life, a sound education and the achievement of the Sustainable Development Goals. Over the past decade, we have witnessed a chain reaction that threatens the very foundations of life for millions of the world's people. Rising energy prices drove up the cost of food and ate away the savings that people otherwise would have spent on health care or education. Unsustainable plantation management induced forest fire and posed haze hazard to the whole Sumatra island and our neighboring countries.

The human cost of the food and energy crisis has been enormous. Millions of families have been pushed into poverty and hunger. Thousands more suffering from the collateral effects. Over the past year, food insecurity led to political unrest in some 30 countries. Yet because the underlying problems persist, we will continue to experience such crises, again and again -- unless we act now. That is why we are here today.

We must make significant changes to feed ourselves, and most especially, to safeguard the poorest and most vulnerable. We must ensure safety nets for those who cannot afford food, or energy, nor even a health service. We must transform agricultural development, markets and how resources is distributed. We must do so based on a thorough understanding of the issues. That is the only possible way we can meet the Goals of Sustainable Development.

Thank You,

Assoc. Prof. Dr.-Ing. Uyung Gatot S. Dinata,MT.

Opening Ceremony
Rector of Andalas University

Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

I welcome the opportunity to address you at this important event.

It gives me great pleasure in welcoming you to this 3rdConference on "Security in Food, Renewable resources, and Natural Medicines (SFRN)" 2019. I am delighted that so many have accepted our invitation. I am particularly happy that we have in this room, dedicated individuals from so many stakeholder groups — including our most respected and distinguished guest "The ministry of Agriculture of the Republic of Indonesia". We also welcome the mayor of Payakumbuh and the Regent of Lima Puluh Kota. We extend our welcome to the civil society, the private sector, international organizations; the science community; and others dedicated to help create an environment in which people can escape food insecurity. Imagine what we can do together if we make the security for all as an our top priority, and pull in the same direction. We can make a difference in the lives of millions.

Food is a basic right. Food security are the foundations of a decent life, a sound education and the achievement of the Sustainable Development Goals Access to medicines - a fundamental element of the right to health. Health is a fundamental human right, indispensable for the exercise of many other rights in particular the right to development, and necessary for living a life in dignity. Moreover, human rights principles and language are being used to support resource access claims as rights-based approaches empower individuals and groups to gain or maintain access to natural resources

Much progress has been made during the last decades but much more needs to be done. Millions of people are Insecure worldwide, meaning that they either starve or they do not know from where their next meal, health care or resources will come.

Much of the progress on security has occurred at the expense of our environment. With business as usual, we foresee that the production improvements during the next decade will be less than the last one, while the environmental degradation will continue, and health will deteriorate significantly. Without available resources to seek, mankind will become endanger species in a very short time.

Solutions to the security problems need to be designed and implemented within a new and rapidly changing environment. Globalization and sweeping technological changes offer new opportunities for solving these problems. A number driving forces or trends must be taken into account in developing appropriate action. Some of the action needed, such as appropriate technology for small farms, is not new but it must be cast in the new and changing global and national environment, taking into account new opportunities and risks. I hope that by providing a forum for knowledge exchange, this conference will help identify the action to be taken. Furthermore, this conference will help to provide constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrive at the best solutions.

In conclusion, even if those responsible give high priority to achieving sustainable security for all and back it up with action, the world may not achieve the goal by 2030. But we will be much closer than with business as usual. I urge all of us to provide the strongest support for this event, to enable securing the food for all in the closest time possible. It is my sincere optimism that through the accomplishment of the objectives of this event, we will come to an important step nearer to secure the food for all.

Finally, I would like to thank the organizing committee who have spent their utmost efforts to prepare and manage this event successfully. Let me conclude my remarks by wishing our guests happiness, good luck and great success in the conference.

May I announce now the opening of the "3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019" in Payakumbuh.

Thank you.

Rector,
Prof. Tafdil Husni, SE, MBA, PhD

Welcome Message
Director of Politeknik Pertanian Negeri Payakumbuh

Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikumwr.wb

I congratulate to all participants on the invitation and participate at our beloved campus Payakumbuh StateAgricultural Polytechnic. I feel really honoured to welcome all of you at our event, the 3rd International Conference on Security in Food, Renewable Resources, and Natural Medicines (SFRN) 2019 at thePayakumbuh State Agricultural Polytechnic, Indonesia.

Food security is a very important aspect in a country's sovereignty. Food also determines the future direction of a nation. Many social and political fluctuation can also occur if food security is disrupted. Food availability that is smaller than its needs can create economic instability. This critical food condition can even endanger economic and national stability. In the current situation, there are many challenges in exteriorize food security, such as climate change, population, limited natural resources and other challenges both locally, regionally and globally.

Renewable resources are also our starting point to start sustainable development. Research on renewable resources is also very important as the solution in meeting the principles of sustainable development. As we know that Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainability is the foundation for today's leading global framework for international cooperation - the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs)

The discovery of treatment based on local culture also contributes greatly to the good of humanity. Unfortunately, there are still many treatments that have not been carried out by scientific research. So, through this conferencewe hope it can be a trigger to increase in traditional plant-based treatments that not go through complex chemical processes, so that the effectiveness of the pillars can be further suppressed and also contribute to the community's economy.

Finally, I would like to express my gratitude to all people who involved in organizing this event and to all ofstakeholders who have helped to make this event go on succesfully. Please accept my apologize for any shortage, Assalamu'alaikumwr.wb.

Thank you

Ir. Elvin Hasman, MP

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Production Factors Affecting Taro Production in Sinaboi Sub-District Rokan Hilir Regency

Eliza1, Shorea Khaswarina, Ermi Tety
Faculty of Agriculture, Riau University Jl. Binawidya KM 13 Pekanbaru, Riau Province
Corresponding author e-mail, elizaunri@gmail.com and shoreakhaswarina@gmail.com and ermitety@yahoo.com

Abstract: This research purpose is to analyze the factors of production which affect taro production, the dominant factor affecting taro production in Sinaboi sub-district, Rokan Hilir regency. The research uses a survey method, and the sampling is simple random sampling with a total sample is 60 taro farmers with the condition of sample ≥ 30 statistically normally distributed. The types and sources of data are primary and secondary data. Data analysis is descriptive and quantitative data analysis. Analysis of the factors' effects of production used the Cobb-Douglas production function model. The results show that the factors of production that affect taro production are land area, seeds, fertilizer, labor, sample age, and farming experience, while herbicides, length of education does not affect the production. The dominant production factors affecting taro production are labor, seeds, fertilizer, sample age, farming experience. The elasticity value of taro production is 1,264; technically, the use of production factors is still on the Increasing Return to Scale. It means that the use of inputs is still possible to be added so that taro production can increase.

Keywords: Taro, Factors Of Production, Elasticity Of Production, Cobb-Douglass

INTRODUCTION

The availability of food crops as a staple commodity in sufficient quantities for all the time is inevitable. Since the need for food is sustainable and continuously, making a priority of national agricultural development from time to time is what every household must do. Besides food crops, there are horticultural crops, which include vegetables, tubers, fruits, and others. Taro is a horticultural plant that has many benefits for our lives because of its high nutrition.

One of the regencies in Riau Province is the Rokan Hilir Regency, where almost 50% of the economy in the Rokan Hilir Regency is from the agricultural sector. The economic development in this area focuses on the agricultural sector. The development of the agricultural sector aims at increasing food production, crops, and horticulture, including taro.

In Rokan Hilir Regency in 2015, there are 238 hectares of taro area and Sinaboi District is the center of taro development in Rokan Hilir District with an area of taro is 217 hectares, the production is 4,125 tons, with productivity reaches 19 tons/hectare (BPS Kabupaten Rokan Hilir, 2015). The demand for taro production is quite high because many people know the benefits and diversification of taro products, but the production is still limited. The main problems of farmers to increase productivity are simple cultivation techniques, use of production factor, which is not optimal, limited capital, limited marketing of products, low level of farmers' knowledge. Efforts to increase taro production through the utilization of available resources and ongoing coaching are really needed, so it will increase the income and welfare of the people and also form a business-oriented independently and professionally.

According to Nurfarianti (2016), the Land Area Variable (X1) obtained the t-count value of 8.304, which is higher than the t-table of 2.086. It means that the land area variable has a significant effect on taro production. Capital Variable (X2) obtained the t-count value of 2.354, which is higher than the t-table of 2.086. It means that the capital variable has a significant and positive effect on taro production. Labor Variable (X3) obtained the t-count value of 1.923, which is higher than the t-table of 2.086. It means that the labor variable does not have a significant effect on taro production in Kaway Sub District XVI West Aceh Regency.

According to Rosmawati. H.(2015), a decline in potato production in Bengkulu province and especially in the study area, was caused by several factors, namely: Farmers in the study area switched to planting other commodities, namely coffee, which is considered more profitable. Potato planting requires a high enough capital, and the risk of failure is also quite substantial, Potato farming in the study area is already efficient and R / C ratio = 3,400. Seedling production factors have a very significant effect, and labor has a significant effect on potatoes production, while fertilizer and pesticide production factors on potatoes production have no effect

According to Hari.P.A. (2011), research about the analysis of factors affecting cassava production in East Java 1986-1999 concludes that the variable land area, seeds, fertilizer significantly influence cassava production in East Java, while the variables of medicine and labor do not significantly influence the production of cassava.

The purpose of this research is to analyze the effect of production factors on taro production and analyze the dominant production factors that affect taro production and taro production scale in Sinaboi District, Rokan Hilir Regency.

RESEARCH METHODS

This research takes place in Sinaboi District, Rokan Hilir Regency, which is a center of taro production and also as an agricultural development area. This research is using survey methods and sampling. Sampling is done by using a simple random sampling method as plenty as 60 taro farmers with consideration of a sample with a total of 30 statistically normally distributed.

The data consists of primary and secondary data. Primary data comes from interviews with sample farmers by using a list of questions or questionnaires that have been prepared in advance. Primary data also comes from direct observations in the field. The secondary data comes from related institutions and other literature related to research.

The data obtained are tabulated and then analyzed by using various calculations to answer the research objectives, both descriptive and quantitative analysis of the variables studied. Analyzing the factors of production on taro production used a production function model with the Cobb-Douglass production function equation. The Cobb-Douglas production function, according to Soekartawi (2003), is a function or equation involving two or more variables, where one variable is the dependent variable (Y) while the other is an independent variable (Xi). There is an assumption that some production factors affect the production of taro in Sinaboi District. They are plant area, high amount of seed, fertilizer usage, labor flow, amount of herbicide, age, length of education, and farming experience. Mathematically, the function of taro production is as follows:

Y = b0X1b1X2b2X3b3 X4b4X5b5 X6b6 X7b7 X8b8 en (1)

By :

Y = Taro production (Kg/MT)

X1= Plant Area (Ha/MT)

X2= Seeds (seed/MT)

X3= Fertilizer (Kg/MT)

X4= Herbicide (l/MT)

X5= Labor (HOK/MT)

X6= Age of sample (year)

X7= Education (year)

X8= Farming experience (year)

b0 = Intercept

b1….b4 = Production factor parameters to be estimated

e= natural logarithm e =2,718

The estimation of the equation above is simplified by converting it into a natural logarithmic model, as follows:

Ln Y = Ln b0 + b1 Ln X1 + b2 Ln X2 + b3 Ln X3 + b4 Ln X4 + b5 Ln X5+ b6 Ln X6+ b7 Ln X7+ b8 Ln X8 + en (2)

According to Kuncoro (2011), the reasons to choose natural logarithm are as follow: (1) avoiding heteroskedasticity (2) knowing the coefficients that indicate elasticity, and (3) getting closer to the scale of the data. The Taro production function is estimated by using the OLS (Ordinary Least Square) method.

Some econometric assumptions are tested first to provide valid results. It includes the detection of normality, multicollinearity, heteroscedasticity, and autocorrelation. The Shapiro-Wilk test is used for normality. Variance Inflation Factor (VIF) test is used for multicollinearity, and the Breusch-Pagan test is used for heteroskedastic (Thomas 1997; Verbeek et al., 2000).

A hypothesis test is done by comparing the critical value F (F table) with the value of the F ratio (F count) found in the Analysis of Variance (ANOVA) Table. If Fcount> Ftable, then H0 is rejected, and H1 is accepted. It means that the independent variable variation is significant, explaining the dependent variable variation (taro production). Conversely, if F count <F table, H0 is accepted, and H1 is rejected. It means that the independent variable variation is not significant, explaining the dependent variable variation (taro production).

According to Widarjono (2009), the proportion of the dependent variable variation (taro production) is explained by the variation of the independent variable shown by the coefficient of determination (R2). According to Ghozali (2013), the T-test aims to determine the significant effect of each independent variable individually on the variation of dependent variables. If T arithmetic> T Table, then H0 is rejected, and H1 is accepted. The hypothesis is carried out to a significant level of α 10%.

Hypotheses to be tested include:
H0: $\beta i \leq 0$; it means that the independent variable variation does not influence the dependent variable (taro production) significantly.
H1: $\beta 1 > 0$; it means that the variation of the independent variable influences significantly the dependent variable (taro production)

RESULTS AND DISCUSSION

1. Sample Farmer Identity

The success of a business carried out by farmers is determined by the identity or potential of farmers, such as physical factors and socio-economic factors that farmers have. These factors include age, education level, number of family dependents, farming experience in Table I below:

Table I. Sample Identity Of Taro Farmers In Sinaboi District

NO	Identity	Total (person)	Percentage (%)
1	Age (year)		
	15 - 58	47	78,33
	>58	13	21,67
2	Education level		
	ungraduated elementary school	8	13,33
	Elementary school	20	33,33
	Junior high school	23	38,33
	Senior high school	9	15,00
3	Number of dependent (person)		
	≤ 3	25	41,67
	> 3	35	58,33
4	Farming experience (year)		
	≤ 3	24	40,00
	>3	36	60,00
5	Land Area		
	≤ 1,5	38	63,33
	> 1,5	22	36,67

In Table 1, most respondents are in productive age, with the range of ages between 15 - 58 years is 78.33%, and the average age is 43-72 years. Farmers must have physical abilities as labor so that they would be able to contribute more to develop their businesses and increase their household income.

The level of education can affect thinking, attitude, and action to make decisions, the level of education of the samples described here is the level of formal education that is not graduating from elementary school to the level of high school education. In Table 1, the most significant sample of formal education level is junior high school graduates by 38.33%, and Senior high school by 15%. It shows that a significant number of respondents' education is above nine years of compulsory education in a government program. The higher their education is, the more responsive they are to innovations. It would be better if they are also supported by non-formal education through coaching and counseling, knowledge, skills, mindset, and farmer's behavior in doing business.

The results of the research in Table 1 show that the number of dependents of sample farmers> 3 people is 58.33%. It is the highest number of family dependents, and > 3 people are 41.67% with an average number of family dependents of 4 people. The number of dependents will affect the family economy and family expenses to meet the needs. In terms of the long experience in taro farming, data shows that the most significant sample is farmers with over two years of experience ranges from 36 people or 60.00%. The experience in taro farming enables farmers to face risks, know how to overcome, and minimize problems if they experience difficulties in farming. From the area of land, which is one of the factors that affect the level of income from the most significant taro farming, it has a small land area of 1.5 hectares (63.33%). Loans, respondents whose land status is loans are respondents who use other people's land to be utilized without being charged in rent.

2. Performance of Production Factors in Cassava Farm Production

The allocation of the use of production factors is closely related to the technical aspects of taro cultivation, at the technical research location the taro cultivation is still traditional and hereditary. The average area of land cultivated for taro plants is 0.86 Ha with a range of 0.45 - 2 Ha. Farmers still use local variety seedlings, namely local production varieties themselves. With an average use of seedlings per hectare of 25,734 stems. The number of taro seeds needed in one hectare of land is around 20,000 - 30,000 seedlings. Seedlings used by taro farmers in Sinaboi Sub District are following the recommended number of seeds planted for one-hectare ± 25,000 stems using a spacing of 30 x 70 cm.

To obtain high production yields, taro plants need organic and inorganic fertilizer. The organic fertilizer used is manure, whereas inorganic fertilizers used are Urea, TSP, and KCL. Farmers in the field have not followed the recommended fertilization according to (Direktorat Jenderal Tanaman Pangan, 2013), namely 135 kg Urea, 50 kg TSP. The use of fertilizer by farmers is 74.28 kg Urea, 39.56 kg TSP and 26.18 kg KCl. It is due to limited capital owned by farmers to buy fertilizer. The use of regent type pesticides is 3.15 liters / Ha. The total outpouring of the workforce was 53.67 HOK / Ha / MT sourced from workers in the family of 61.43% and 38.57% of workers outside the family.

The taro is first harvested when the plants are 8-10 months old which is marked by the growth of the leaves begin to decrease, the color of the leaves begin to turn yellow, and many leaves fall out. Harvesting is done manually by pulling a large stem from the Taro and cutting the tubers that have grown. Field results show that the average production of 19,864 kg/ha / MT is obtained.

3. Variety of Production Function Model and Dominant Production Factors Affecting Taro Production

The result of research conducted on five variables using the Cobb Douglas function showed a determinant coefficient (R2) of the production function of 0.8264, which means that variations in the production of taro 82,64% are explained by variations in the plant area, seed, fertilizers, herbicides, and labor. At the same time, 17,36 percent is influenced by other variables, which is not included in the model.

The result of the normality test using the Shapiro Wilk Test is 0.93, with a probability value> 0.0001 that is significantly different from zero at a 5 percent level. It can be concluded that the taro production factor used in the model is normally distributed. The heteroscedasticity test result with Breusch-pagan statistical calculations is 8.56, with a probability value of 0.0674. This value is significantly different from zero at a 10 percent real level. This states that the model is homoscedasticity, where there is no heteroscedasticity problem. The multicollinearity test result from a VIF value is less than 10. It can be concluded that there is no multicollinearity in the model that has been built. The result of testing of the overall variables conducted by the F Test is by comparing the critical value of F (F table) with the value of the F ratio (Fcalculate) contained in the analysis of variance (ANOVA) table. ANOVA results show that the value of F-count (27.638) is greater than the value of F table at 5% significant level (2.426). It means that Ho is rejected, and H1 is accepted. It also means that the variation of independent variables significantly influences on the variation of the dependent variable (taro production). The results of the regression analysis can be written by using the Cobb-Douglas production function equation as follows:

Y = 3,2617 X1 0,215 X2 0,231 X3 0,308 X4 -0,042 X5 0.391 X6 -0.024
X7 0.056 X8 0.127

Partial Test (t-Test) is used to find out how much influence each of the independent variables individually to explain the variation of the dependent variable at a certain level of significance. Decision-making acceptance or rejection of the hypothesis H0 and H1 can be done by comparing the value of t-count to t-table or can be seen from its significance value. For more details, see Table 2 as follows.

Table 2. Results of Estimation of Production Function Models for taro farming in Sinaboi District

Model	Unstandardized Coefficients		Stndardized Coefficients	T	Sig	Collinearity Statistics	
	B	Std Error	Beta			Tolerance	VIF
Constant	3.2617	0.6432		5.736	0.0013		
Plant Area (X1)	0.2158**	0.1632	0.1942	1.932	0.0157	0.349	2.8634
Seed (X2)	0.2312**	0.0714	0.2561	2.116	0.0001	0.534	1.6573
Fertilizer (X3)	0.3086*	0.0969	0.0794	2.486	0.0001	0.506	3.6414
Herbicide (X4)	-0.0422	0.1365	-0.0363	-2.948	0.2247	0.667	1.2159
Labor (X5)	0.3918*	0.0612	0.3712	4.349	0.0024	0.595	2.8452
Age (X6)	-0.0247**	0.1536	-0.0183	-1.604	0.0003	0.316	2.2631
Education (X7)	0.0564	0.1491	0.1146	1.588	0.0861	0.643	1.7453
Experience (X8)	0.1272**	0.0363	0.3452	1.794	0.0042	0.417	3.1462

R2 = 0,8264   * significant at α 1 %, ** significant at α 5 %
F hit = 29,641

The results of the research estimation on the production function model of taro farming in Sinaboi Subdistrict is presented in Table 2. It shows that the factors of production of land area, the seeds, the fertilizer, the number of workers, the age, and the experience have a significant effect on Taro production. In contrast, herbicides and education do not affect taro production. The description of the effect of each factor of production on Taro production is as follows:

The regression coefficient of the land area is 0,2158. The value of t-count is 1,932, while the value of t-table at ∝ (5%) is 1,671, which means that t-count> t-table, then Ho is rejected H1 accepted at ∝ (5%). It shows that the variable land area influences the production of taro. It means that each 10% increase in the land area will significantly influence taro production if the other independent variables remain. According to Suratiyah (2011), the broader the land cultivated, the higher the production per unit area is. So the size of the farm area will affect the amount of product obtained in order to increase farmers' income.

The regression coefficient value of the seed variable is 0.2312, which means that every 10 percent increase in plant seeds usage will increase the amount of taro production by 2,312% with the assumption that the other free variables are fixed. From the t-count value for the seed, the variable is 2. The value of T-table at ∝ (5%) was 1,671. It means that t-count> t-table, then Ho is rejected; H1 is accepted at ∝ (5%). It shows that plant seeds affect the production of taro. The average number of taro seeds of sample farmers in Sinaboi District is 25.734 stems. However, the estimation results of the model show that the number of seeds can still be added because the regression coefficient value is positive. The number of seeds used gives the second most significant influence on taro production. This data indicates that if the number of seeds is added, taro production will increase.

The regression coefficient of the fertilizer variable is 0,3086, which means that every 10% increase in fertilizer usage will increase taro production amount by 3,086% with the assumption that the other free variables are fixed. From the t-count value for the fertilizer variable of 2,486, the value of t-table at ∝ (1%) is 2,390, and it means that T-count > T table then Ho is rejected and H1 is accepted at ∝ (5%). It shows that fertilizer affects taro production. However, the use of fertilizer by farmers is still far from the recommendation. The use of fertilizer still needs to be increased in order to achieve maximum production.

The regression coefficient value of the herbicide variable is -0.0422, which means that every 10% increase in herbicide usage will reduce the amount of taro production by 0.422 % with the assumption that the other free variables are fixed. From the value of t-count for herbicide variables of -2.948, the value of t-table at ∝ (5%) is - 1,671, it means that t-count <Ttable, then Ho is accepted and H1 is rejected at ∝ (5%). It shows that herbicide does not affect taro production.

The regression coefficient of the labor variable is 0.3918, which means that every 10% increase in the use of labor will increase the total production of taro by 3,918% with the assumption that the other free variables are fixed. From the value of t-count for the labor variable of 4.349, the value of t-table at ∝ (1%) is 2,390. It means that t-count> t-table, then Ho is rejected; H1 is accepted at ∝ (1%). It shows that labor affects the production of Taro. The estimation results of the model show the amount of labor used to produce a positive value to increase production, and it can be done by adding labor flows to taro farming. The value of the regression coefficient of the variable of labor is the greatest among the values of the regression coefficient of the other independent variables so that it can provide an illustration that the labor factor is the dominant factor in taro plants. The type of labor used consists of workers in the family and workers outside the family. Field observations of taro farmers are more dominant using labor in the family.

The regression coefficient value of the sample age variable is -0.0247, which means that every 10% increase in age sample will reduce the amount of taro production by 0.247 % with the assumption that the other free variables are fixed. From the value of t-count for sample age variables of -1.604, the value of t-table at ∝ (5%) is -1,671. It means that t-count >t-table, then Ho is accepted, and H1 is rejected at ∝ (5%). This shows that age has an effect on taro production.

The regression coefficient value of the education variable is 0,0564, which means that every 10% increase in age will reduce the amount of taro production by 0.564 % with the assumption that the other free variables are fixed. From the value of t-count for education variables of 1,588, the value of t-table at ∝ (5%) is 1,671. It means that t-count <t-table, then Ho is rejected, and H1 is accepted at ∝ (5%). This shows that education does not affect taro production.

The regression coefficient value of the experience variable is 0,1272, which means that every 10% increase in age will reduce the amount of taro production by 1,272 % with the assumption that other free variables are fixed. From the value of t-count for education variables of 1,794, the value of t-table at ∝ (5%) is 1,671. It means that t-count >t-table, then Ho is accepted, and H1 is rejected at ∝ (5%). This shows that education has an effect on taro production.

From the eighth variations of the production factor variables analyzed, the dominant effect on taro production is the labor variable with a regression coefficient is 0.3918, fertilizer variable with a regression coefficient is 0.3086 the taro seed variable with a regression coefficient is 0.2312, and the taro plant area variable with a regression coefficient is 0.2158

3. Conditions of return to scale

The value of the regression coefficient in the Cobb-Douglas production function model is the elasticity of each independent variable consisting of land area, seeds, fertilizer, herbicides, and total labor force. The sum of all the values of the regression coefficient of the independent variable (production elasticity of each factor of production) shows the condition of the return to the scale of business. Based on the estimation results of the model, it is known that the elasticity of taro production in Sinaboi District is 1.264. It means that if factors of production are added by 1%, productivity increases up to 1,264. The elasticity value is greater than one which means that taro farming in Sinaboi District is in the increasing return to scale condition, which means that each addition of production factors will provide a greater increase in production, i.e. factors of production are still possible to be added so that taro production increases.

CONCLUSION

1. The production factor of taro farming in Sinaboi sub-district is the largest proportion of taro area (72%) in the small land area of 1.5 Ha, the average number of plant seeds is 25,734 stems/ha, the average use of Urea, TSP and KCl is still lower than the recommendation, the total outpouring of workforce is 36.40 HOK / Ha / MT sourced from workers in the family of 61.43% and 38.57% of workforce outside the family, the average production of 19,864kg / ha / MT.
2. Production factors that affect taro production are land area, seeds, fertilizer, labor, sample age, and farming experience, while herbicides, length of education do not affect production.
3. The dominant production factors affecting taro production are labor, seeds, fertilizer, sample age, and farming experience. Taro farming is in the condition of increasing return to scale where the value of production elasticity is 1.264 greater than 1, which means that the addition of production factors is still possible to increase taro production.

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