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SECURE FOOD FUTURES SUMMIT

BIOSECURITY FOR FOOD SECURITY

CRC PLANT biosecurity

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Bali, May 21st - 22nd, 2015

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"SECURE FOOD FUTURES"

21st – 22nd May 2015

Bali, Indonesia

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PREFACE

Indonesia in 2015- 2020 faces many and complex development challenges particularly in relation to poverty and food security. National targets in Indonesia are to increase food supplies and food sovereignty over the four year period to 2019. There are two core sets of strategies to achieve these goals, and a third for securing sustainable food futures such as **INCREASE YIELDS: Increasing** crop yields through better technology, water, seeds and fertilizer; **REDUCE LOSSES: Reducing** existing crop losses through better pest and disease management, storage conditions and supply chain quality. Biodiversity is a key to stability in ecosystems (natural and managed). Traditional food production systems, for example, are diverse – and stable. Breakdown of ecosystems due to biosecurity incursions introduces instability and incurs losses, social, economic and environmental; **IMPLEMENT TOGETHER INCREASES OUTCOMES:** With the current bilateral opportunity for Indonesia and Australia working in collaboration for the period to 2019, considerable additional benefits to secure food futures will be achieved if strategies for both increased yields and reduced loss strategies can work together. For example, in selecting new technologies to support to increase yields in the short term, consideration should also be given to the technology's impact on pest and disease cycles and biodiversity issues.

Strategies for **increasing** food supplies are usually seen as adding more and better fertilizer, better and more resilient seeds, enhanced and more appropriate technologies and more and more reliable water supplies. Increasing productivity of crops is often seen as the key to improving food security but, increasingly, it is recognized that reducing crop loss both on farm and 'beyond the farm gate' are of at least equal importance.

The *"Secure Food Futures"* Summit will focus on how secure food futures can be achieved more effectively through a dual approach – (1) increasing yields and (2) reducing loss. Equally important is (3) how INCREASE YIELDS and REDUCE LOSSES STRATEGIES should work together to compound the benefits of each strategy.

We would like to take this opportunity to express our sincere appreciation to the members of Technical Advisory Committee who helped review the papers and maintained high standards for the international conference proceedings.

May 2015

SECURE FOOD FUTURES

INTERNATIONAL BILATERAL BIOSECURITY SUMMIT, BALI, 21st -22nd MAY 2015

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ROLES OF TRADITIONAL IRRIGATION SYSTEM IN SUPPORTING RICE PRODUCTION IN BALI: Lessons Learned from Bali Province, Indonesia

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Abstract

Presently, rice self-sufficiency has become a prime objective of agricultural development in Indonesia in order to solve rice import problem. In case of Bali, the existence of subak as traditional irrigation system has been frequently involved by the government in the implementation of rice farming program. This paper is aimed to describe the roles of subak in supporting rice self-sufficiency. In relation to rice production, subak system has significant roles in managing and mobilizing the natural, man power and financial resources under the principles of togetherness and harmony. Subak as an organization that regulates the distribution of water in the rice is one of Bali's cultural heritage that has been recognized worldwide. The functions of subaks are distribution and allocation of irrigation water; mobilization of resources for operation and maintenance of irrigation facilities; fund raising, conflict management; and ritual activities. By these functions, subak could manage cropping intensity and ensure the demand of irrigation water for making higher rice productivity. Subaks as a social capital should be more intensively strengthened its capacity in terms of technical, socio-cultural, economic, agricultural, irrigation and management aspects for supporting rice self-sufficiency and gaining economic incentives as well.

Key words: Subak, irrigation, productivity, rice self-sufficiecy

I. Introduction

In Indonesia, agricultural development could not be separated with rural development since they support each other. Agricultural development, particularly on rice field (*sawah*) has significant roles on national economic development because rice constitutes a staple food for the Indonesia people. Since the beginning of New Order era, government had increased the particular agricultural program for achieving rice self-sufficiency which was finally gained in 1984. Nowadays, the national demand of rice has been increased and even it bigger than the production at the national level. It has resulted in making import policy on rice. In order to solve the import problem, the government has intensively improved rice program through intensification by applying good agricultural practices supported by other related sectors, such as irrigation development, agro-inputs provision, credit, etc.

In case of Bali, the existence of subak as a traditional irrigation system is still very important in the agricultural programs, especially those which are related to rice farming on *sawah* (Dewi,

et.al. 2014; Sedana; 2013). Irrigation water as one of important thing for rice farming has being a problem for subak concerning the scarce of irrigation availability and its worse quality. On the other hand, the government has still expected for the farmers to be able to increase cropping intensity for supporting the government program, rice self-sufficiency. Subak might have good management in water distribution and allocation to members aside from managing internal social activities of subak (Pitana, 2005). Subak is not only an institution in agriculture, but also as a part of Bali's local wisdom about human society and its relationship with the environment (Sedana, et al, 2014). Subak is a customary law community that has the characteristics of socio-religious-agriculture, which represents farmers' associations that manage an irrigation system in paddy fields (Sedana, et. al, 2014). Regarding this condition, objectives of this paper is to describe socio-cultural aspects of subak as traditional irrigation system; and to understand the roles of subak in supporting rice self-sufficiency program in Bali.

II. Subak as Traditional Irrigation System and Its Roles

Water is one of the most important natural resource that is being used for agricultural and non-agricultural sectors. Nowadays, scarcity and competition of water have increasingly happened including in Indonesia. In Bali province, for instance, these frequently make conflicts among the users, such as *subak*, private sectors (for tourism and industry), and government (for domestic water), particularly along the water source such as river. Subak as an organization that regulates the distribution of water in the rice is one of Bali's cultural heritage that has been recognized worldwide (Aryawan, et.al., 2013).

Subak irrigation system in Bali has been known since more than thousands ago (Purwita, 1993). The *subak* is a widely known 'traditional' irrigation management institution for rice cultivation on the Indonesian island of Bali. It has developed over the centuries in the specific socio-cultural, agro-ecological and political-administrative environment of this small and mountainous island (Roth and Sedana, 2015). As a consequence, the subak and irrigated rice agriculture became well adapted to, and embedded in the characteristic Balinese landscape of rugged mountains and steep valleys deeply incised by fast-flowing rivers.

In the past, the kings (monarchy) involved in subak system by allowing farmers group to construct temporary dams on the rivers to irrigate the existence dry land. Even, the Monarchy gave freely some land tax for the farmers. In the period of the Dutch administration, the head of subak was instructed to collect land tax from the farmers (subak members). It is worthy to note that subak has specific activity--ritual ceremonies which might not be found in other irrigation systems in Indonesia (even in the world).

Subak is not only an institution in agriculture, but also as a part of Bali's local wisdom about human society and its relationship with the environment Subak is a customary law community that has the characteristics of socio-religious-agriculture, which represents farmers' associations that manage an irrigation system in paddy fields. The philosophy of the subak system is *Tri Hita Karana* (three causes of happiness) concept based on the harmony among the three. Tri Hita Karana is a universal concept of harmony and togetherness (Windia, 2010). The fast growth of development in Bali, however, has brought about the increase of land converse. The competition of water also becomes complex due to water for non-agricultural purposes increase. This is a

major threat to the subak sustainability in Bali. Subak must be revitalized in anticipating the challenges (Sunaryasa, 2013).

Roles of Subak System in Supporting Rice Self-sufficiency Program

The subak system as an organization has a variety of roles and functions (multi - functional roles), which is not merely to produce food. Several functions of subak on irrigated land are as follows: production and economic funsctions to ensure food security; environmental functions including flood control and erosion control, groundwater recharge; purification of air and water; and giving cool air; ecological function (as an habitus for various species that provide a source of protein for farmers and preservation of biological diversity. It also has social and cultural functions, namely as buffer of rural tradition and social-cultural values; rural development functions, which is the source of drinking water for livestock, washing and bathing for the villagers, providing employment opportunities for the villagers (Sutawan, 2005; Groenfeldt, 2006). In terms of tourism aspcts, subak also has ecotourism and agrotourism functions because of the attractiveness of scenic beauty in the form of rice terraces and natural rural and agricultural life of the rural population including agricultural production (Lorenzen, 2011; Mizutani, 2002; Shah and Shah, 1994).

At subak level, there are some roles that should be done for achieving the goals of subak members and suppoting the above mentioned functions. These are: distribution and allocation of irrigation water; mobilization of resources for operation and maintenance of irrigation facilities; fund raising, conflict management; and ritual activities (Wiguna, et al, 2015). Water distribution and allocation is the primary function for binding the farmers in farming activities within Subak system. The division and allocation of irrigation water is done from the source at the river through weir to the farm level at the rice fields. At the weir level, for example, the water is proportionally divided to a subak and other subaks located at the downstream area. Before government's intervention, the subaks along the river had a consessus to divide allocation of water among themselves. Informally, they had coordination for water distribution and allocation including water control. .

After government (Public Works Office or PU) intervention by constructing permanent weir, distribution and allocation of water was done by the government officer. They set water meter control device and put a water gate to up and down control and sedimentation flow control. Under the national regulation, operations and maintenance works at the primary level icluding at the weir are under government officials.

At the river level, water distribution system is done through an agreement among subak that utilize water. In case of singular subak having some sub-subak called tempek, water distribution was done under various systems based on the subak consensus (Sushila, 1991). There are continuous, rotation and stragering system. During dry season, water distributon is run on the continuous system. In dry season, however, the system might be rotation and stragering. The subak should manage water uses for planting rice and secondary crops called palawija based on the availability of water at the source level or river. By subak system, it is fully allowed among the members to have mutual water borrowing in order to overcome scarcity of water.

It is sometimes done by stagering system. There is interval period time for a number of farmers to cultivate their land earlier than the others. One the earlier farmers completed their land preparation; the water should be distributed to other farmers. Allocation of water is managed by using traditional measurement, called *tektek* or *depuk*, or *nyari* dependent on the locations where the subak are. These are found on the division structures at tertiary system. *Tektek,* or *depuk,* or *nyari* is a concept to allocate water to each subak members (farmers) proportionally, based on the wide of existing canal, where the water division is constructed (Roth, 2011). This system is regarded effective for farming works on farmers' rice fields.

Nowadyas, government has been increased its development to support food safety by constructing the dam and other water supply or reservoir in Bali. This is aimed at storing excess water during rainy season that can be used to water supply and water resources at a time required, agricultural needs as well as flood control, water quality, sediment control and energy or hydropower. Dam constructed by government (Ministry of Public Works) is very important for subaks in ensuring the availability of water in the river. At least, subaks might not work any more at this level, thus they could focus on the farming works and operation and maintenance of irrigation facilities at the farm level only. Under the regulation, the government has the responsibility on the primary level (dam and primary and secondary canal).

In term of subaks, development of dam or reservoir must bring benefit in supplying irrigation water. The primary indicator for this benefit is higher cropping intensity on the ricefield that is about 300 % per year. Subaks principally have a good management in planting rice, such as variety selection, planting schedule, planting pattern and others. Therefore, it must be clear information about the condition of water availability after dam construction. Irrigation water management is fully managed and operated by subak (in one dam) and the federation of subaks (several dams along the river). The subak system and subaks federation have significant roles in supporting self-sufficiency program through the provison of irrigation water. The Ministry of Public Works and The Ministry of Agriculture are closely related to each other in supporting subaks for rice farming, in which the Public Works Misnistry has responsible to the irrigation infrastructure development, while the good agricultural practices on rice farming are being responsibility of Agriculture Ministry.

III. Conclusion

Subaks have significant roles in water management within subak level and inter-subaks level. Philosophy of Tri Hita Karana is always being a guide of subaks in irrigation management, especially in running their functions. The functions of subaks are distribution and allocation of irrigation water; mobilization of resources for operation and maintenance of irrigation facilities; fund raising, conflict management; and ritual activities. Government has been increased its development to support food safety by constructing the dam or reservoir in Bali. By subak system, the availability of irrigation water could be effectively managed for irrigating ricefield to grow rice and make good productivity.

Subaks should be strengthened its capacity in terms of technical, socio-cultural, economic, agricultural, irrigation and management aspects for supporting better productivity of rice in order to support government program in achieving self-sufficiency.

References

Aryawan, I P.S. Windia, W. dan Wijayanti, P.U. 2013. Peranan Subak dalam Aktivitas Pertanian Padi Sawah, Kasus di Subak Dalem, Kecamatan Kerambitan, Kabupaten Tabanan. E-Jurnal Agribisnis dan Agrowisata Vol. 2, No. 1, Januari 2013

Dewi, R.K., W. Windia and W. Budiasa. 2014. Simulation Subak Management Function Optimally in Subak Lodtunduh, Bali, Indonesia. *Journal of Economics and Sustainable Development.* Vol.5, No.28, 2014

Groenfeldt, D. 2006. Multifunctionality of Agriculture Water: Looking beyond Food Production and Ecosystem Services. Irrigation and Drainage 55:73-83(2006)

Lorenzen, R.P. 2011. Changing realities: perspectives on Balinese rice cultivation. *Human Ecology 39.1 (2011): 29-42*

Pitana, I.G., 2005. *The Cultural Values of the Laeks in the Rice-based Society of Bali, Indonesia* – paper prepared for the Asian Wetland Symposium 2005, Innovative approaches to sustainable livelihood, Bhubaneswar, India, 6-9 February 2005.

Purwita, I.B. 1993. Kajian Sejarah Subak di Bali, dalam Pitana, editor. *Subak, Sistem Irigasi Tradisional di Bali*. Denpasar: Upada Sastra.

Roth, D. 2011. The Subak in Diaspora: Balinese Farmers and the Subak in South Sulawesi. Hum Ecol (2011) 39:55–68

Roth, D. and Sedana, G. 2015. Reframing Tri Hita Karana: From 'Balinese Culture' to Politics. *The Asia Pacific Journal of Anthropology, 16*(2), 157 - 175

Sedana, G. 2013. Social Capital on Farmers' Agribusiness within Subak System in Bali. Dissertation in Udayana University. Indonesia.

Sedana, G. I G.A.A.Ambarawati, W. Windia. 2014. Strenghtening Sosial Capital for Agricultural Development: Lesson from Guama- Bali, Indonesia. *Asian Journal of Agricultural Development, Volume 11, Issue 2*.

Shah, P. and M.K. Shah., 1994. "Multifunction Irrigation Organisations: Advantage or Handicap". *Irrigation Managemnt Network, Network Paper No.28, April 1994.* Londdon: Overseas Development Institute.

Sunaryasa, M.O. 2013. Upaya Revitalisasi Peran Subak dalam Pelestarian Fungsi Lingkungan, Studi Kasus Subak Jatiluwih dan Subak Klooda Tabanan, Bali. Semarang: Tesis Pascasarjana Universitas Diponegoro.

Susanto, S., Pusposutardjo. S., Suryo, D. 1999. Theoretical Framework and Methodological Approach to Explore Subak System as an Indigenous Cultural, Social, and Technological System, in *A study of the subak as an indigenous cultural, social, and technological system to establish a culturally based integrated water resources management* (ed: S.Susanto), Faculty of Agricultural Technology, Gadjah Mada University, Yogyakarta.

Sushila, D. 1991. *Subak: Sistem Irigasi di Bali dalam Irigasi di Indonesia: Dinamika Kelembagaan Petani*. Editor: John S. Ambler. 1991. Jakarta: LP3ES.

Sutawan, N. 2005. Subak Menghadapi Tantangan Globalisasi. Dalam: *Revitalisasi Subak Dalam Memasuki Era Globalisasi*, editor : I Gde Pitana dan I Gede Setiawan AP.). Andi Ofset. Yogyakarta.

Wiguna, W.A.A., Lorenzen, R,P. and Lorenzen, S. 2015. Past, Present and Future – Perspectives of Balinese Rice Farming. International Rice Conference 2005: 12-14 September 2005, Indonesia.

Windia, W. 2010. Sustainability of Subak Irrigation System In Bali (Experience of Bali Island). Paper presented in the *Seminar on the History of Irrigation in Eastern Asia*, organized by ICID.IID, in Yogyakarta on October 13, 2010

STRENGTHENING LOCAL SECURE FOOD THROUGH REVITALIZATION OF RULES (*AWIG-AWIG*) OF SUBAK AND AGRIBUSINESS BEHAVIOR

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Abstract

The aims of study: (1) to analyze the contents of *Awig-Awig* Subak in Buleleng Regency and to recreate with including regulations for preventing alterations of rice field function and pests and diseases spreading; (2) to analyze the agribusiness behavior of farmers; (3) to map the agricultural potentials; and (4) to analyze the cost-return on the plots of organic-based rice cultivation. The results indicated that socializations of *Awig-Awig* were lacking, no *Awig-Awig* Subak included rules and sanctions against habits to pollute irrigation and rice fields. *Awig-Awig*s were not delineating the rules for preventing alterations of rice field function and pests and diseases spreading. The level of productivity and profit of rice farming in Subaks were just met the basic consumption needs for a farmer family. The prospect for agro-industries development was quite good. The average of productivity on rice cultivation plots was 4.16 tons of rice/ha with profit Rp 13.165.000,- / ha. Nevertheless the agribusiness behavior of farmers was still at middling level. To strengthen the local secure food in this manner was then necessary to revitalize *Awig-Awig* of Subaks with written rules explicitly to prevention of altering rice field function and pests and diseases spreading as well as to upgrade the agribusiness behavior of the farmers to be high industrial culture.

Keyword: Awig-Awig of Subak, Agribusiness behavior, Local secure food, Revitalization and Alterations of rice field function

I. Introduction

Subak is social, economic, cultural and religious pillar for the farmers in Bali. No farmer in Bali which is not bound in Subak organization. Even now the cultural landscape of Subak is one of the World Heritages. Tourism sector in Bali obviously directly utilizes assets of aspiration-tradition-religion-culture (TRAC) are rooted in Subak as a tourist attraction. Subak is very strategic role in maintaining the sustainability of agriculture and environment. But behind the "sparkling" it turned out that Subaks in Bali are increasingly miserable. The high currents of globalization and the rapid activities of capital-based tourism in Bali have many impacts that cause various changes in form and social motives of Subak, which also provide different functions and roles of Subak at first. Many rice fields in Subak have changed into tourist accommodation buildings, hotels, restaurants, residential development and craft industry and manufacturing. If the alterations of rice field function are not unstoppable, Subak will remain

possess only a temple (a place for worshiping), while the land will remain a distant memory. If this phenomenon continues, the local farm operations will be decreasing due to the seriously rice fields reduction and how the farmers in Subaks can contribute positively to the initiatives to strengthen local secure food?

These phenomenons had been a lot happening in the area of Buleleng regency. Practice of industrialization and commercialization of agricultural land each year more rampant done by big investors with a pretext and instrument of investment. The changed land ownership to big investors generated a lot of cases of rice field conversion to non-agricultural, resulting in the closure of many irrigation channels and roads of Subak. This triggered a severe conflict between farmers against outsiders of Subak (Kardi, 2012).

In the past before the era of 1980 Subaks were very absolute autonomy. All decisions made by consensus with the testimony of the Lord *Ida Sang Hyang Widi Wasa*. Therefore *Sangkepan* (customary members gathering) always done in Subak's temple. *Sangkepan* always preceded by prayers together using *banten*/offerings and incense, so *Sangkepan* was always magical. It was important to make the best decisions and avoid internal conflicts (Sutjipta, 2006). Every decision of *Sangkepan* was absolutely binding on all farmers. Including the sale and purchase of land through Sangkepan decision in Subak. It was very hard the rice field of farmers could be transferable to outsiders of Subak. Subak autonomy in land sales to extinction since land certificates issued by National Land Agency served as the legal status for the most powerful land ownership, which further compounded by booming land demand for various building development. Finally rice fields in Subak changed hands to the investors who were far away, so that the productivity of rice into a slump, the emergence of bare lands and sleepy lands. Agricultural lands eventually become a trade commodity of speculators (owners of money) to earn a profit.

Due to the business activities with competitive paradigms, the farmers and officials of Subak, are more likely to cede agricultural land on the demand-supply mechanism that makes the price of land to be very high compared to the returns given land in their function as agricultural land. The local wisdoms of *Tri Hita Karana* (which requires the utilization and management of agriculture should be prudent and preserved for the benefit of all the people in the community) arre many neglected. Returns of the lands in their function as agricultural land are still quite low due to the agrarian culture of the farmers are still communal, emotional bonding, primordial, collective, highly bound to natural and simple technology. Therefore the farmers in Subaks are imperative to be empowered until they have agribusiness behavior with high industrial culture.

Every Subak has *Awig-Awig*. *Awig-Awig* is a legal product of a traditional organization (customary law) in Bali, which is generally made by consensus and serves as a guideline to behave for members of the organization (Surpha, 2003). *Awig-Awig* is made based on fairness and propriety, so that all members avoid deviations in carrying out their duties and responsibilities as well as in the use of their rights. *Awig-Awig* has advantages given as the product of customary law in Bali, *Awig-Awig* has domain knowledge, namely: ethics, physical and metaphysical of life (magic qualities), so it is more powerful to bind and believed and obeyed (Geriya, 2004). Subak as one of the traditional organizations has *Awig-Awig* Subak. Any irregularities or violations to agreements or decisions which have been set in *Awig-Awig* Subak

can be subjected harsh sanctions. With the *Awig-Awig* Subak, it is expected to create peace and order in around Subak (Sutawan, 2008).

Most *Awig-Awig* Subaks are not written and well documented, so there is a tendency farmers disregard *Awig-Awig*, especially disregarding in the context of conservation of land and water resources, when they are faced to the swift currents of modern technology development and commercialization of lands and water due to the side effects of globalization (Kardi et al., 2012).

On the account of the above phenomenons, this study was aimed: (1) to analyze the contents of *Awig-Awig* Subak and to recreate with including regulations for preventing alterations of rice field function and pests and diseases spreading; (2) to analyze the agribusiness behavior of farmers; (3) to map the production, marketing and agro-industry potential; and (4) to analyze the cost-return on the demonstration plots of organic-based rice cultivation. In the future expected the attitudes and patterns of farmers in action can re-adhere to the noble cultural value system which are implemented in the form of application of revitalized *Awig-Awig* Subak; and the achievement of agribusiness with globally managing and locally caring toward a better local secure food.

II. Materials and Methods

This study conducted on some Subaks in coastal areas of Buleleng regency. This research used survey method to collect information and data about functioning of Subak's *Awig-Awig* and agribusiness behavior of farmers. The sampels were 31 Subaks with highest area of agricultural land conversion. Demonstration plots in Subak Dangin Yeh, Sangsit Village was for introducing organic-based rice cultivation using rice variety of *Ciherang-Petrocid*.

In the event to analyze the contents of *Awig-Awig* and to strengthen it with written rules which were contextual to prevention of agricultural land conversion and pests and diseases spreading, the variable measurements were qualitatively by examining and interpreting the vision, mission and objectives of each articles in *Awig-Awig* of Subak. The analysis and synthesis of *Awig-Awig* were descriptively-qualitatively-interpretatively based on tradition-religion-aspiration-culture (TRAC) that were developing in Subak.

Adapted from Suparta (2005), regarded the agribusiness behavior with industrial culture on farmers at the following elements: (1) knowledge-based decision making; (2) engineering technology in production activities; (3) production orientation to market demand; (4) augmentation in efficiency and productivity; (5) improving the quality and value added; (6) innovative; (7) business risks; (8) vertical and horizontal coordination; and (9) and professional independence in the decision. Each of these elements agribusiness behavior was measured on aspects of cognitive, affective, psychomotoric (Mardikanto, 1993).

The demonstration plots of organic-based rice cultivation using variety of *Ciherang-Petrocid* were tested on 4 rice field plots, each with an area of 25 acre and used moving rice seeds technique with the planting model of *Legowo* 2:1 which was 40 cm and 20 cm row spacing and the distance between rows of plants in lane was 10 cm. The full implementation of this

demonstration plots applied the pack of Organic-Based Rice Farming Technology/P3BO Unmas (Widnyana, 2009) (see Table 1). Subak community involvement through participatory rural appraisal (PRA).

Table 1. Aspects of Technology and Treatments on Demonstration Plots of Organic-Based Rice Farming

Technology Aspects	Treatments
Variety	• Variety of *Ciherang-Petrosid* • Tolerant varieties of brown planthopper, tungro disease, and bacterial leaf blight
Seedbed	Wet seedbed, grain seed treatment soaked in water 3 days. Laying the seeds in east-west rows.
Dosage of grains/ha cultivation	40 kg/ha
Days of Seedling	• 18-21 days
Number of seeds per hole	• 1-2 pieces of seed
Planting and watering methods	• Legowo model with type 2: 1 which was 40 cm and 20 cm row spacing with the distance between plants in rows 10-15 cm. • The interrupted water supply (intermittent irrigation) through the making of a trench around each of a maximum of 250 m^2
Fertilizer efficiency	Using the Leaf Color Chart (LCC). The use of spraying organic fertilizer (ABG) and urea starter
Organic fertilizer	8 tons /ha of manure compost and Biourine
Pest and Disease control	• Monitoring pest populations per week • Botanical and biological pesticides, when needed
Crop handling	• Involving crop group/*seke manyi* • Dry the grain immediately after harvest, use the dryer if it gets cloudy

III. Results and Discussion

3.1 Existence and Performance of *Awig-Awig* Subak

Actually, *Subak* denotes a technology developing and synergizing with community culture. On that account, *Subak* is known as an institution having socio-cultural characteristic. It is reflected by the activities of *Subak* predominated by mutual assistance and ritual ceremonies (Windia et al., 2010). The results indicated that the future of agricultural lands and Subaks along the coast of Buleleng regency were very unwelcoming. Agricultural land conversion on Subaks were rather extensive (with average 21.5 ha or 1.26% per year), because of the location of the lands was very strategic area for development of tourism accommodation along the coast of Buleleng regency.

The condition of Subaks increasingly apathetic to protect land and infrastructure resource brought about high Agricultural land conversion and rather not unstoppable. The whole Subaks also did not have authoritative *Awig Awig* for initiatives to prevent agricultural lands conversion.

Awig-Awig of Subaks were very perturbing as the socialization of *Awig-Awig* was lacking. No *Awig-Awig* Subak listed the rules and sanctions against pollution to irrigation canals and rice fields of plastic waste, trash cans and other chemicals. Concern and awareness towards environmental hygiene for irrigations and rice fields were very low. No *Awig-Awig* Subak included rules to accommodate efforts to prevent changes in the function of agricultural land to non-agricultural as well as to to prevent spread of pests and diseases of plants and animals. Authority of Subaks to determine their own life to protect land and infrastructure resources was getting weak and threatened, so *Awig-Awig* (either written or unwritten) should be reinforced with written rules which contextual to the prevention of land degradation and conversion as well as pests and diseases spreading.

3.2 Agricultural Potential in Subak and Agribusiness Behavior

The geographical map of the population of Subaks in Buleleng regency with along the upper reaches of the region can be seen in Figure 1. Actually the main source of water flow for rice fields irrigation in Subaks is Buyan and Tamblingan lake. Quantity and quality degradation in conservation area of Buyan and Tamblingan will make fatal to the irrigation water supply for the lands of Subak. The present increased soil erosion due to the building development for hotels, villas, restaurants, housing and agricultural cultivation on the slopes of the mountains and the downstream area of Buyan and Tamblingan should be controlled as soon as possible.

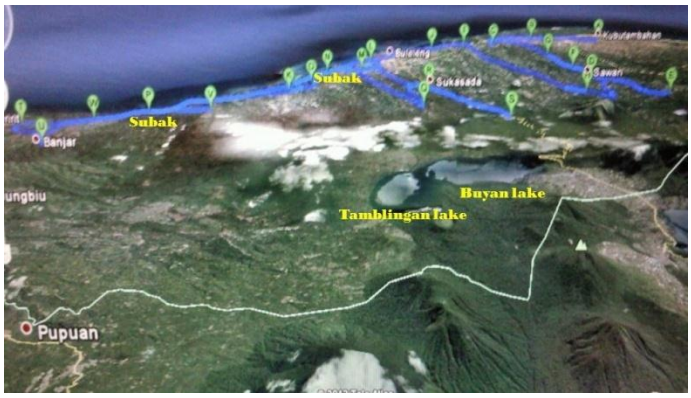

Figure 1. Geographical Map Location of Subaks, Buyan and Tamblingan Lake

The average farmer's land area was 64.2 acres, with an average number of farmers 95 people per Subak. Approximately 70% of farmers were tilling the land and not the owners. The average rice productivity of land was 56.45 quintal/ha/season (dry grain harvest). The average revenue of rice production was Rp 23.71 million/ha/season with farm income of Rp 12.24 million/ha/season. The productivity and farm income was at middle level. With an average of 64.2 acre land size, then every farmer had the income from rice farming around Rp 1.96 million/month, which was

an income figure that just met the basic consumption needs for a farmer family. Farmers who cultivated onions and other horticultural crops planting throughout the year had a higher income than rice farming, it reached by Rp 2.45 million/month.

The demonstration plots of organic-based rice cultivation using variety of Ciherang-Petrosid gave productivity 4.16 tons of rice/ha with profit Rp 13.165 million /ha. Excess of organic-based rice cultivation was that an increase in organic matter and biodiversity that were potentially to increase productivity and income of rice farming in the next planting season. Through participatory rural appraisal to these demonstration plots afterward the farmers could plan, implement, utilize and assess organic-based farming method.

In the aspect of *cognitive* with the sequence level: Simply knowing (score 1); Understanding (score 2); Using (score 3); Analyze (score 4); Synthesise/integrate (score 5); and Evaluate (a score of 6). The *cognitive* of the farmers was at a level sufficient to analyze. In the aspect of *psychomotoric* with the sequence level: Receive (score 1); Preparing (score 2); Try (score 3); Accustomed (score 4); Skilled (score 5); and Adaptation (score of 6). The *psychomotoric* of the farmers was at a level rather Accustomed. In the aspect of *affective* with the sequence level: Receive (score 1); Responding (score 2); Assess (score 3); Organizing (score 4); and Living (score 5). The *affective* of the farmers was at a level rather Assess. Therefore the agribusiness behavior of farmers was at middling level. The improving elements of *cognitive*, *psychomotoric* and *affective* should be expanded in the forum of Subaks, so that the farmers can have agribusiness behavior with high industrial culture which then can increase the return of lands in their function as agricultural lands.

IV. Summary

Awig-Awig of Subak was very perturbing as the socialization of *Awig-Awig* was lacking. No *Awig-Awig* listed the rules and sanctions against pollution to irrigation canals and rice fields. No *Awig-Awig* Subak included rules to accommodate efforts to prevent changes in the function of agricultural land to non-agricultural as well as to to prevent spread of pests and diseases of plants and animals. The level of productivity and profit of rice farming in Subaks just met the basic consumption needs for a farmer family. The prospect for agro-industries development was quite good. The average of productivity on rice cultivation plots was 4.16 tons of rice/ha with profit Rp 13.165 million/ha. Nevertheless the agribusiness behavior of farmers was still at middling level.

Participatory all parties appraisal should be continued to make people aware of the importance of local agriculture and food security for Buleleng regency area by revitalizing *Awig-Awig* of Subaks with written rules explicitly to prevention of altering agricultural lands function and pests and diseases spreading (including the imposition of strict sanctions against *Awig-Awig* violators). Afterward *Awig-Awig* can be high-powered and high-authorized. The improving elements of *cognitive*, *psychomotoric* and *affective* should be expanded in the forum of Subaks with much presenting counseling and demonstrating plots of organic-based farming, so that the farmers can have agribusiness behavior with high industrial culture to increase the return of agricultural lands.

V. Acknowledgements

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References

Geriya, I. W., 2004. *Transformation of Baliness Culture Entering the XXI Century*. Denpasar: Perusda Provinsi Bali.

Kardi, C., 2012. *Enhancing Competitiveness of Subaks in Sustainable Agriculture Development and Community-BasedTourism in Buleleng regency*. Agrimeta Journal Vol. 2 No. 3.

Mardikanto, T., 1993. *Broadening to Agricultural Development*. Surakarta: Sebelas Maret University Press.

Sutjipta, N., 2005. *Tourism Revolution on Pulau Dewata*. Denpasar: Penerbit Universitas Udayana.

Suparta, N., 2005. *Holistic Approach to Buid Up Agribusiness*. Denpasar: CV. Bali Media Adhikarsa.

Surpha, I.W., 2003. *The existence of the Customary Villages in Bali*. Denpasar: Upada Sastra.

Sutawan, N., 2008. *Organization and Management of Subak in Bali*. Denpasar: Pustaka Bali Post.

Widnyana, IK, P. Sujana, and Eka Martiningsih, 2009. *Enhancing Based-Organic Rice Productivity to Support Tourism in Bali*. Denpasar: LPPM University of Mahasaraswati Denpasar.

Windia, W., Ketut Suamba and Wayan Sudarta. 2010. *The Development of Food Security Model Based on Subak System In Bali*. SOCA Journal. Vol. 10. No.1.

THE ACCELERATION OF IMPLEMENTATION OF AGROINDUSTRY REGION BASED ON ENVIRONMENTAL MANAGEMENT SYSTEM IN INDONESIA

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Abstract

The purpose of this study was to evaluate the performance of agro-industry in terms of corporate commitment, cost implementation, corporate culture, corporate orientation, proactive environmental management and environmental management driven as an embodiment boost the implementation of environmental management systems in Indonesia and identify the various components that can speed up the implementation of agro industry region based system environmental management in Indonesia. The method of analysis used in the study was a survey conducted in the corporate of Agro-industry sector in Bali that followed of PROPER programmed of the Ministry of Environment Period of Year 2010-2013. The samples in this study were 180 respondents. Data collection techniques using documentation, interviews and questionnaires. The technique uses multiple linear regression analysis and analysis of the spider web. The results showed an increase in the agro industry corporate performance is influenced by the corporate commitment , cost implementation, corporate culture, corporate orientation, proactive environmental management and environmental management driven as the embodiment of the environmental management systems and environmental management in Indonesia necessary mindset change of approach by involving stakeholders into shareholders of the corporate, community, government, academia, NGOs, banks, suppliers and the media. The conclusion of accelerate of the park implementation an environmental management system based agro industry it is necessary to increase the performance of the agro industry corporate with shareholders approach of all components.

Keywords: corporate commitment, cost implementation, corporate culture, corporate orientation, corporate performance, shareholders

I. Introduction

Indonesia is the dream of every child prosperous nation to prosper better life. To achieve this dream, the agricultural sector can become the foundation for most Indonesian people, however the agricultural sector has yet to be able to optimally contribute to the Indonesian people wide. Case until this happens is still high dependence on imported agricultural sector broadly and that even more alarming many end products instead of imported raw materials come from Indonesia. This condition is clearly cause for concern because Indonesia as an agricultural country that largely community relies on agriculture as a livelihood. In principle, no

agricultural product which can not be utilized if done with the innovation and use of technology to the maximum which is expected to create value added of agricultural products and does not damage the environment (zero waste). To make it real Indonesia prosperous the shareholders role in accelerating regional agro-based management system environment in Indonesia, especially to build alternative energy from agricultural products has become imperative to immediately applied in every area even at the village level.

The basic principle is the reference in the process of drafting a national energy policy in accordance with the Undang Nomor 30 Tahun 2007 on energy in article 1 number 25 is the principle of fair, sustainable and environmentally friendly in order to achieve self-reliance and national energy security by realizing the policy direction energy security in order to support sustainable development. To realize this, the basic principle required the active involvement of national energy management / areas over the existing shareholders optimizing the agro-industry sector to accelerate the implementation of the regional agro-based management system environment by maximizing the added value of agricultural derivative products as an alternative energy such as bio ethanol, biodiesel or biopremium.

Agroindustrial sector not only provides income agricultural actors from upstream to downstream, but can absorb labor in a number of significant, increase foreign exchange earnings through increased export results agriculture and encourage the emergence of new industries producing alternative energy. Therefore the agro-industry sector has strategic role not only for equitable development, economic growth and national stability, but plays an important role in protecting and preserving the environment. According Saragih (2000) is an agro-industry leading sector (leading sector) in the future because the agro-industry sector has a large market share in the economy as a whole so that the progress made can affect the economy overall. Growth and relatively high added value are expected to have relevance to the forward and backward (forward and backward lingkages) large enough to be able to draw on the growth of other sectors and the diversity of activities. The sector does not have elements that can be an obstacle (buttleneek effect) if it is growing.

Research conducted Montabon et al., (2000), shows that there are significant management system ISO 14001 environment against environmental and economic performance of the company. Research Yeo & Quazi (2005) shows results that top-management commitment to environmental management, total employee involvement, training, green products, supplier management and information management are critical factors that influence environmental management the environmental performance of the company. Meena study (2005) showed that small and medium enterprises the more that care and concern for the implementation of an environmental management system for the greater benefits for the sustainability of the company's business. This condition can be felt with more efficient and improve company performance. Research Goh et al., (2006) showed that ISO 14001 certification has positive influence on company performance.

Research Ja'far & Dista (2006) showed that proactive environmental management and encouragement environmental management significantly influence the company's environmental performance The purpose of this study to analyze the performance of the company for the agro-industry in terms of its commitment, implementation costs, corporate culture and orientation of

the company and identify the various components that can accelerate the implementation of agro-based regional environmental management systems with emphasis on value added agricultural derivative products as an alternative energy.

II. Research Methods

This research is a survey conducted on the management of agro-industrial company listed in PROPER program Ministry of Environment period of 2010 - 2013. The samples used were 180 employees were taken by using proportional stratified random sampling. The type of data used are primary data in the form of a questionnaire distributed to respondents who become sample. Methods of data collection in the form of a questionnaire in the form of a list of questions submitted to the the management company that handles the company's environmental management system.

The analysis technique used in this study is testing instrument to test the validity of this study is to use one-shot method and reliability testing using Cronbach alpha. Hypothesis testing using multiple linear regression method, t-test, F and coefficient determination and analysis of spider webs to identify the various components that can speed up the implementation agro-based regional environmental management systems with emphasis on value-added products derived agriculture as an alternative energy.

III. Results and Discussion

Results of research and discussion in this study can be explained as follows:
1) Testing research instruments
The result of the research instrument can be seen in table 1 below:

Tabel 1. Testing research instruments

Uji	Alat	Variabel	Status
Validitas	*One shot method*	Kinerja perusahaan agroindustri	Valid
	One shot method	Komitmen perusahaan	Valid
	One shot method	Implementasi biaya	Valid
	One shot method	Budaya perusahaan	Valid
	One shot method	Orientasi perusahaan	Valid
	One shot method	Manajemen lingkungan proaktif	Valid
	One shot method	Dorongan manajemen lingkungan	Valid
Reliabel	*Cronbach alpha*	Kinerja perusahaan agroindustri	Reliabel
	Cronbach alpha	Komitmen perusahaan	Reliabel
	Cronbach alpha	Implementasi biaya	Reliabel
	Cronbach alpha	Budaya perusahaan	Reliabel
	Cronbach alpha	Orientasi perusahaan	Reliabel
	Cronbach alpha	Manajemen lingkungan proaktif	Reliabel
	Cronbach alpha	Dorongan manajemen lingkungan	Reliabel

Source: results of data processing, 2015

The test results of research instruments by using validity and reliability test showed that all variables in the research status of valid and reliable.

2) Testing Hypothesis
Results of hypothesis testing can be seen in table 2 below:

Table 2. Results of Hypothesis Testing

Variabel	Koefesien	t hitung	Sig	Keterangan
Komitmen organisasi	0,244***	3,128	0,004	Signifikan
Implementasi biaya	0,178**	2,050	0,048	Signifikan
Budaya perusahaan	0,343***	3,304	0,002	Signifikan
Orientasi perusahaan	0,292**	2,673	0,011	Signifikan
Manajemen lingkungan proaktif	0,429***	4,011	0,000	Signifikan
Dorongan manajemen lingkungan	0,201**	2,113	0,042	Signifikan
F hitung = 77,608				
R2 = 0,740				
Catatan: **p < 0,05; ***p < 0,01				

Source: results of data processing, 2015

Hypothesis testing results showed that the significant value of each variable is smaller than α = 0.05 is commitment of the company amounted to 0,004; implementation costs amounted to 0,048; corporate culture of 0.002; orientation of the company amounted to 0.011; 0,000 proactive environmental management and boost management neighborhood of 0,042. These results indicate that the company's commitment, implementation costs, culture company, company orientation, proactive environmental management and environmental management boost effect on the performance of the company in accelerating the implementation of the implementation of agro-region agro-based environmental management system in Indonesia.

3). Analysis of cobwebs
Results of the analysis of the cobwebs in this study can be seen in Figure 1 below:
Figure 1. Analysis of spider webs

Figure 1 shows that the various components that play an important role in accelerating the implementation of agro-based regional environmental management systems with emphasis on value-added products derived agriculture as an alternative energy company, society, government, academia, non-governmental organizations (NGOs), banks, suppliers and the mass media. The eighth component is expected to synergize together to promote agro-industry companies realize alternative energy production Massive which is expected to replace oil-based fuels energy fossil reserves dwindling, able to reduce the subsidy to be borne by the state, is able to open up job opportunities for the community, more environmentally friendly and most importantly, can meet the needs of energy and fuel for the people who live in rural areas, the smallest islands and remote areas that are difficult to reach in accordance with the characteristic of Indonesia as an agricultural country.

IV. Discussion

1) Commitment to the company, the implementation costs, corporate culture, company orientation, environmental management proactive and urge the implementation of environmental management in the area of agro-based acceleration environmental management system in Indonesia.

The company's commitment can be seen from the environmental policy in the respective companies with consider the characteristics, scale and environmental impact of any activity. Environmental policy includes a commitment to continuous improvement and the prevention of pollution (pollution prevention) as well as compliance with environmental regulations. The management company should be able to harmonize environmental policy with environmental objectives, capable of intense supervision, management must capable of continuous review and improvement of environmental management systems and enterprise should pay particular attention to the aspects that damage the environment.

For the commitment of all shareholders the company is required by way of a comprehensive plan; implementation of environmental management systems that include aspects of the structure and responsibilities, training, awareness and competence, communication, document control and operations on an ongoing basis; checks and implementation of correction that includes aspects of monitoring and measurement, mismatches, and improvement efforts prevention and review by top management is expected to be done through the implementation of the evaluation system overall environmental management to ensure sustainability and effectiveness in achieving agroindustrial company performance. These results are consistent with research Montabon et al., (2000) which states that there are significant environmental management system ISO 14001 for environmental performance and economics company.

Nouri & Toutounchian research (2004) shows that policy makers and managers plays an important role in sustainable development as its main strategy. Environmental policy and top management commitment is essential in the implementation of environmental conservation through management good organization. Activities required for successful environmental conservation among education and training of environmental management systems, internal and external communications all stakeholders, supervision operational, responsibility and behavior of each individual to raise awareness of the environment, whereas according to Yeo & Quazi (2005) that the commitment of top management to environmental management, total employee involvement, training, green products, supplier management and information management is critical factors of environmental management that affect the company's environmental performance. Implementation costs related to the internalization of environmental values required to include the cost of an environment that can be pollution and / or damage to the environment in the calculation of costs production or the cost of a business or activity in the policy.

During this time there are still companies who view environmental costs are still considered external costs to be borne by the public because of the nature of the public goods. Environmental costs have not been seen as necessary parts are internalized into the cost calculation and the benefits of a business activity. Research results Goh et al., (2006) stated the application of the

system environmental management could affect the company's performance, especially in terms of financial aspects in particular the improvement of return on equity. Agroindustrial company culture that existed during this needs to be improved, especially in changing employee behavior to focus on improving high concern to the environment, a strong motivation for implement an environmental management system.

Result research Meena (2005) stated that more and more companies that care and concern for the the implementation of an environmental management system because the greater the benefit to the business sustainability company. This condition can be perceived by the more efficient and improve the performance of the company, while Samuel and Enquist (2007) research shows the implementation of an environmental management system can be used as an active tool to promote a comprehensive organizational change towards development and sustainable value creation in an effort to improve the performance of the company. The orientation of the company in any organization's policies, objectives and targets based on knowledge about the activity and its effect on the environment. In the course of the production of clean (cleaner production) companies should focus more on the efficient use of resources such as savings and increase productivity, decrease the amount of garbage, waste and emissions as well as a decrease in exploitation productivity increase, decrease the amount of garbage, waste and emissions and a decrease in the use of exploitation, for example, water usage and efficiency in the production process sugar mills and fuel efficiency in the boiler, power savings through the use of energy saving lamps and use power-saving electronic device and water.

According to Padma et al., (2008) that the environmental management system can be used to increase the competitiveness of companies in the face of competitive market, continual improvement in aspects of environmental management processes, able to identify environmental issues effectively and improve efficiency in the use of resources proactive environmental management associated with an increase in the company's efforts to minimize waste as well an effort to improve efficiency, especially the efficient use of raw materials in order to all raw materials can be utilized and enhanced value added. The application of the company is to reduce or eliminate raw materials containing hazardous and toxic materials such as heavy metals, dyes and solvents; using quality raw materials and pure to avoid contamination in the production process; production scheduling can help prevent waste of energy, materials and water, developing care management, thereby reducing losses due to damage to equipment and machinery; reuse residual process water, cooling water and other materials inside or outside the production system, take back the waste material as a waste of energy and creates usefulness as other products can be exploited by outsiders.

According to research Samuel and Enquist (2007) shows management proactive environment if it is not offset by the improvement of the behavior of every employee to further improve a high concern for the environment will cause the performance of the agro-industry companies is not running optimal The encouragement of environmental management is particularly important for the company to integrate environmental responsibility with the purpose of the market, the company increased concern for the environment, the company internally to meet or exceed the requirements of environmental regulations and is able to meet the demands of shareholders which is getting stronger then expected to improve the performance of the company agro-industry. Results Meena (2005), shows that more and more small to medium companies are care

and concern for the implementation of an environmental management system because the greater the benefit for the sustainability of the company's business. This condition can be perceived by the more efficient and improve performance company.

2) Components that can accelerate the implementation of the regional agro-based management system environment with emphasis on the added value of agricultural derivative products as an alternative energy.

The company plays an important role in the realization of alternative energy production of derived products agriculture massively. It's good for small and medium scale companies and consumers must work together together to create alternative energy. Efforts to do them is improving the utilization of alternative energy, efficient use of resources, adherence documents and regulatory environment, provide environmental education and training to all employees, do 4 R (reduce, reuse, recycle, recovery), ecoturism and prevention of pollution of air, water and soil. Society plays a role in increasing awareness, role and participation in realizing the acceleration of the implementation of the regional agro-based systems environmental management in generating alternative energy by supporting any activities of the company which produces environmentally friendly products, use energy efficiently, changing behavior with support and consume or use environmentally friendly products.

Government role in regulate and facilitate the production facilities as well as provide support to farmers' groups or small, medium and corporations to create alternative energy systems well. Academia play an important role in producing research that can be implemented, devotion community by providing assistance to communities, companies and component other in developing alternative energy as well as provide education and training to all shareholders to accelerate the implementation of the regional agro-based environmental management system in generating alternative energy. Non-governmental organizations have a role in providing assistance to the public and constructive feedback that can realize the acceleration regional implementation of agro-based environmental management system in generating alternative energy.

Banking instrumental in providing financial facilities which can be used by SMEs and corporations develop alternative energy business as well as providing training books and records khususya financial statements to MSMEs. Suppliers play a role in supplying goods national and international standard and environmentally friendly which is expected to have the quality good. The mass media play an important role in publicizing, disseminating and campaign movement alternative energy products as well as disseminating information widely to the public.

V. Conclusions

The company's commitment, implementation costs, corporate culture, company orientation, environmental management proactive and boost environmental management plays an important role in improving corporate performance agroindustrial accelerate the implementation of agro-based regional environmental management systems with emphasis on value added agricultural derivative products as an alternative energy.

Components that play an important role in accelerating the implementation of regional agro-based systems environmental management in Indonesia with emphasis on value-added products derived farming as an alternative energy is a company, society, government, academia, non-governmental organizations, banks, suppliers (suppliers) and mass media.

References

Goh, E. A., Suhaiza Z. and Nabsiah A. W., 2006, A Study on The Impact of Environmental Management System (EMS) Certification Toward Firms Performance in Malaysia, *Management of Environmental Quality: An International Journal*, Vol. 17, No. 1, pp. 73 – 93.

Ja'far S. M. dan Dista A. A. 2006, Pengaruh Dorongan Manajemen Lingkungan, Manajemen Lingkungan Proaktif dan Kinerja Lingkungan Terhadap Public Environmental Reporting, *Simposium Nasional Akuntansi 9*, K-AKPM 27, Padang.

Meena, C. 2005, An Appraisal of Environment Management Systems: A Competitive Advantage for Small Businesses, *Management of Environmental Quality: An International Journal*, Vol. 16, No. 5, pp. 444 – 463.

Montabon, F., Meinyk, S.A., Stroofe, R and Calantone, R.J., 2000, ISO 14000: Assesing Its Perceived Impact on Corporate Performance, *The Journal of Supply Chain Management*, pp. 4 – 16.

Nouri, J and S. Toutounchian., 2004. Application of Environmental Management System – ISO 14001: 1996, in Urban Environment and Municipalities, *International Journal of Environmental Science & Technology*, Vol. 1, No. 2, pp. 109 – 117, Summer 2004.

Padma, L.S. Ganesh and Chandrasekharan R. 2008. A Study On The ISO 14000 Certification And Organizational Performance Of Indian Manufacturing Firms. *Benchmarking: An International Journal*. Vol. 15, No. 1, pp. 73-100.

Samuel, P. S. and Bo E. 2007 ISO 14001 as a Driving Force for Sustainable Development and Value Creation, *The TQM Magazine*, Vol. 19, No. 5, pp. 468 – 482.

Saragih, B. 2000, Kebijakan Pertanian untuk Merealisasikan Agribisnis Sebagai Penggerak Utama Perekonomian Negara, Paper Pada Panel Diskusi Jakarta American Club. 14 November 2000, *Centre Policy for Agro Studies*, Jakarta.

Yeo, S. W. and Quazi H.A. 2005, Development and Validation of Critical Factors of Environmental Management, *Industrial Management & Data Systems*, Vol. 105, No. 1, pp. 96 – 114.

ENHANCING STUDENTS' UNDERSTANDING OF RICE PADDY CULTURAL LANDSCAPE BY USING PARTICIPATORY PHOTOGRAPHY

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Abstract

For the majority of Indonesian people, food security is linked with the agricultural landscape since majority of the population has consumed rice from traditional farming system. However, the understanding and application of youth of their ancestral sustainable farming has been declining drastically for more than three decades. We describe a collaborative learning research proposal project by using participatory photography to increase the four basic learning competencies: awareness, attitudes, skills and knowledge. This research project consists of two phases. Firstly, designing a combination of outdoor and indoor action research learning through collaboration among lecturers, teachers, student teachers and students. Participatory photography is utilized to engage participants in understanding food security with focused on *subak* cultural landscape as a case. Secondly, disseminating and assessing of the first phase output through workshops, participatory action research, and focus group discussions will be conducted. This phase will provide various set of information to evaluate students' achievement in enhanching their understanding of food security as well as rice paddy cultural landscape.

Key words: food security, collaborative learning, research proposal, learning competencies.

I. Introduction

In the case of Indonesia, food sovereignty is closely related to rice paddy cultural landscape. Most of the rice that is consumed by Indonesian people is produced by traditional farmers from various agricultural landscapes in which rich with local economy, ecology, and social context. However, global economic development tends to neglect the role of cultural landscape in sustaining our economy, social, and environment for centuries (Almo, 2000). More than two decades ago, ecologist David Orr (1994) warned that the people would lose local identity without a deep knowledge of the environment as a storage warehouse meaning, history, lifestyle, medicine, recreation, and the source of material, energy, food and collective action. Therefore, today is a very important time for people to re-establish contact with nature and the local environment (Visker & Matthews, 2002).

The study is designed to utilize local culture as a source of learning in which using *subak* as case of study due to several reasons. The *subak* is a traditional and religious institutions at the community level of farmers in Bali that manages irrigation water and is believed to come from

the Goddess (God in the form of a woman), and lakes as common property resources (Lansing, 2006, Lansing & de Vet, 2012). It is rich with a variety of cultural property landscape of Bali, making it one of the attraction for millions of tourists to Bali (Lorenzen and Lorenzen, 2011). As the most famous cultural landscape in Indonesia, *subak* is not just a part of the landscape heritage but also an egalitarian agricultural planning. It is an association of farmers who are autonomic to manage the flow of irrigation to rice field terraces and also coordinate agricultural rituals (Lansing, 2006). The *subak* is also an expression of a place-based integrated system that provides ecological feedback and social systems (Suradisastra et al., 2002; Schoenfelder, 2003). Meanwhile, Falk & Surata (2007; 2012) argue that *subak* is an education and learning systems that are complex, due to the importance of *subak* which is higher than the character and success in managing complex situations. Therefore, *subak* could be a model of learning that can eliminate the gap between classroom learning and real life, jobs and professions, especially between culture and youth.

The focus of this study is student teachers, who are encouraged to be actively involved in learning engineering-based collaborative between the integration of modern science and ethno-science. The Collaborative Participatory Photography (CPP) learning model will be designed through the integration between the local cultural heritage of science (ethno-science) and the progress of modern science and technology (photography), to achieve four basic learning competencies (awareness, attitudes, skills and understanding). The construction of the model is based on synthesis of "learning to build collaborations and networks" (Puspawati, 2009; Surata, et al., 2008; 2010; 2011a), the concept of "learning as a social-ecological systems" (Falk & Surata, 2007; Surata 2011; Surata, et al., 2011b), "cross-cultural learning" (Surata et al., 2013), and "ecopedagogy as social-ecological literacy, cultural literacy, and technology literacy" (Kahn, 2008; Surata et al. 2012; Surata, 2013).

II. Project Program Strategies

The research subjects of this study are the student teachers of the Universitas Mahasaraswati Denpasar (Mahasaraswati University of Denpasar), teachers, farmers, and primary and secondary school students. We will begin this study by providing education and training to student teachers. These activities will lead to the achievement of the four basic learning competencies: awareness, attitudes, skills, and knowledge. In the end, students are encouraged to implement participatory action research through 5E learning approach namely engagement, exploration, elaboration, explanation, and evaluation. Engagement is a formation stage that strengthens group primarily through making and editing techniques of photography. Exploration is a stage where groups explore, define, and give meaning to ethno-science *subak*. Further, elaboration stage asks the students to provide meaning, discuss, and present a series of photos that has been designated as group selection. In addition, evaluation allows the students to improve their ability in assessing themselves (self-review) and group (peer-review) by assessing processes and products.

In the second stage, dissemination of CPP to teachers and students from various schools will be done. The participants (students and students) who have involved in the first phase will be facilitators in teaching other students in the second phase. Each student will work collaboratively with farmers in teaching other students about various aspects of ethno-science of *subak*. The

evaluation will be done through focus group discussions and workshops which will be attended by teachers, farmers, students, and students. Data will be analyzed qualitatively and quantitatively by student teachers and researcher team.

III. Collaborative Learning and Character Education

The main target of character education is literacy (the ability to implement) of the four basic learning competencies, namely matter (learning to live together), attitudes (learning to be), skilful (learning to do), and understanding (learning to know). Unfortunately, although the character education has been proposed since a few years ago, until today formal education system in Indonesia emphasizes more on the content. In other words, it is not enough to develop the students' critical thinking and takes place in a less fun learning atmosphere. If we do not reform this learning model, it will obstruct process of achieving the goals of Indonesian education for the future generation that is not only to educate youth to be honest, intelligent, and skilful, but also to nurture them to take care of their environment (including the cultural heritage of their ancestors). This education reform need to be done so that gap between the goal and reality of education in the school system is not widened. This study offers a CPP model as an innovation in collaborative learning, which leads the students in developing their competence, ability to think deeply and critically, and capability to analyze creatively, as well as providing fun learning processes. The Collaborative Participatory Photography is constructed based on the concept of learning in the context of ecopedagogy: social-ecological literacy, cultural literacy, and technology literacy. As such, the CPP as a synthesis between ethno-science (*subak*) and modern science (photography) is an innovation in collaborative learning; educating of future generations to use the cultural heritage, not just as pride, but more importantly as source of inspiration and motivation in building the future (Surata et al., 2012, 2014).

IV. Collaborative Learning and Future Generation

Job opportunities in the future will require a greater ability in collaborating to solve a new problem. Knowledge that will be used by students for their careers in the future is not known yet today, thereby they need to learn it after graduation. Without providing good training for young people to work as a team in the future, it might be difficult for them to achieve economic welfare, healthy ecosystem and social inclusion.

Hence, an urgency to prepare learning activities which promote the students' ability to solve new problems appears. The CPP is designed and focuses on improving student skills to anticipate the sustainability issues. In this activity, the students are involved as active participants in the study by giving them the camera and then invite them to take a picture related to various aspects of their lives. Photos are then used as a subject in an interview to explore the images and meanings ethno-science according to the student and the student (Jorgenson & Sullivan, 2010). In this case, CPP covers a wide range of application concepts for understanding deep ecology, various forms of self-awareness, critical reflection, creative thinking, and social skills in managing issues related to the availability, access, distribution of natural resources and the environment (especially rice as a staple diet for Indonesian nation). The collaboration will make student teacher and student responsible for summarizing, integrating, or synthesizing information (Favero, 2011).

As a model of collaboration, CPP uses service-based learning approach that allows student teachers to apply their knowledge, understanding, and awareness of sustainable living, in the forms of small and local but real action; ranging from self-action to responsibility to school and surrounding environment (Surata et al., 2011c). The CPP makes the students as active participants, which in responses of community needs as well as further academic goals of the student. Through CPP students can work together in collecting evidence, learn from group, and then apply the information in the new situation. The students are encouraged to interpret, connect and integrate the new information, and then apply new information to solve new problems. The CPP also includes a group of peer learning, which has been shown to increase students' knowledge and ability in solving new problems (Cortright et al., 2005).

Subak as a Source of Collaborative Learning

Innovation in collaborative learning can be done by using local place or bioregional as a source of education (place-based education), since its is a source of ideas, values that shape a person's personality and/or aspiration and professionalism identity. Hence, Stevenson (2008) asserted that today we should be considered not only as a physical environment but also as a real environment which is a source of information, identity which can trigger emotional engagement in learning and knowledge, and resources to stimulate and continuing concern for the environment outside the human (Stevenson, 2008).

The *subak* with a diversity of traditional culture is a model of integration between local ecology and cultural education, since the culture is still alive, and in the long run of equilibrium relationship with the local environment. The culture offers a variety of learning about healthy living in a natural environment and sustainable way in obtaining food. Thereby, *subak* as an example of cultural landscape which is rich of culture is an extra-ordinary source of education to achieve both learning competencies and environmental understanding.

V. Conclusion

The Collaboration Participatory Photography (CPP) learning model by using *subaks* as its center-based education can encourage students to show their concerns, attitudes, skills, and knowledge of the local place with diversity of culture as values, norms, practices, and identity – as source of motivation and inspiration for building the future. Thus, CPP is designed to revitalize an existing school curriculum to promote learning as a deep thinking, a critical analysis and a fun process. It consists of two phases, i.e. (1) conducting participatory action research and (2) evaluating level of student achievement in order to enhance their understanding on rice paddy cultural landscape, as well as their learning competencies: concern, attitudes, skill, and knowledge.

References

Almo, F. 2000. The cultural landscape as a model for the integration of ecology and economics. Bioscience 50 (4), 313-320

Cortright. R. N., H. L. Collins and S, E. DiCarlo. 2005. Peer instruction enhanced meaningful learning: Ability to solve novel problem. Adv Pgysiol Educ 29, 107-111.

Favero, T.G. 2011**.** Active review sessions can advance student learning. Adv Physiol Educ 35: 247–248.

Falk. I., and S.P.K. Surata. 2007. Real social capital in Bali: Is it difference from literature? Rural Society: The Journal of Social Capital and Rural Society. 17(3):201-312.

Kahn. R. (2008). From Education for Sustainable Development to Ecopedagogy: Sustaining Capitalism or Sustaining Life? Green Theory & Praxis: The Journal of Ecopedagogy. 4(1). [online] diunduh 19 Mei 2012 dari http://antiochla.academia.edu/ecopedagogy/Papers/

Lansing. J. S. (2006). Perfect Order: Recognizing Complexity in Bali. Princeton: Princeton University Press.

Lansing. J. S. and T. A. de Vet. 2012. The functional role of Balinese Water Temples. Human Ecology, 40:453-467.

Lorenzen. R. P. and S. Lorenzen. 2011. Canging realities – perspectives on Balinese rice cultivation. Human Ecology, 39:29-42.

Orr. D. W., 1994. Earth in Mind: On education environment and the human prospect. Island Press: Washington.

Puspawati I. D. A., Ismail. D., and S.P.K. Surata. 2009. The Social Network Map as Assessment Tool of Cooperative Learning. Suluh Pendidikan 6(1): 1-8.

Savelava. S. Savelau. D., and M. B. Cary. 2010. Practicing ESD at School: Integration of Formal and Nonformal Education Methods Based on the Earth Charter (Belarusian Experience). Journal of Education for Sustainable Development, 4(2): 259-269.

Stevenson. R.B. 2011. Sense of Place in Australian Environmental Education Research: Distinctive. Missing or Displaced? Australian Journal of Environmental Education, 27: 46-55.

Sylvia. A., dan A.C. Mackenzie. 2011. The Historical. Present and Future **ness** of Environmental Education in India. Australian Journal of Environmental Education. 27. Pp.

Surata. S.P.K. 2008. Structure and process in facilitating community action in Bali. Community Management of Biosecurity. Special Co-publication between Kritis (Journal of Interdisciplinary Development Studies – Indonesia) and Learning Communities (International Journal of Learning in Social Contexts – Australia). 75-89.

Surata S.P.K., dan T. Agung. 2010. Local Food Ecoliteracy: A Strategy for Building Ecotone between Ethno-culture and Scoentific Knowledge of Food Security. Paper presented in International Small Island Conference. Ambon. August 5th. 2010.

Surata. S.P.K. Vipriyanti. N.U., dan I. Falk . 2010. Social network analysis for assessing social capital in biosecurity ecoliteracy. Jurnal Ilmu Pendidikan, 17(3). 238-244

Surata S.P.K. 2011. Billingual Glossary as Strategy for Bridging Cross-cultural Knowledge of Global Biosecurity. pp 129-143. In Falk I. Wallace R. Eagling D. & Martin N (eds). Managing Biosecurity Across Border. Heidelberg: Springer.

Surata. S.P.K. Jayantini. I.G.A.S.R., and I. Falk. 2011a. Local food ecoliteracy: Small, real, local actions to promote education for sustainable development. Paper on International Education Cooperation for Sustainable Development in the Contex of Globalization: A Critical Appraisal. Seoul National University. Seoul. Korea.

Surata. S.P.K. Suda I.K., dan I.M Sudiana. 2011b. Aspek sosio-natural halaman sekolah: Model evaluasi terintegrasi bioekologi, dan preferensi lingkungan dalam ekosistem urban. Jurnal Bumi Lestari 11(2). 306-314. (Indonesian version with abstract in English).

Surata S.P.K., Widyana. I.K., and N. L. K. Martini. 2011c. Accross Generation Ecoliteracy of Local Food as a Model for Promoting Sustainable Living to the Youth. Paper presented in Asian Pacific Regional Center of Expertise Conference. Yogyakarta.

Surata. S.P.K., Arnawa. I. K., dan I. G. A. S., Jayantini. (2012). Ekopedagogi: Pelibatan mahasiswa calon guru dalam integrasi lansekap budaya *subak* dan MapPack ke dalam kurikulum jenjang pendidikan dasar. Proceeding Seminar Nasional Cakrawala Pendidikan Berkualitas. Direktorat Pendidik dan Tenaga Pendidik. Direktorat Jenderal Pendidikan Tinggi. Kementerian Pendidikan dan Kebudayaan. Jakarta. 25-27 September 2012.

Surata. S. P. K., Jayantini. I. G. A. R., dan J.S. Lansing. 2013a. Sustainable Learning: Encourage Teacher Training in Incorporating Traditional Knowledge into Modern Science. Paper presented in International Conference on Education and Research. Hosted by the Seoul National University. Seoul 16-19 October 2013.

Surata, S.P.K. 2013. Pembelajaran Lintas Budaya: Penggunaan *Subak* sebagai Model "Ecopedagogy". Paper dipresentasikan pada Kongkres Kebudayaan Bali ke-2 .di Inna Bali Beach Hotel. Sanur Denpasar. 24-25 September 2013. Dinas Kebudayaan Provinsi Bali.

Surata, S.P.K., I G.A.S. Jayantini, and J.S. Lansing. 2014. Exploring community capital of the Balinese *subak* cultural heritage: A content analysis of participatory maps. International Jour. of Technical Research and Applications. Special issue 2 (7), 28-34. (http://www.ijtra.com/ijtra-special-issue07.php) (18 January 2015).

Surata, S.P.K. 2013. Lanskap budaya *subak*. Belajar dari masa lalu untuk membangun masa depan. Denpasar INA: Unmas Press.

Vickers. V.G., and C.E. Matthews. 2002. Children and place: A natural connection. Science Activities, 39(1): 16-24.

THE EFFECT OF VARIOUS DOSES OF BIOCHAR AND COMBINATION WITH DOSES ORGANIC MATTER ON SOIL PROPERTIES AND MAIZE PLANTS GROTWH ON THE SOIL RAINFED

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Abstract

Biochar is derive from the combustion of waste organic matter are not perfect with limited oxygen, it has a potential function to improve the nature of rainfed and limited soil water conditions, because of the C-organic still remained in the black carbon (biochar), capable as absorbent. The research was conducted in the field in March-June 2014. Experiment in the field using a randomized block design with three replications which is a single factor consisting of 8 treatments, namely: B1 = rice husk biochar 10 tons / ha, B2 = biochar chicken manure 10 tons / ha, B3 = chicken manure 10 tons / ha, rice husk B4 = 10 tons / ha, rice husk Biochar B5 = 5 tons / ha + chicken manure 10 tons / ha, rice husk Biochar B6 = 5 tons / ha + rice husk 10 tons / ha, B7 = Biochar 5 tons chicken manure / ha + chicken manure 10 tons / ha, B8 = Biochar chicken manure 5 tons / ha + rice husk 10 tons / ha. The research results show that: 1) the combustion pyrolysis can caused changes in the characteristics of organic matter, due to the degradation of some organic components in chicken manure and rice husks, which are directly also degradation of functional groups. Biochar has a better potential of organic matter to improve soil properties and growth of maize plants in soil rainfed . 2) rice husk biochar dose formulation 5 tons / ha of chicken manure at a dose of 10 tons / ha can fix the physical, chemical and biological soil rainfed. Furthermore the value of bulk density is decline, and the soil water content, total porosity of the soil, available K, available P, CEC and C-organic soil is increase.

Keywords: biochar, soil rainfed , soil characteristics.

I. Introduction

1.1.Background

Rainfed areas as one of the assets of agricultural development, has great potential and is one strategic option as the area of crop production in order to support the improvement of food security. According to experts, rainfed areas including dry land. Rainfed areas characterized by drought while during the dry season, while during the rainy season it happens a high attrition rate. At this time, agricultural crops in rainfed areas faced with problems of land management that does not correspond to the potential and suitability as well as the declining value of land properties. To speed up the recovery of the physical, chemical, and biological should did a land rehabilitation using organic materials which is difficult to decompose so that it can survive in the soil as biochar. Biochar well as a soil amendment, because organic C still remain in the carbon

black (Ferizal et al, 2011) The potential is closely related to the characteristics of biochar to form organo-mineral complex (Glaser *et al*., 2000).

The addition of biochar to soil agriculture will provide considerable benefits, can improve soil structure, holding water and soil from erosion due to the larger surface area, enriching the organic carbon in the soil, improving soil pH thus indirectly increasing crop production (Ismail et al, 2011). It is supported by the results of research Chan *et al.*, 2007; Liang *et al.*, 2006; Yamato *et a*l., 2006, shows the application of biochar in the soil can increase soil organic C, soil pH, soil structure, soil CEC, and the water storage capacity of the soil. Increased C-organic soil and nutrient content of the soil through the use of biochar (Novak *et al*., 2009). also an increase results in maize, cowpea, and peanut (Yamato *et al.,* 2006), Soybean (Tagoe *et al*., 2008), upland rice (Asai *et al*., 2009) and rice on land sulfate sour (Masulili, 2010).

Relating to the above matters, to solve the issues that arise in the use of land for the development of rainfed maize cultivation after the first rice planting season, need to perform land management with the addition of organic matter in the form of biochar in an effort to improve soil physical and chemical properties of rice field rain and increase land productivity.

1.2 Research Purpose

The second phase of the study specifically aims to:

1. Looking at the influence of biochar dose and combination with organic amendments to the soil characteristics and growth of maize plants in rainfed land.
2. Make use of biochar in the management model of the physical and chemical properties of rainfed land.

II. Research Methods

This research was carried out on the ground in March-June 2014. Experiments in the field using a randomized block design with single factor repeated 3 times, which consisted of eight treatments, namely: B1 = biochar rice husk 10 tons / ha,B2= chicken manure biochar 10 tons / ha,B3= chicken manure 10 tons / ha, B4 = rice husk10 tons / ha, B5 = Biochar rice husks 5 tons / ha + chicken manure 10 tons / ha, B6 = Biochar rice husks 5 tons / ha + rice husk 10 tons / ha, B7 = chicken manure biochar 5 tons / ha + chicken manure 10 tons / ha, B8= chicken manure biochar 5 tons / ha + rice husk 10 tons / ha.

III. Results and Discussion

3.1 The effect of various doses of biochar and its combination with a dose of organic matter to the soil physical properties

Effect of treatment of various doses of biochar and its combination with organic material provides a very real effect on all parameters of soil physical properties such as air dry soil water content, Bulk Density, Particle Density, and Porosity total. Statistical test results in Table 1 show that rice hull biochar treatment dose of 10 tons / ha gives the highest value for the parameter total porosity and air dry soil water content of soil physical properties observed, and significantly

different from other treatments, except for the parameters BV, and Density the lowest value. So also for the treatment biochar doses and combinations, biochar dose treatment of rice husk 5 tons / ha + 10 tons / ha of chicken manure gives the highest value for the parameters water content, and total porosity with different grades of 8.29% for air dry soil water content, and 67.002% of the total porosity, as well as significantly different from the biochar dose combination treatment (Table 1).

The fall in the value of bulk density and increased total soil porosity and air dry soil water content on B5 combination treatment due to the content of C in the treatment B5 provide increased value organic C were high as well. According to the research Glacer *et a*l. (2002) and Hammmond *et a*l. (2007) found biochar containing recalcitrant aromatic compounds that are able to maintain the stability of C in the soil and air old age. So also from the results of research Sujana at al. (2014) obtained, the mechanism due to a decrease in bulk density of rice husk biochar administration occurs because of the potential for biochar aromatikan high rice husks, which can form complexes organomineral, thus increasing the occurrence of soil aggregation. Likewise the high surface area of biochar rice husk will affect the bulk density decrease and increase soil porosity. Wolf (2008) discovered the mechanism that causes the increase in the value of the physical properties of the soil is the presence of an organic acid that can form complexes organomineral resulting in aggregation of soil as well as their functional components of organic matter added to the soil. Organic materials are supplied into the soil will decompose have an important role in the granulation soil so that the soil compaction experience into the nest. This is consistent with the results of research Afany (2003) said that the addition of humic acid levels in Entisol able to increase the total porosity higher ground.

Table 1. Effect of various doses of biochar and its combination with the dose of organic matter to the soil physical parameters

Treatment	Soil Physical Properties			
	Bulk Density (g / cm3)	Particle Density (g / cm3)	Total Porosity (%)	Air Dry Soil Water Content (%)
B1	0,85 f	2,46 e	65,97 bc	8,55 a
B2	0,88 c	2,53 d	65,32 cde	7,95 bc
B3	0,93 b	2,74 a	65,26 de	7,83 c
B4	0,95 a	2,73 a	65,07 e	7,65 c
B5	0,85 f	2,57 bc	67,00 a	8,29 ab
B6	0,88 c	2,56 cd	65,53 cde	8,19 b
B7	0,87 d	2,60 b	65,87 bcd	7,76 c
B8	0,86 e	2,54 d	66,27 b	7,65 c

Descriptions : Figures followed by the same letters in the same column are not significantly different at Duncan's test level 5%

B1 = Rice husk biochar 10 tons / ha
B2 = Biochar chicken manure 10 tons / ha
B3 = Chicken manure 10 tons/ha
B4 = Rice husk 10 tons/ha
B5 = Rice husk biochar 5 tons/ha + chicken manure 10 tons/ha

B6 = Rice huskl biochar 5 tons/ha + rice husk 10 tons/ha
B7 = Biochar chicken manure 5 tons/ha + chicken manure 10 tons/ha
B8 = Biochar chicken manure 5 tons/ha + rice husk 10 tons/ha

3.2 The effect of various doses of biochar and its combination with a dose of organic matter against chemical and biological soil properties

Effect of combination treatment with doses of biochar and organic matter doses showed a significant influence on the chemical properties of parameters such as EC, available K, available P, pH, CEC, Base Saturation, and N total. The influence of biochar dose treatment of rice husk 10 tons / ha gives the highest value on the chemical properties of soil parameters were observed, except for the parameters N total and significantly different from other treatments. So also the influence of biochar dose treatment of rice husk 5 tons / ha + chicken manure 10 tons / ha gives the highest value for the parameter CEC, Base Saturation, available P and K available and significantly different dose treatment with doses of biochar other organic matter (Table 2).

An increase in the value of available P and available K this occurs as a result of the release of P and K from organo complexes at the ends of biochar aromatic rice husk and functional group of the organic acid. Chicken manure decomposition will be able to increase the value of available P and K are available in the soil. Increased levels of organic matter will be followed by an increase in the value or the cation exchange capacity (CEC) and the organic fraction. This is because the soil containing organic matter generally contains organic colloids able to bind cations.

It is also evident from the high value of the CEC in soil treated with biochar rice husks and chicken manure. Where, according to Glaser *et al*. (2002) series of aromatic biochar has a major role to the decline in activity and an increase in the value of metals continuously . As well as CEC researches Sujana at al. (2014) found the administration of doses of biochar rice husk 9 tons / ha in the soil contaminated liquid waste garment capable of improving soil properties and lowering the concentration of heavy metals in the soil. Soepardi (1983) states that the presence of organic compounds is high enough allowing the chelate, it is an organic compound which binds with metal cations such as Fe, Mn, and Al. As a result of the formation of these metal chelate will reduce the binding of phosphate by oxide and silicate clay that P becomes more available.

Tabel 2. The effect of various doses of biochar and its combination with organic matter against some chemical properties of soil parameters

Treatment	Soil Chemical Properties			
	pH	CEC(me/100g)	Base Saturation(%)	N total(%)
B1	7,06 a	41,11 a	173,35 a	0,19 c
B2	7,05 ab	36,06 c	163,02 d	0,24 a
B3	7,03 abc	35,51 d	153,07 e	0,22 b
B4	7,00 c	32,66 e	129,97 g	0,17 d
B5	7,02 bc	39,08 b	171,34 b	0,12 f
B6	7,04 ab	38,84 b	165,45 c	0,18 d
B7	7,04 ab	38,65 b	165,26 c	0,22 b
B8	7,03 abc	35,99 cd	146,47 f	0,15 e

Description: Figures followed by the same letters in the same column are not significantly different at Duncan's test level 5%

Tabel 3. The effect of various doses of biochar and its combination with organic matter to the soil chemical parameters and biological properties of the soil.

Treatment	Soil Chemical Properties			Biological
	P available (ppm)	EC (mmhos/cm)	K available (ppm)	C- Organik (%)
B1	298,37 a	3,15 a	467,30 a	2,94 a
B2	136,47 g	2,24 c	463,76 b	2,89 a
B3	148,16 e	2,10 d	256,18 e	2,52 c
B4	146,20 f	1,82 e	228,80 g	2,62 b
B5	167,35 b	2,69 b	265,23 c	2,95 a
B6	122,10 h	2,32 c	198,36 h	2,16 d
B7	152,86 d	1,76 e	260,48 d	1,87 e
B8	157,22 c	1,59 f	240,11 f	1,77 f

Description: Figures followed by the same letters in the same column are not significantly different at Duncan's test level 5%

The effect of various doses of biochar and its combination with a dose of organic matter to organic C- parameters, providing a significant influence. The influence of biochar dose treatment of rice husk 5 tons / ha + 10 tons of chicken manure / ha give a highest value of 2.95% and was significantly different to other treatments, except the rice husks dose treatment biochar and biochar chicken manure dose of 15 tons / ha did not differ real. (Table 3).

The high content of soil organic C in treatment caused B5 input in the form of biochar ground enhancer rice husks 5 tons/ha+ 10 tons / ha of chicken manure was able to create loose and fertile soil, where the soil friability is closely hubungannnya the total content of carbon (C) , In general, according to Hariah et al. (2002) said the total amount of carbon in the soil loose range between 3-4%, and this can be maintained if land is given input in the form of organic matter enhancer ranged between 8-9 tons / ha.The increase effect of biochar on soil biology because of the

potential of biochar is capable of affect the development of microbial biomass (Steiner *et al*., 2004).

3.3 Effect of various doses of biochar and its combination with a dose of organic matter on growth and yield of maize

Effect of combination treatment with doses of biochar and organic matter doses showed a significant influence on the growth and yield parameters were observed, except for plant height parameters showed no significant difference. Effect dose of rice husk biochar 10 tons / ha gives the highest value on the parameter number leaf, seed weight per tile and seed yield per hectare and significantly different from other treatment. As well as the influence of biochar dose treatment of rice husk 5 ton / ha + chicken manure 10 tons / ha gives the highest value for the parameter seed weight per tile and seed weight per hectare and significantly different dose treatment with doses of biochar other organic matter (Table 4) , this is probably due to dose biochar rice husks 5 tons / ha + 10 tons of chicken manure / ha this is the dose that can improve the physical, chemical, and biological soil rainfed.

The ability of biochar or biochar rice husks chicken manure to improve soil physical and chemical properties, is strongly associated with the characteristics possessed of the two biochar. When biochar rice husks and chicken manure biochar is added to soil, was able to increase the porosity, available P, available K, CEC, soil water content and lower the weight value isi.The increase of soil properties can affect, either individually or jointly to the growth and yield of maize. Research results Lehmann *et al*., 2003; Steiner *et al*., 2007 found that the addition of biochar can improve plant growth and nutrition. According to Glaser *et al*. (2000) administration of biochar into the soil will be able to form a complex organo-mineral in the ground and able to contribute to the additional nutrients in the soil. The potential for the formation of organo-mineral complex is the case, because biochar rice husks have aromatic functional group structure. Research results Steiner *et al*. (2007) stated biochar has a high resistance to microbial decomposition and can guarantee the fertility of the soil.

Tabel 4. The effect of various doses of biochar and its combination with organic matter to several parameters of growth and yield of maize.

Treatment	Growth Parameters and Yield			
	The number of leaf (strand)	Plant's height(cm)	Seed weight per tile (kg)	Seed weight per hectare (ton)
B1	12,33 a	216,00 a	4,45 a	6,35 a
B2	11,66 ab	207,83 a	4,14 b	5,92 b
B3	11,00 b	204,66 a	3,50 e	4,99 e
B4	11,83 ab	210,00 a	3,16 g	4,52 g
B5	11,16 ab	204,66 a	4,05 c	5,78 c
B6	11,50 ab	202,16 a	3,75 d	5,35 d
B7	11,83 ab	207,00 a	3,40 f	4,87 f
B8	11,83 ab	207,00 a	3,23 g	4,61 g

Description: Figures followed by the same letters in the same column are not significantly different at Duncan's test level 5%

IV. Conclusions and Suggestion

4.1 Conclusion

1. Biochar has a better potential of organic matter to improve soil properties and growth of maize plants in rainfed land.
2. Formulation rice husk biochar dose of 5 tons / ha w ith a dose of chicken manure dose of 10 tons / ha can improve the physical, chemical and biological soil rainfed. There was a decrease bulk density, increased air dry soil water content, total soil porosity, available K, available P, CEC and soil organic C.

4.2 Suggestion

1. The biochar-dose combination formulations of rice husk 5 tons / ha with chicken manure dose of 10 ton / ha, can be used as a soil conditioner to improve the physical, chemical and biological soil constraints rainfed and water shortages after the rainy season.
2. Further studies should be done by using the location of rainfed land another in order to obtain more information from the biochar and organic matter as soil conditioner rainfed.

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References

Asai, H., Samsom, B.K., Stephan, H.M., Songyikhangsuthor, K., Homma, K., Kiyono, Y., Inoue, Y., Shiraiwa, T. & Horie, T., 2009. Biocharamandement techniques for upland rice production in Northern laos 1. Soil Physical properties,leaf SPAD and grain yield. *Field corps Research*, 111,-81-84.

Chan, K.Y., van Zwieten, B.L., Meszaros, I., Downie, D. & Joseph, S., 2007. Agronomic values of greenwaste biochars as a soil amandments. *Australian Journal of Soil Research*,45,625-634.

Ferizal,M., Basri,A.B. 2011. Arang Hayati(Biochar) Sebagai Pembenah Tanah.Balai Pengkajian Teknologi Pertanian(BPTP) Aceh.

Glaser, B., Balashov, E., Haumaier L., Guggenberger G., & Zech W. 2000. Black Carbon in Density Fractions of Anthropogenic Soil of the Brazilian Amazon Region. *Organic Geochem*, 31: 669 – 678

Glaser, B., Lehmann, J. &Zech, W.,2002. Ameliorating Physical and chemical properties of highly weathered soils in the tropics with charchoal: A review. *Biol Fertil Soils*, 35: 219-230.

Hairiah, K., Widianto, Utami, S.R., Suprayogo, D., Sunaryo, Sitompul, S.M., Lusiana, B., Mulia, R. Van Noordwijik, M., & Cadisch, G. 2002. *Pengelolaan Tanah Masam Secara Biologi.* Intenational Centre for Research in Agroforesty.Bulletin. Bogor.

Hammond, D., Steege, H., & Van der Borg, K. 2007. Upland Soil Charcoal in The West Tropical Forests of Central Guyana. *Biotropica*, 39(2) : 153-160.

Ismail,M., Basri,A.B. 2011. Pemanfaatan Biochar Untuk Perbaikan Kualitas Tanah. Balai Pengkajian Teknologi Pertanian(BPTP) Aceh.

Liang, B., Lehmann, J., Kiyangi, D.,Grossman, J.,O'Neill, B., Skjemstad, J.O., Thies, J., Luizao, F.J., Peterson, J. & Neves, E.G.2006. Black carbon increases cation exchange capacity in soil.*Soil Sci. Soc*. Am.,70: 1719-1730.

Masulili,A.,2010. Kajian Pemanfaatan Biochar Sekam Padi untuk Memperbaiki Beberapa sifat Tanah Sulfat Masam dan Pengaruhnya Terhadap Pertumbuhan dan Hasil Padi (*Oryza sativa L*). Desertasi Pascasarajana Universitas Brawijaya Malang.

Novak, J.M., Bussecher, W.J., Laird, D.L. Ahmedna, M., Watts, D.W. & Niandou, M.A.S.,2009. Impact of biochar amendment on fertility of a Southeastern Coastal Plain. Soil. *Soil Science*, 174: 105-112.

Soepardi, G. 1983. *Sifat dan Ciri Tanah*. Jurusan Tanah Fakultas Pertanian Institut Pertanian Bogor. Bogor. 591p.

Steiner, C., Teixeira, W., Lehman J., Nehls, T., Vasconselos de Macedo, J., Blum, W., & Zech, W. 2007. Long Term Effect Manure Charcoal and Mineral Fertilization on Crop Production and Fertility on a Highly Weathered Central Amazonia Upland Soil. *Plant and soil*, 291: 1-2.

Sujana, P., Lanya, I., Netera Subadiyasa, N., Suarna, W. 2014. The Effect of Dose Biochar and Organic Matters on Soil Characteristic and Corn Plants Growth on the Land Degraded by Garment Liquid Waste. Journal of Biology Agriculture and Healthcare,IISTE, 4: 77-88.

Tagoe,S.O., Takasugu Horiuchi, T., & Matsui, T., 2008. Effects of carbonized and dried chicken manures on the growth, yield, and N content of soybean. *Plant Soil*,306,-211-220.

Yamato, M., Okimori, Y., Wibowo, I.F., Anshori, S. & Ogawa, M. 2006. Effects of the application of charred bark of *Acacia manginum* on the yield of maize, cowpea and peanut, and soil chemical properties in South Sumatra, Indonesia. *Soil Science and Plant Nutrition*, 52, 489-495.

PRESERVING LOCAL FRUIT THROUGH PLANT SELECTION OF SALAK GULAPASIR IN BALI

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Abstract

Salak is one of local fruit in Bali which is have distinctive taste (sweet and have a thick fruit flesh). Every regions in Bali have a specific variant because of the expansion of crop cultivation of salak gulapasir. In the garden can be found at least three different types of characters based on the shape of fruit, color of the flesh and rind, unfortunately the possibility to enhance the economic aspect of salak gulapasir is still neglected. To spread out the diversity of salak as one strategy for food security and food sovereignity that is very advantage to increase the economic value of salak gulapasir. As one case study in Tabanan regency that the emergence of a new variant for plant driven by propagation by seed. The farmers' on this site gave the name of the new variant as Gulapasir Pineapple (*nanas*) salak, Mumps (*gondok)*, Jackfruit (*nangka)*, but some cultivars have not been identified. All of the variants have a specific characteristic in adjusment of water stress. On the other hand, new development areas (Tabanan) has a short wet month 3-4 months, and the water deficit period lasts 3 months from the beginning of June to August with a total deficit of 69 mm / m^{-2}, while the salak plants included in the group of species susceptible to drought and roots are easily damaged so that the miscarriage rate salak is very high reached 88.96%, the development of flowers into fruits distracted and failed to form fruit. According to climate and water supply challenges in Tabanan region, this study will use salak gulapasir variant which is have tolerant to drought stress. The research aim is to find the salak gulapasir variant that is tolerant to drought and high yield potential.

Key words: variant, fruit flesh, selection, tolerant.

I. INTRODUCTION

Gulapasir salak plant (*Salacca zalacca* var. Amboinensis) is a commodity indigenus Indonesia which could be developed to meet the needs of both domestic and export markets. Some of the advantages Gulapasir salak is thick flesh, sweet taste like sugar even though their age is still young, not sintered, small grain, flesh color white and not attached to the seeds, fruit prices are four times more expensive than bali salak (Wijana, 1990). Furthermore Salak Gulapasir is also monoecious (monoeceous) (Kriswiyanti et al., 2008; Darmadi et al., 2002), so that the cost required for cultivation over the same area is 30% cheaper compared with deoecius salak like pondoh salak (Ashari, 1993; Sukewijaya et al., 2009). The nature of the fruit is quite ideal to meet the demands of the market both for domestic and export markets (Anonymus, 2004). The success of Karangasem Regency develop Gulapasir salak make other areas both inside and outside the province of Bali keen to cultivate this commodity. When at the beginning of the development of the plant Gulapasir salak limited in Karangasem, it is now extended to Tabanan, Buleleng, Badung and Bangli (Wijana et al., 1993). The regencies of Tabanan is the highest planting area with development centers in Saribuana Village, Duren Taluh, Batungsel, Pajahan, Munduk Temu, Kebon Jero, Angkah, Bantiran and Mundeh, and Padangan (Sumantra, 2013; Wijana 1993).

Expansion of crop cultivation Gulapasir salak cause phenotypic diversity variation with phenotype similarity level 58.62% - 93.10% (Sumantra, 2013). In the garden can be found at least three different types of characters, in the shape of fruit, aroma, flesh color and fruit weight (Sumantra et al., 2012). The results of this study imply that the emergence of crop diversity for plant propagation by seed, so it appears variants of new Gulapasir salak as has been reported by Sumantra et al. (2012). The results are consistent with the findings Mansyah et al. (2003) on mangosteen and Rai et al. (2008) in plants *wani*. Based markers that can be used as a differentiator, the farmers' gave the name of Gulapasir salak nenas, gondok, nangka. However, some cultivars have not been given the name because it does not provide specific differentiation as well as tolerance to drought stress is unknown. This information is very important because this plant is classified as plants are sensitive to drought stress.

Another problem in the development of this salak area the wet months of short duration, and the period of water deficit occurred from June, July and August with a total deficit of 69 mm / m^{-2} (Sumantra and Labek 2012). On the other hand salak plant belongs to the group of species susceptible to drought (Lestari and Ebert, 2002) due to the spread of the roots is not extensive, shallow, and can easily be damaged if the water shortage (Tjahjadi, 1989). Limitations of the water causes the water content in the leaves relatively low, causing miscarriage rate of salak is very high reached 88.96%, the development of flowers into fruits distracted and failed to form fruit (Rai et al., 2010). Using plant material tolerant to drought stress is a solution that should be considered. Initial selection can be done in the field is to explore elders who have the potential drought tolerant and high yield potential. But the selection is conventionally inefficient because it is not cost-effective and time (Mayes et al., 1996). Hence the selection procedure required immature plants (seed phase) to see the response of morphology and physiology. Through exploration and selection types can be found Gulapasir salak superior cultivars tolerant to drought that specific location suitable to be developed in new areas to support agribusiness salak in Indonesia.

The general aims of this study is to determine the variation of cultivar Gulapasir salak and elders obtained a superior for the assembly of new varieties for agribusiness salak development in Indonesia

The others objectives that will be find are:

1. Identify the character and distribution of salak Gulapasir morfofisiologi in different habitats (Sela and Gadu season) in Tabanan Region .
2. Identification of flowering and flower forming ability of some cultivars fruit of Gulapasir salak in various habitats on the season.
3. Identify the yield and quality of the fruit of some cultivars Gulapasir salak in various habitats on the season *Gadu* (less water condition) and interrupted in Tabanan .

II. MATERIALS AND METHODS

To answer the purpose of the research is carried out research for three years . year- to - one identification code Gulapasir salak morphophysiology some cultivars that have been adapted in Tabanan area in *Gadu* season and *Sela* (in between). The 2nd year research will study a phenology , fruit set and yield of some Gulapasir salak accession in *Gadu season* and *Sela* . The

3rd year study Identification characters morphophysiology some cultivars Gulapasir salak in nursery phase as plant responses to drought stress.

Phenotype observation made by observing the morphology and physiology of plants and results in each of the locations of some of the accessions that have been adapted to the local environment will conduct on the first year research. The equipment for the observation of the phenotype consists of plastic bags, scissors, rulers, scales, tool-making plant samples, and the camera GPS. The plant material used was some accession Gulapasir salak with a total of 100 plants with an estimated age of the plant between 8 years to 20 years.

Implementation of the Research and Observations

Observations morphophysiology done starting altitude range of 450 m - 780 m above sea level. Determination plants purposive sample is done on the basis of consideration of uniformity of plant and crop cultivation techniques salak that has been done. Observations phenotype refers to the book Free Testing Individual (PPI) salak species (MOA., 2006) include: 1) The main color vanished. 2). The color of the leaf midrib. 3) The number of child leaves. 4) The length of the leaf child. 5) The width of leaflets. 6) The color of thorns. 7) color flower sheath. 8) The length sheath. 9) Long-interest without sheath. 10) The number of bunches of flowers sheath-1. 11) The color of petals. 12) The color of the stalk juice. 13) The number of fruit bunches-1. 14) The number of seeds. 15) Thick flesh. 16) The shape of the fruit. 17) The color of the fruit skin. 18). Frond growth rate and bunches of relationship, 19). Relative water content, 20). Fruit set, 21) Total dissolved solids. Observations sheath length, flower length without sheath, the number of bunches of flowers sheath-1, the color of petals, stalk color of cider, fruit bunches number 1, number of seeds, thick fruit pulp, fruit shape, fruit color, growth rate and bunches of flowers frond , relative water content, fruit set, and total dissolved solids do two seasons, seasons *Gadu* and interrupted.

III. RESULTS AND DISCUSSION

To obtain superior bark (high yield potential and drought tolerant) needs to be elaborated roadmaps research has been and will be carried out. From the previous research which is the formulation of salak that began in 2010 through 2014 through doctoral research grants , research grants competition and science and technology activities for the community (IbM) have been studied seven researchtopic . Beginning with the research : 1) . The performance results of salak at various elevations in the area of new development (published in Proceedings Perhorti , in 2011) . 2) . Identify the characteristics of climate and soil water availability analysis for Gulapasir salak plant . Results of this study have been published in the Journal Agrimeta No. 1 Vol.1 20111. 3) . Identify the types of cover crops , and studying their effects on the microclimate in the plant bark Gulapasir.

Identify and analyze the factors soil, climate and crop management are thought to cause differences in yield and quality of fruits Gulapasir.6). Multilocation trials of three cultivars Gulapasir salak do with yield, and fruit quality improvement efforts (Sumantra et al, 2012). 7). Solutions to improve the outcome and quality of fruits Gulapasir through thinning and wrapping fruit bunches (Labek dkk.2013). Study agroecosystem of bark Gulapasir as basic improvements

in yield and fruit quality of new development areas have been carried out by Sumantra (2013). The results were obtained Gulapasir salak plants grown in Tabanan and Karangasem showed good variation in phenotype (0:58 - 0.93) and genotype (0.50 - 0.80). The study gives the meaning that the difference in the location causes a variation in Gulapasir salak. Gulapasir salak yield potential cultivars (nenas, nangkat and gondok) and improvement efforts have been made by Sumantra et al. (2012). The results were obtained fruits of Nangka Gulapasir types derived from Karangasem heavier and fruit quality (thick meat, fruit volume, moisture, texture, vitamin C, the ratio of TPT / total acid) higher. Factors planting location and real soil affects weight-1 fruit trees and fruit quality. Soil components that affect the weight and quality of fruit are: levels of N, P content, CEC, KB, the percentage of sand, silt and clay, organic-C levels and soil pH (Sumantra 2013). But from the research that has been done is not yet known about the properties of their espective tolerant cultivars to drought stress conditions as well as excellence in depth cultivars no information salak plant developed especially in the area of new development. This is important given the fluctuations in yield and a very large diversity of properties such as shape, size and taste of the fruit caused by climatic factors and the soil in which the plants grow. Differences in results and a great diversity of results caused by limited water either from rainfall or from irrigation water. Limitations of this water is mainly experienced by farmers in production periods *gadu* season, causing the development of flowers became distracted and failed to form fruit bunches so that the plants do not bear fruit Gulapasir continuously.

IV. SUMMARY

1. Gulapasir salak have the advantage of thick flesh , sweet taste like sugar despite the young age of the fruit , seeds small , pure white flesh color and flesh of the fruit is not attached to the seed (Wijana , 1990)
2. The Expansion of crop cultivation of Gulapasir salak cause phenotypic diversity variation with phenotype similarity level 58.62 % - 93.10 % (Sumantra , 2013) its also driven by seed plant propagation, so it appears new variants of Gulapasir salak.
3. There are three different variants of Gulapasir salak and it is very important to preserv the continuity of plantation and also the adoption of drought soil condition.

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REFERENCES

Ashari 2002. On the agronomy and botany of Salak *(Salacca zalacca)*. PhD Thesis Wageningen University. pp. 126.

Bangerth F. 2000. Abscission and thining of young fruit and their regulation by plant hormones and bioregulators. Plant Growth Regulation. (31) : 43 – 59.

Gardner, F.P., R.B. Pearce, R.L. Mitchell. 1991. *Fisiologi tanaman budidaya. Terjemahan* H.Susilo. UI-Press. pp.428.

Kinet,J.M., R.M. Sach, G.B. Bernier. 1985. The development of flowers. *In* The Physiology of Flowering. Volume III. Florida:CRC Press. Inc. pp. 274.

Levitt, J. 1980. Responses of plant to environmental stresses. Water, radiation, salt and other stresses. Vol.II. Academic Press, New York-London-Toronto-Sydney-San Fransico

Kriswiyanti, E., K. Muksin, Watiniasih, M. Suartini. 2008. *Pola reproduksi pada salak Bali* (*Salacca zalacca* Var. Amboinensis (Becc.) Mogea. J. Bio. 11 (2): 78-82.

Leopold AC, Kriedemannn PE. 1975. Plant growth and development. Second edition. USA: Mcgraw- Hill Book Company. 271 – 336 p.

Lestari, R. and G. Ebert. 2002. Salak (*Salacca zalacca* (Gaertner.) Voss.) – The snakefruit from Indonesia. Preliminary Results of an Ecophysiological Study. Deutscher Tropentag - Witzenhausen, 9-11 October 2002 Conference on International Research on Food Security, Natural Resource Management and Rural Development. pp. 8.

Mogea, J.P. 1979. *Faktor musim dalam pembuahan salak* (*Salaca edulis*). Berita Biologi 2 (4): 71 -74.

Rahayu, L.R. Sudaratmaja, A. Rachim, Sumartini, W.Soethama, Rosdiah, Trisnawati. 1999. *Pengkajian sistem usaha pertanian salak berbasis ekoregional lahan kering*. IP2TP, Bali. pp.137.

Rai, I.N., C.G.A. Semarajaya, I.W.Wiratmaja, 2010. *Studi fenofisiologi pembungaan salak Gulapasir sebagai upaya mengatasi kegagalan* fruit set. J. Hort. 20 (3): 216-222 p

Sukewijaya, I.M., Rai and Mahendra. 2009. Development of salak bali as an organic fruit. As. J. Food Ag-Ind. Special Issue. 37- 43 p.

Sumantra,K., Sumeru Ashari, Tatik Wardiyati, Agus Suryanto. 2011. *Hasil dan mutu salak Gulapasir pada ketingiian tempat berbeda di daerah pengembangan baru di Bali. Prosiding Seminar Nasional Perhimpunan Hortikultura Indonesia, Balitsa Lembang*, pp.15

Sumantra, K. S. Ashari, T. Wardiyati, and A. Suryanto.2012a. The agroecosytem approach as a concept in sustainable cultivation of salak trees cv. Gulapasir in new development areas in Bali, in Proceeding of the International Conference on Sustainable Development (ICSD*)*, Denpasar, Bali, 2012, pp. 348- 364.

Sumantra, K, Sumeru Ashari, Labek Suyasdi Pura, 2012b. *Potensi hasil dan mutu buah beberapa kultivar Salak Gulapasir dan upaya perbaikannya di daerah pengembangan baru di Bali. Laporan penelitian hibah bersaing*. Fak.Pertanian Unmas Denpasar. 50 h.

Sumantra, K. Sumeru Ashari, T. Wardiyati, Agus Suryanto, 2012. *Diversity of Shade Trees and Their Influence on the Microclimate of Agro-Ecosystem and Fruit Production of Gulapasir Salak (Salacca Zalacca var. Amboinensis) Fruit*. International Journal of Basic & Applied Sciences IJBAS-IJENS :12 (06) : 214-221.

Sumantra, K. 2013. *Kajian agroekosistem salak Gulapasir sebagai dasar perbaikan hasi dan mutu buah di daerah pengembangan baru di Bali*. Disertasi. Fak. Pertanian Univ. Brawijaya Malang. 176 h.

Sumantra, K.. Sumeru Ashari, N.Labek Suyasdi Pura, 2014. *Heat unit, phenology and fruit quality of salak (Salacca Zalacca var. Amboinensis) on different elevation in Tabanan regency Bali*. Agriculture, Forestry and Fisheries. : 3 (02): 102-107.

Wijana, G. 1990. *Telaah sifat-sifat buah salak Gulapasir sebagai dasar penggunaannya*. Post Graduate Faculty, Institut Pertanian Bogor. pp. 163.

Wijana, G. A. Gunadi dan N. Kencana Putra. 1993. *Upaya peningkatan kuantitas dan kualitas buah salak Bali dengan penentuan waktu penjarangan dan jumlah buah per tandan*.Report reseach. Faculty of Agriclture. Unud Denpasar. 40 pp.

MARKET WASTE UTILIZATION MODEL FOR OPTIMIZATION OF RICE PRODUCTIVITY IN RAINFED TO INCREASE FOOD SECURITY AND OVERCOME THE NATIONAL WASTE PROBLEM

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Abstract

Rainfed in Indonesia is so wide and reached 2.21 million hectares have not been used optimally, so also in Bali as many as 480.559 hectares or 85.26 percent of agricultural land in Bali is rainfed areas. The addition of organic materials can be done to improve the productivity of the land through the use of market waste. In 2011 the volume of waste in Bali average 10.005.83 cubic meters per day and is increasing from time to time. Utilizing market waste to increase land productivity will be able to overcome the problems of waste management and simultaneously improve national food security. Is a multi-year research needs to be done to find the way of making and the way the application of organic fertilizer is the most easy to follow farmers, to get a dose of organic market waste fertilizer optimum used in an effort to improve rainfed rice production that can increase water absorption and provide optimal nutrition for rice plants. Besides that some rice varieties tolerant to drought will be tested in this study to obtain a combination of organic fertilizer market waste doses with rice varieties that have the highest productivity for rainfed. The research conducted in the laboratory to determine the content of C-organic, N-total, P-available, K available, soil pH, and other micro-nutrient content, while research in the field in the form of demonstration plots with drought-resistant rice varieties adapted to the number of replications analysis. Analyses were performed by Anova is a randomized block design (RBD), and equipped with regression correlation analysis.

Keywords: rainfed, market waste, organic fertilizers, water availability, productivity of rice

I. Introduction

Rainfed areas in Indonesia reached an area of 2.1 million ha if managed properly can become a second national granary after the irrigated land. However, the productivity of the land is still low, ie, approximately 3-3.5 tonnes/ha. The potential of rainfed rice in Indonesia is quite widespread in the province of Banten, West Java, Central Java, Lampung, South Sulawesi, Bali and NTB. In Bali, 85.26 percent or 480 559 hectares of agricultural land in Bali is rainfed areas. Of the total area, 42.10 percent (202.335 hectares) is located in North Bali.

Over the past five years, the productivity of rice in Bali showed that the development is relatively low, at only 3.18%. This condition is exacerbated by decreasing the flow of water for irrigation as a result of competition with the industrial sector and for land clearance, climate

anomalies and disorders of plant pests, and the application of technology at the farm level is not optimal (Department Pertanian, 2007).

One strategy that can be implemented to optimize the potential of rainfed areas is to provide indigen microorganisms and organic fertilizer on the land. Indigen microorganisms capable of maintaining soil fertility, increase soil microbial populations and environmental sustainability. Organic fertilizers can improve soil absorption of water, stabilize soil structure and aggregate stability and improve propping fertilizer, which can ultimately increase the efficiency of fertilization (Rinsema, 1983).

Organic fertilizer is used as a soil improvement (soil conditioner), can increase soil organic matter content in order to maintain and increase soil fertility (Setyorini *et al*., 2006). Utilization of organic fertilizer from the waste market is a step recycle or reuse waste is wasted, because the waste that is directly felt by bringing a lot of problems, especially as a source of environmental pollution, the source of disease and interfere with the cleanliness of the environment. This step is in line with the opinion Sutanto (2002) which states that, organic fertilizer is an effort to suppress the amount of waste, collection and transportation costs.

One source of organic material that can be used as organic fertilizer is waste market. waste has a lot of impact on humans and the environment, among others, health, environmental, social and economic. Waste materials market is a byproduct of human activities that are in the market and contains a lot of organic material. According Hadiwiyoto (1983), market waste that contains organic material is rubbish bins agricultural products such as vegetables, fruits and leaves as well as from the fisheries and livestock. Waste vegetable is a vegetable that can not be used or discarded. Fruit waste consists of waste watermelon, melon, papaya, grapefruit, pineapple and others while vegetable waste consists of waste leeks, celery, mustard greens, chicory, cabbage, bean sprouts green waste, corn, leaf flower cabbage and many other vegetable wastes.

According to Buckman and Brady (1982), the result of decomposition of organic matter will produce humus which color is dark brown to black, which has water-binding properties can be four to six times its own weight so as to enhance the ability of soil to retain water. With the bound water by reducing water percolation of humus means that leaching of nutrients by water can be reduced. In addition kolloid negatively charged which can absorb cations so as to reduce leaching of nutrients in the soil (Hanafi, 2004).

There are several benefits derived from the use of organic fertilizer for agricultural land. According Novizan (2002) of these benefits are: a) provide nutrients for plants resulting in efficiency in the use of chemical fertilizers, b) improve soil structure, c) increase the cation exchange capacity, d) increase the ability of soil to hold water, e) increasing the activity soil biology, f) improves the pH of acidic soil, g) increasing the availability of micro elements and the most important thing today is that h) does not cause environmental problems.

Based on the above, it is necessary to research on the use of indigen microorganisms and organic fertilizer from market waste to suppress the dependence on chemical fertilizers and water limitations in an effort to increase the productivity of rainfed. This study is expected to answer the question (1) how to manufacture indigen effective microorganisms as liquid fertilizer and as

a market waste dekompuser, (2) a dose of organic market waste fertilizer optimum used in an effort to improve rainfed rice production (3) rice varieties that can highest production in rainfed after using microorganisms indigen and waste market organic fertilizer.

II. Materials and Methods

2.1 Manufacture of Microorganisms Indigen as Organic Waste Dekompuser

The main ingredient of microorganisms manufacture indigen consists of three types of components: namely 1) Carbohydrates (such as former rice (stale), cassava, potato, wheat), 2) Glucose (such as Red sugar, liquid sugar, rock sugar, coconut water) , 3. source bacteria: (snails, fruit leather, urine, fish and other materials containing a source of bacteria). For this study will be made 4 types of microorganisms indigen with different bacterial sources, namely: fruits, vegetables, fish, and a mixture of the three materials.

2.2 Making Organic Fertilizer from the Waste Market

Waste organic fertilizer market is made by utilizing microorganisms indigen already made previously. Windrow composting using semi-aerobic system, which is chopped organic waste, stacked approximately 1.5 m and then covered with a tarpaulin. Each thickness of 30 cm watered with a solution of microorganisms indigen. If the temperature has exceeded 60°C, the organic fertilizer is reversed. Organic fertilizer will be within 1 month

2.3 Analyzing the Content of Organic Fertilizer from the Waste Market

Organic fertilizers from waste market before use, were analyzed in the laboratory to determine the content of organic C, N-total, P-available, K available, pH, and micronutrients to facilitate the determination of the optimum dose to use rice crops in rainfed areas.

2.4 Making the Research Plots

Making the plots aims to determine how the optimum dose of organic fertilizer market waste is used to increase rice production in rainfed areas, and types of rice varieties able to produce the highest after being given organic fertilizer from the waste market. Liquid fertilizer of microorganisms indigen and solid organic fertilizer agricultural waste is given at the time of land preparation. Liquid fertilizer is given by 10 lt / plots treated with splashed where first diluted 1: 10. Next sprayed once a week after planting to 10 times watering agricultural waste solid organic fertilizer is given only once with a dose according to treatment. Urea fertilizer is given as a starter that is 150 kg per ha which is 50% of the dose recommended doses.

2.5 Research Design

Research using randomized block design (RBD) with factorial pattern prepared following treatment. The treatment under study consists of three factors: the first factor, namely the fourth

types of indigen microorganisms, factor II is a 5th dose of organic fertilizer waste market and factor III is 5 rice varieties tolerant to water shortage.

2.6 Observation and Data Collection

In this study observed variable growth, yield components and yield of rice plants as well as several other variables. Growth variables include: plant height (cm), number of leaves plant-1 (strands), leaf area index, maximum tillering Total clumps-1.
The variable component of the yield include: Weight fresh stover tan-1 (g), the weight of oven dried stover plant-1 (g), number of panicles clump-1, number of panicles pithy and hollow panicles clump-1, number of seeds panicle-1 (grain) , oven dry weight of 1000 seeds (g), and the weight of the dry seed harvested and oven dried clump-1 (g)

2.7 Data Analysis

The data collected were analyzed statistically using analysis of variance (ANOVA) in accordance with the design used. When the real interaction effect ($P < 0.05$) were observed variable, then continued with different test average value using Duncan's multiple range test 5%. When only a single factor that influences real, then, followed by LSD test 5%. To obtain a dose of organic fertilizer and seed varieties with yield crop dried and oven dried seed yield ha-1 regression analysis (Gomez and Gomez, 1984).

III. Discussion

Geographically Bali has 8 months of the rainy season and dry season 4 months. The average rainfall between 2500 - 3000 mm per year (climate area B) located in Central Bali; areas with a 7-month and 5-month rainy season with the dry season (Climate region C) with an average rainfall of 2000-2500 mm per year contained in the West Bali; areas with 6-month and 6-month rainy season to dry season (climate area D) with precipitation antara1500 - 2000 mm per year contained in South Bali and West Bali; areas with 5 months and 7 months of the rainy season to dry season (climate area E) with rainfall between 1000-1500 mm per year in Bali are South and Southeast; whereas areas with 4 months of the rainy season and dry season of 8 months (Climate region F), with rainfall between 800-1300 mm per year contained in East Bali and North Bali. Thus, the East and North Bali Bali weather circumstances drier when compared with West Bali, Central and South.

Areas that have the rainfed areas in Bali, including Buleleng (districts Kubutambahan, Sawan, Buleleng, Sukasada, Banjar, Seririt, Busungbiu); Tabanan regencies (districts Pupuan); Bangli regencies (districts Kintamani); and Karangasem (districts Kubu, Abang, and Karangasem) with a total area of 70.424 ha of degraded land has 240 ha and critical potential of reaching 10.615 ha (Mentri Kehutanan, 2005). Rainfed areas of an area of 2.1 million ha of land productivity is still low, ie, approximately 3-3.5 tonnes/ha.

Alternative strategies to improve land productivity in rainfed is through the approach of Integrated Crop Management (ICM) Rainfed Rice. New varieties, such as, Ciherang, Cibogo, Cigeulis, Way Apo Buru, Mekongga, and Widas almost all of them suitable to be planted in

rainfed areas. Planting varieties by applying the ICM model, has a good opportunity to support the promotion of the national rice production. Suppose increased yield only reaches 1 ton / ha only, then the extent of 2.1 million ha rainfed can produce 2 million tons. The potential yield on rainfed when using ICM can be increased by 2-4 tons / ha. Based on the experience of the application of ICM model rainfed rice at the research level, an increase of 37%. On a scale of assessment increased by 27% and at the level of farmers increased by 16%. Besides, the research plots ICM models rainfed rice 2005/2006 in Sumedang and Pati, respectively reached 6.08 t / ha and 6.16 t / ha dry milled grain.

Various attempts have been made in order to be able to suppress dependence on chemical fertilizers that are so large, in addition to environmental sustainability towards sustainable agriculture. Inoculation of microorganisms can be used as an alternative to overcome the scarcity of chemical fertilizers (inorganic) due to high prices and unequal distribution. The existence of microorganisms solvent soluble P in the soil in the form of bacteria, fungi and actinomycetes can increase the availability of P through the binding process and the dissolution P, which in turn will increase the productivity of plants. Working process is solvent P microorganisms will produce organic acids are able to bind Al, Fe, Ca, and Mg form stable complexes organomental and P becomes available to plants.

Decomposition process (fermentation) organic material will cause the material temperature increases. The success of the decomposition process will be followed by an increase in temperature of up to about 70°C, then decreased which indicates the cooling caused by the reduction in the decomposition process and finally reaches a constant point. This indicates the end of the decomposition process or the process of making organic fertilizer has been completed (Haryanto *et al*, 2002).

Waste is generally divided into three, namely waste liquid, solid and gas. Organic wastes are mostly from the agricultural sector with a number of very abundant, but because of the nature of this waste is decomposed it will cause odor and groundwater contamination. Organic waste is indispensable for agricultural soils because organic matter content in it is very important. It can be seen from the role that can set various properties of the soil, as a buffer supply of nutrients for plants and the effect on soil structure (Winarno *et al*., 1985). Furthermore Rochayati and Adiningsih (1989) states that, the organic waste in agriculture rainfed areas have a very important role because it can improve aggregate stability, soil structure, water holding capacity and soil erosion and to improve the capability of supporting the fertilizers which ultimately can improve fertilizer efficiency. The main source of soil organic matter are crop residues returned to the soil and organic fertilizer (Buckman and Brady, 1982).

One case occurred in an area of red onion planting in Brebes, Central Java, continuous use of inorganic fertilizers, in certain periods decrease the productivity of the soil. Previously crumbly soil texture becomes sticky and hard to be processed. Organic fertilizer can increase soil productivity back (Djuarnani *et al*., 2004). Organic fertilizer in the ground beside the aim to provide nutrients, it also aims to improve the physical condition of the soil (Yuwono, 2006). The physical properties of the soil can be improved because of humus as result revamp organic materials can be as kolloid, so with the addition of organic fertilizers means it will increase the amount of land kolloid. It is important to coarse-textured soils that have little land kolloid levels,

so that with the water holding capacity of organic fertilizer, cations of nutrients and cation exchange capacity to be increased (Muhadi, 1979).

Organic fertilizers are made from a variety of abrasive materials, such as rice straw, household waste, leftover grass, assorted mixture of animal dung, ash, sewage sludge and other (Rifai, 1974). Most common characteristics of organic fertilizer, among others: (1) containing the nutrients in varying amounts depending on the type and origin of the material, (2) provide nutrients slowly (slow release) and in limited quantities, and (3) has the primary function of fixing fertility and soil health (Setyorini *et al*., 2006). Organic fertilizers contribute significantly to improvement of properties of the chemical, physical and biological soil as organic matter content. Organic material is an essential ingredient in the fertile soil as it works to stabilize the soil aggregates. Organic materials also have a number of latent energy as the rest of the heating plant that is above the ground level which is 4-5 kcal g-1 dry matter (Winarno *et al*., 1985).

Further explained, the content of nutrients contained in organic fertilizers varies greatly depending on the origin of materials used and the procedure for its manufacture. Generally, the content of nutrients in organic fertilizer, N (nitrogen) from 0.19 to 0.5%; P2O5 (phosphate) from 0.08 to 0.27% and K2O (potassium) from 0.45 to 1.20%. The characteristics of a good organic fertilizer is blackish brown, slightly moist and constituent materials has not looked back (Yuwono, 2006; Rismunandar, 1984).

Results of analysis of waste organic fertilizer market indicate that the amount of available nutrient content is 1:21% Nitrogen, Phosphate available was 763.98 ppm and 178.88 ppm Potassium is available, as well as organic material is 29.13%; better (much) of the number of similar nutrient content contained in the soil, the nutrient content is available 0:07 to 0:08% Nitrogen, Phosphate available 11.70 - 26.10 ppm, and Potassium available 101.29-158.40 ppm, as well as organic materials 0.9-1.56%. Organic fertilizer has been used farmers, but the exact dosing for agricultural crops including rice crops have not been widely applied. The addition of organic fertilizer market waste will be able to improve the physical, chemical and biological soil, which in turn can increase the production of rice plants.

IV. Conclusion

1. Undertake research to be able to optimize the productivity of rain-fed land by utilizing the waste market
2. Need to do research to get the local microorganisms to decompose the organic material from the waste market and can be done by farmers
3. Need to do market research to use waste as organic fertilizer to increase the productivity of rainfed
4. Need to do research on the effectiveness of waste organic fertilizer market in increasing rice production

References

Adisarwanto,T., Widyastuti,Y.E. 2002. *Meningkatkan Produksi Padi di Lahan sawah tadah hujan, Sawah dan Pasang Surut*. Jakarta : Penebar Swadaya. 86 hal.

Anonim, 2003. Kumpulan Buku Tanaman Pangan, Tanaman Sayuran, Tanaman Buah, Tanaman Kebun dan Tanaman Obat. Jakarta. Badan Pengembangan Sumberdaya Manusia Pertanian. Proyek Pemberdayaan Penyuluhan Pertanian Pusat.

Buckman, H.O., Brady, N.C. 1982. *Ilmu Tanah.* Jakarta: Bhratara Karya Aksara (Terjemahan). 788 hal.

Djuarnani, N., Kristian, Setiawan, B.S. 2004. *Cara Cepat Membuat Pupuk organik*. Bogor : Agromedia Pustaka. 74 hal.

Gomez, A. K. and A. A. Gomez. 1995. *Prosedur statistik untuk penelitian pertanian.* (terjemahan oleh Enang Sjamsudin & Justika Baharsjah). Edisi 11. UI press, Jakarta 698 hal.

Hadiwiyoto, S., 1993. *Penanganan dan Pengelolaan Sampah.* Yayasan Idayu, Jakarta

Hanafiah, 2004. Dasar-dasar Ilmu Tanah, Jakarta : Raja Grafindo Persada

Muhadi, I., 1979. *Pengetahuan Pupuk*. Yogyakarta: Yayasan Pembina Fakultas Kehutanan UGM. 79 hal.

Novizan, 2002. Petunjuk *Pemupukan yang Effektif* . Jakarta : Agro Media Pustaka. 114 hal.

Rifai, B. 1974. *Ilmu Pemupukan I*. Jakarta : PT. Soeroengan.

Rismunandar, 1981. *Pengetahuan Dasar Tentang Perabukan*. Bandung : Sinar Baru.

Rinsema, W.T. 1983. *Pupuk dan Cara Pempukan*. Jakarta : Bhratara Karya Aksara

Rochayati dan Sri Adiningsih. 1989. Konservasi Bahan Organik Melalui Alley Cropping Pada Lahan sawah tadah hujan. Jakarta : Badan Peneliti dan Pengembangan Pertanian. Hal 8.

Setyorini, D., Saraswati, R., Anwar, E.K. 2006. *Pupuk organik.* Bogor : Badan Penelitian dan Pengembangan Pertanian. Hal 11 – 40.

Sutanto, R. 2002. *Penerapan Pertanian Organik.* Yogyakarta : Kanisius. Hal 46 – 87.

Winarno, F.G., Budiman. A.F.S., Silitonga, T., Soewardi, B. 1985. *Limbah Hasil Pertanian*. Jakarta : Monografi. Kantor Menteri Muda Urusan Peningkatan Produksi Pangan. Hal 243-254.

Yuwono, D. 2006. *Pupuk organik*. Jakarta : Penebar Swadaya. 84 hal.

CUSTOMARY LAW IN BALI FOR CONTROLLING THE CONVERSION OF PADDY FIELDS REGARDING FOOD SECURITY IN BALI

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Abstract

The food security cannot be separated from the existence of productive land, especially paddy fields, however, the current state of availability of productive land, especially paddy fields thinning in Bali, which is caused by the impact of globalization and Tourism continues to increase. Local government policies in Bali in favor of the development of tourism has become a major contributor to conversion of paddy fields, so the state law is supposed as an instrument to create food security even become shredder food security. The existence of Customary Law of Bali which is based on the concept of Tri Hita Karana is the balance of the human relationship with God, man's relationship with other human beings and human relationships with the environment to be one of the means to control the conversion of productive land, especially paddy fields in relation to the behavior and understanding of the people of Bali about the benefits of agricultural land in all aspects of community life. To this phenomenon with research using empirical juridical research that looks at the phenomenon of law is not only concerned with the formal legal side alone, but also look at the phenomenon of the law on the symptoms that arise in the application of law in a society that strengthening customary law to increase the role of traditional village as carrier laws Balinese traditional local wisdom can be found in Bali that can be synergized with the development of Balinese society today. Rescue productive land, especially paddy fields which have implications for the achievement of food security tailored to the will of the people and the values and culture of Bali will create synergy between the development of the tourism industry and food security.

Keywords: paddy field control, food security, customary law

Introduction

Tourism sector in Bali is very popular in foreign countries, due to a lot of destinations provided by the island of Bali in pampering the tourists, one of which is that Bali presents a very intriguing natural beauty, as well as presenting the lives of people with a unique culture to the world community besides the art, and rides other tourist attractions. Bali is an island with a breadth of ± 5632.86 (five thousand six hundred and thirty-two comma eighty-six) km2 with limited carrying capacity, which is administratively consists of 8 (eight) districts, 1 (one) city, 55 (fifty-five) sub districts, 701 (seven hundred and one) villages, 1,432 (one thousand four hundred and thirty-two) traditional village, and 3,945 (three thousand nine hundred and forty-five) traditional hamlet with a population of approximately 4.1049 million (four million one hundred four thousand nine hundred) people in 2014. 1,432 (one thousand four hundred and thirty-two) traditional village, and 3,945 (three thousand nine hundred and forty-five) traditional hamlets with a population of approximately 4.1049 million (four million one hundred four thousand nine

hundred) people in 2014[1]. If seen, in accordance with the Bali Provincial Tourism Office, foreign tourists who come directly to Bali reached 1,397,668 (one million three hundred ninety-seven thousand six hundred sixty-eight) people during January to May 2014, increased to 14.81% (fourteen comma eighty one percent) from the same period in 2013 is only 1.217.354 (one million two hundred seventeen thousand three hundred fifty-four) people[2]. In addition the course will impact on increase of the urbanization that is looking for a job to improve the necessities of life, in which it has an impact on increasing the number of people in Bali, which is of course related to the increasing amount of demand for non-agricultural land as residential land communities, where the land used to create residential land for the people of Bali is the land that was once a productive land, so that it is one of the factors decreasing food in Bali.

Other than the mentioned above, the impact of tourism in Bali which resulted in a lot of land conversion and reduction of food result in Bali is escalation of infrastructure in Bali to support the infrastructure requirements Tourism, as well as development of the hotel area, villas, resort areas, shops, malls, and others, in which to get a strategic place for the construction of hotels and villas, as well as to get a beautiful view, automatically hotel or villa will be built in the area close to the scenic destination, be it land productive or non-productive land, but most of the area in Bali is productive land is located in an area of rice fields directly in contact within the area with a view beautiful.

Infrastructure development is increasing constantly happening in Bali of course have an impact on the level of land prices and land in Bali becomes very high and erratic, so it makes the interest of the people of Bali to sell the land or their land is very high, and the factors of the economic needs of society not balanced by their income to meet their needs, which makes people sell their agricultural land which is the productive land to produce food needs are great. it is, because there is no control over the transfer of land that have an impact on the uncontrolled development that occurred in Bali. Of the development is not well controlled, would have an impact also on the paradigm shift in the management of water resources and The watershed (DAS), where it can cause damage to irrigation canals in areas downstream. Disruption of water resources and watershed (DAS), which resulted in a lack of water supply for plantations and rice fields resulted in maximal harvest of farmers both in quantity and quality.

According to Iwan Isa, factors that encourage the conversion of agricultural land into non-agricultural, among other things[3] :

1. Population Factor. The rapid increase in population has increased the demand for land for housing, services, industry, and other public facilities. In addition, improving standards of living also contributed to creating extra demand for land as a result of an increase in the intensity of community activities, such as golf courses, shopping centers, highways, recreation areas, and other facilities.
2. Factors of land needs, ie for non-agricultural activitiesamong other things real estate development, industrial areas, commercial areas, and other services that require large

[1] I Made Oka Parwata, 2014, *Lahan Pertanian Pangan Berkelanjutan, Aviable at* http://distanprovinsibali.com/lahan-pertanian-pangan-berkelanjutan/ accessible at 13 Februari 2015

[2] Dinas Pariwisata Daerah Provinsi Bali,2014, Pariwisata Bali Siap Hadapi MEA 2015, *Available at*: http://www.disparda.baliprov.go.id/id/Pariwisata-Bali-Siap-Hadapi-MEA-2015-, accessible at 12 May 2015

[3] Iwan Isa, 2004, Strategi *Pengendalian Alih Fungsi Lahan Pertanian*, Badan Pertanahan Nasional, Jakarta

tracts of land, most of which comes from agricultural land, including paddy. This is understandable, considering its location chosen such that it is close to the service users are concentrated in urban areas and surrounding areas (sub urban area). The location around the city, which was previously dominated by the use of agricultural land, were subjected to the development of non-agricultural activities considering the price is relatively cheap and has been equipped with facilities and infrastructure such as roads, electricity, telephone, water, dna other facilities. In addition, there is the existence of "*sawah kejepit*" ie fields that are not overly broad because the surrounding area has been turned into residential or industrial areas, so that farmers in this area is difficult to get water, labor, and other production facilities, which forces them to transfer or sell the land.

3. Economic factors, namely high activity landrent obtained non-agricultural sector than the agricultural sector. Low incentives to try to farm due to the high cost of production, while prices of agricultural products are relatively low and fluctuating. In addition, because of the needs farming families are pressured by the needs business capital or other family purposes (education, employment non-agricultural, or other), often makes farmers have no choice but to sell part of the farm.
4. The socio-cultural factors, among other things the existence of the law of inheritance that causes fragmentation of farmland, so it does not meet the minimum economic scale profitable businesses.
5. The environmental degradation factors, among other things long drought that cause water shortages for agriculture, especially rice; the use of fertilizers and pesticides excessively impacting on improving certain pests due to the destruction of natural predators of the pest is concerned, as well as irrigation water pollution; environmental damage paddy fields around the coast resulting in encroachment (infiltration) of sea water inland that could potentially poison the rice plant
6. Factors of that promotes local autonomy in the development promising sectors of higher short-term profits to increase Locally-Generated Revenue, the lack of attention to the long-term interests and the national interest that is so important for society as a whole.
7. Factors of weak legal system and Law Enforcement of existing regulations.

The data show that in 2009 the total wetland area in Bali recorded 81.931 ha (eighty one thousand nine hundred thirty-one hectares), while in 2012 total recorded 81.625 ha of paddy fields (eighty one thousand six hundred twenty-five hectares). This means that within a period of four (4) years from 2009 up to in 2012 recorded over the function of wetland of 306 ha (three hundred six hectares) of 0,37% (zero comma thirty-seven percent), or about 76.5 ha (seventy-six point five hectares)/ year[4]. . it can be seen from these data that the decrease in the number of productive wetland approximately 76,5 ha (seventy-six comma five hectares) / year of course will result in a decrease in food products is a very big year in Bali.

Actually the local government of Bali has made a policy that is based on the local wisdom in terms of control land conversion, but in practice has not been getting results, then to maximize the results, the necessity to synergize between the central government as a policy holder with a traditional village that makes the customary law, so the expected results in the control of land conversion can be maximized.

[4] I Made Oka Parwata, Loc Cit

In this paper, using the method of juridical empirical research that looks at the phenomenon of law is not only concerned with the formal legal side purely, but also look at the phenomenon of the law on the symptoms that arise in the application of law in a society that strengthening customary law to increase the role of traditional village as carrier for the Bali Customary law get local wisdom found in Bali that can be synergized with the development of Balinese society today.

Benefits of Rice Field Farm in Improving Food Security in Bali

Land which is the principal resource in agriculture, and nowadays in Bali land is increasingly scarce because of the amount of land that has not increased even begin to decrease each year. Of course the main factor of the lack of land per year in Bali, caused by land conversion which is the a the threat to food security and a serious amplification of the food production, the physical environment, as well as the impact on welfare, and public health. Systematically, if the available agricultural land is increasing, then automatically the greater will be results of food given to the public, and of course will have an impact on the quality of food or foods that will be consumed by the public. Other than that paddy fields would give the ecosystem balance in it, and of course in addition to providing paddy and rice, also provide other food sources, just like, locusts, frogs, the eel, snails, fish, etc., which can be processed to the public for food for consumption by the people.

Other benefits of agriculture, besides providing the benefits of producing food production, and the high availability of rice fields is giving a very good role for the conservation of soil and water, can also maintain revenue groundwater reserves, giving anticipation of CO2, it also serves as an air conditioner, recycling rubbish organic, and can reduce the occurrence of droughts and floods for society, but it certainly will provide a special attraction within field of tourism as argowisata, which of course also have an impact on improving results of society. If the paddy fields begins to decline, of course, will impact on the availability of food which certainly have an impact on the quality of human resources are decreasing, due to lack of nutrition, and also may have an impact on health, but it is also when the supply or food production lower income rather than the number of people existing, will be able to have an impact on political stability, security, economic, and others.

Government Policies Harmonized With Local Wisdom In Controlling Land Conversion Function

Central and local government to seek an outcome of policy taken must always respect local wisdom region, caused by the food agriculture protection is an inseparable part within Spatial arrangement. Spatial arrangement is expected to provide protection to productive land, especially paddy fields or farmland, which of course includes the planning, establishment, development, research, utilization, and development, control, supervision, development, protection and empowerment of farmers. Related to the Policies relating to the control over wetland function or agriculture, the government has published a lot of policies relating to the problem of agricultural land, especially paddy fields irrigated a form of legislation, but implementation was not effective because of legislation such, does not contain the criminal sanctions, then the central government and local governments are not so earnestly to implement them.

As in Bali, the previous local government's attention is more inclined to the development of tourism, so it must sacrifice some productive land especially paddy fields or farmland. But this time the development of the Development in Bali is more based on local wisdom in Bali. This can be seen through the vision of the development of Bali as outlined in the Regional Long-term Development Plan (RPJPD) Bali Province 2005-2025, namely Bali Dwipa Jaya is based on *Tri Hita Karana*[5]

Tri Hita Karana has the elements of the value of the balance between man's relationship with God, the relationship between Man and man, and between man and his environment. All of it, applied through:

1. An element of balance and harmonious relationship between man and God, which is reflected in the form of an attempt to protect the holy places and sacred areas are believed to have the values of sanctity as a place for people to join with God, who subsequently designated as region must be protected, both located in protected areas[6], as well as cultivation area[7].
2. Elements of the value balance and harmonious relationship between man and man is reflected in the structuring and management of residential areas as a container of human social interaction in a safe, peaceful, and civilized, and able to ensure the development of human resources to the maximum.
3. Elements of the value balance and harmonious relationship between humans and the natural environment is reflected in the form of efforts to structuring and management of natural resources to be utilized in a sustainable manner, both for the benefit of the present generation of Bali, as well as generations of Bali in the future.

Other than the philosophical basis of Tri Hita Karana, the policy made by the government in Bali is also grounded in the philosophical of *Sad Kertih*[8] is 6 (six) source of wealth that must be

[5] Tri Hita Karana is a philosophy of life for the people of Bali who has three elements that build balance and harmonious relationship between man and God, man to man, and man and his environment is the source of prosperity, peace and happiness to human life. See, Article 1, paragraph 6 Bali Provincial Regulation No. 16/ 2009 of the Regional Spatial Plan of Bali Province Year 2009-2029.

[6] Protected areas are defined area with the main function to protect the environmental sustainability that include natural resources and natural resources. See, Article 1, paragraph 26 Bali Provincial Regulation No. 16/ 2009 of the Regional Spatial Plan of Bali Province Year 2009-2029

[7] Cultivation area is an area that is defined with the main function to be cultivated, on the basis of the condition and potential of natural resources, human resources, and artificial resources. See, Article 1, paragraph 27 Bali Provincial Regulation No. 16/ 2009 of the Regional Spatial Plan of Bali Province Year 2009-2029

[8] *Sad Kertih* contained in the MPU Kuturan ejection mentioned that Bali as *Padma Bhuwana*, the center of the world, everything is geared in Bali in order to achieve the welfare of all life; *mokhsartam jagatdhita ya ca iti dharma*, in arranging the Bali, which limited Balinese human obedience is required of the importance of preserving the environment that sustain life by implementing the six components *Sad Kertih*. See, Article 1, paragraph 65 Bali Provincial Regulation No. 16/ 2009 of Regional Spatial Plan Bali Province Year 2009-2029

preserved in order to achieve happiness inwardly and outwardly which consists of *atma kertih*[9], *wana kertih*[10], *danu kertih*[11], *segara kertih*[12], *jana kertih*[13], dan *jagat kertih*[14].
Local wisdom is expressed in the form of Bali Provincial Regulation No. 16 / 2009 of Spatial Planning Bali Province from 2009 to 2029, to be used as agricultural designation area covering 298.214 hectares (two hundred and ninety-eight thousand two hundred and fourteen hectares) or 52, 9% (fifty-two comma nine percent) of the area of Bali Provincial, which is implemented through[15]:

1. The development of a master plan development of agriculture;
2. mapping of potential agricultural land;
3. the strengthening of management *Subak*[16];
4. The development of research and development of superior commodities planting pattern systems capable of adapting to climate change conditions;
5. strengthening of the irrigation network services;
6. prevention and limitation of irrigated rice land conversion;
7. The gradual development of organic farming systems throughout the region district / city;
8. The determination of target achievement of sustainable food agriculture land area of at least 90% (ninety percent) of the total land area since enactment this Regional Regulation;
9. development areas of agricultural production centers through integrated agribusiness system integrated with development agropolitan Area; and
10. integration of the agricultural sector development policies with tourism.

[9] *Atma Kertih* is the soul and the spirit that should be preserved by making the arrangement order of religious life in Bali through facility maintenance holy places, *parhyangan* or temple which is mostly used as a religious rite, and developed as well as religious education center equipped with facilities and infrastructure.

[10] Wana Kertih are vegetation and all its contents are realized in the form of forests, which must be preserved to build the *Alas Angker* temple in each forest, to maintain forest *niskala* (spiritual).

[11] Kertih Danu is the sanctity of water resources, which must be preserved by prohibiting polluting water sources such as spit, urinate, defecate, take out the trash, and remove toxic substances.

[12] Segara Kertih is the sea or ocean as a natural source of all the melting point of turbidity, which must be preserved by not doing the pollution and destruction of coastal and marine environment as well as keeping the values of sanctity and beauty.

[13] Jana Kertih is human resources, both individually and collectively, to be built by improving the quality Balinese that are reliable and high competitiveness to maintain continuity and regularity development of Bali.

[14]Jagat Kertih social Balinese culture is integrated in the environment Desa pakraman (traditional village) that must be preserved by maintaining harmony in social and cultural life is dynamic. In this village built a system of harmony between human relations and *Ida Hyang Widhi* (God) with sradha and bhakti, the relationship between man and his fellow by mutual devotion *'paras-paros sarpanaya salumlum sebayantaka* ', the relationship between humans and the environment based on the love. This relationship is a reciprocal relationship called *Chakras Yadnya*. In *Bhagawagitha* mentioned relationship will cause a social atmosphere that ensures everyone can run its each of *Swadharma*.

[15] Article 60, paragraph 3 Bali Provincial Regulation No. 16/ 2009 of Spatial Planning Bali Province Year 2009-2029

[16] *Subak* is a farmer organization wetlands that receive irrigation water from a common source, having one or more *Bedugul* tample (to worship the Goddess Sri, a manifestation of God as the Goddess of Fertility), as well as having the freedom to set own domestic as well as in relation to outsiders, seeI Gede Pitana. 1993. *Subak sistem Irigasi Tradisional di Bali Sebuah Canang Sari.*Upada Sastra, Denpasar

Food crops cultivation area in Bali are in all regencies / cities covering 76 337 ha (seventy six thousand three hundred thirty heading hectares) or 13.5% (thirteen comma five percent) of the area of Bali Provincial, which is implemented through[17]:

1. The use of all lands that have received water (irrigation) but has not been utilized as a wetland, particularly in the area of Tabanan, Badung, Gianyar, Jembrana and Buleleng;
2. Optimizing the productivity of paddy fields that already exist through intensification program in all districts / cities;
3. Strengthening irrigation network services;
4. Prevention and prohibition of conversion of irrigated land;
5. Determination of sustainable food agricultural area of at least 90% of the land area of food crops that are outside the needs land conversion food crop agriculture for public facilities; and
6. Development of the expansion of organic farming areas wetlands gradually on each *Subak* and the village to its potential.

Role of Customary Law Bali in Controlling Land Conversion Function in Bali

The terms of customary law is a translation of the term (language) Dutch "*Adat Recht*" which was originally proposed by Christian Snouck Hurgronje that in his book entitled "*De Atjehers*"[18], stated that[19]:

> "Customary law is customary to have sanctions, while custom that has no sanction is a normative habits, habits that manifest as the behavior and prevail in society. In the reality between customary laws with customs that limit is not clear. "

Then according Soerjono Soekanto, stating that customary law is "customary law is essentially the common law, meaning habits have legal effect. A habit which is the customary law is an act that is repeated in the same form"[20]. And Customary law in Bali based on cultural values containing elements of magical-religious.

Bali terms of customary law was introduced around 1932 by V. E. Korn in his book *Het Adatrecht van Bali* [21]. Customary Law in Bali known as shape of *Awig Awig*[22]. *Awig-awig* itself comes from the word meaning *wig* damaged, while *awig* means no damaged or well. Characteristics that can be seen from *awig awig* is:

[17] Article 61, paragraph 2 Bali Provincial Regulation No. 16/ 2009 of Spatial Planning Bali Province Year 2009-2029

[18] Tolib Setiady,2013, *Intisari Hukum Adat Indonesia,* Alfabeta, Bandung, h. 3

[19] *Ibid,* h. 8

[20] *Ibid,h 16*

[21]I Gede Parimartha, 2009, *Memahami Desa Adat, Desa Dinas, dan Desa Pakraman,* Suatu Tinjauan Historis-Kritis), dalam Pemikiran Kritis Guru Besar Universitas Udayana, Bidang sastra dan Budaya, Denpasar

[22] *Awig-awig* adalah aturan yang dibuat oleh krama desa pakraman atau krama pakraman yang dipakai sebagai pedoman dalam pelaksanaan *Tri Hita Karana* sesuai dengan desa *mewacara dharma* agama di desa *pakraman/banjar pakraman* masing-masing Pasal 1 ayat 11 Perda Daerah Provinsi Bali No. 3 Tahun 2001 tentang Desa Pakraman

- Characteristically religious social, because *awig awig* in *Pakraman* not only regulate the issue of social life but also regulate the life of the universe. So *awig-awig* not only result in sanction *sekala* (birth) well as sanctions *niskala* (spiritual).
- Characteristically concrete and clear meaning here customary law contains a principle which is too concrete, tangible, clear, and be flexible.
- Dynamic, customary law grows and develops in the community, so it must be a dynamic follow changes in society and the changing times.
- Characteristically togetherness or communal. In the preferred application of customary law is a balance in the life of the Balinese people, the goal is peace to be concerned with a sense of brotherhood and kinship.

Awig awig based on local wisdom of *Tri Hita Karana*, which in the implementation of *awig awig* held by the customary villagers or known *Pakraman*. Covarrubias[23] wrote that the traditional village of Bali (Balinese village) is a community that meets the needs of his own, independent, a small republic, governed by a representative body of the village. Each member of the village (village manners), have the right and the same obligations. Here, the village has a sacred place namely: *pura* (temple) desa[24], *pura* (temple) *puseh*[25] dan *pura* (temple) *dalem*[26]. Traditional village or *Pakraman* has the following tasks [27]:

1. Create *awig-awig*.
2. organize *krama desa*[28].
3. organize management assets of the village.
4. Together with the government to implement development in all sectors, especially in the sectors of religion, culture, and society.
5. Maintaining and developing cultural values Bali in order to enrich, preserve and develop national culture in general and regional culture in particular, is based on "*paras-paros, sagilik-saguluk, salulungsabayantaka*" (parley-*mufakat*).

[23] Miguel Covarrubias, 1950. *Island of Bali*. Alfred A. Knopf, New York, USA, h. 58

[24] This temple is called by the name of the village temple because the temple is commonly placed in the center of the village is on one corner of *catuspata* (intersection). Pura village became a center of activity for the benefit of the village ceremony, *Pura Desa* also referred to by the name *Bale Agung temple* . This name may be taken from the name of *Bale Agung* building located on the first page of the temple. See I Gusti Gde Ardana, 2000, *Babad Bali, Pura Kahyangan Tiga (Bagian 2)*. Available at http://www.babadbali.com/pura/pura-kahyangan-tiga-2.htm. accessible at 27 May 2015

[25] *Puseh* word is derived from the word meaning *puser* center. The central word here implies a welfare center in the world that bring prosperity and happiness to mankind, so that the ceremonies associated with fertility world held in *Puseh.*Ibid

[26] *Dalem* word literally means far or difficult to achieve. So called because in reality God *Siwa* is difficult to achieve by man because he is *niskala* (spiritual). Ibid

[27] Article 5 Bali Provincial Regulation No. 3 of 2001 of *Pakraman*

[28] *krama desa* is Village manners are those who occupy *Pakraman* area or elsewhere who became citizens *Pakraman* see Article 1, paragraph 6. Bali Provincial Regulation No. 3 of 2001 on *Pakraman*

6. Protects *krama desa*.

In addition to the task, the traditional village or *Pakraman* has the authority, as follows:

1. Complete disputes the customary and religion in its territory while fostering harmony and tolerance between village manners in accordance with *awig awig* and local customs.
2. Participate and determine every decision in the implementation of existing development in the region, especially with regard to the *Tri Hita Karana*.
3. legal acts inside and outside *Pakraman*

In relation to the control of land use related to food security role of customary law would be extremely helpful in Bali, due to the existence of customary law and indigenous peoples are highly regarded and respected in Bali, but it is currently the role of customary law currently in control of the land has not been maximized , but if the role of customary law and indigenous peoples reinforced, of course, will have an impact on the level of control the amount of land conversion or redemption of the level of productive land, especially paddy fields, as is the case when seen in *awig awig* of *Subak Gede Pulaga-Kumba*, which mentions[29]:

> *Sape sire sane ngadol utawi numbas carik ring wewidangan subak Pulagan- Kumba patut:*
>
> 1. *Mesadok ring prajuru subak utawi Pekaseh Gede*
> 2. *Patut nginutin sepopa-pali pemargin Subak Gede Pulagan-Kumba sane sampun memargi*
> 3. *Yening wenten salah sinungil carik krama Subak Gede Pulagan-Kumba magentos wiguna ayahan lan pola-pali ring kahyangan mangda kasungkemin*
>
> This means:
>
> Anyone who sell or buy paddy fields in the *Subak Gede Pulagan-Kumba* shall:
>
> 1. Reporting to *prajuru* (administrators) or *pekaseh* (chairman) Gede
> 2. Obey the rules that have been agreed *Subak Gede Pulagan-Kumba* which has been running
> 3. If there is one of the land owners of manners *Subak Gede Pulagan-Kumba* converted required to have obligation in accordance with the rules in *Khayangan* (temple) in order to be implemented

So it can be seen that *awig awig* of *Subak Gede Pulaga-Kumba* as a form of control over the land by means of any form of reporting in the case of land transactions, then the policy if the land is transferred, and the agreement of members of *Subak*, and of course there is an obligation which must be met by the landlord if about to sell, or transfer land functions which are in customary areas or area *Subak* group, with requirements given by *Subak*. Then if it is seen that the presence of 1.432 (one thousand four hundred and thirty-two) *Pakraman*, and the 3.945 (three thousand nine hundred and forty-five) traditional hamlets in Bali, each of the customary village or *Pakraman* and followed by traditional hamlets in Bali then it can save the productive land or paddy fields, by creating or applying customary law and make this well in terms of controlling land conversion, which will of course also resulted in the amount of food produced results.

[29] I Nyoman Darmanta, I Ketut Sudiatmika, I Nyoman Pursika, 2013, *Peranan Subak Pulagan-Kumba Dalam Penanggulangan Alih Fungsi Lahan Pertanian Di Desa Tampaksiring, Kecamatan Tampaksiring, Kabupaten Gianyar, Bali,* Artikel Jurusan Pendidikan Pancasila Dan Kewarganegaraan Fakultas Ilmu Sosial Universitas Pendidikan Ganesha, Singaraja, Bali

Conclusion

Productive land, especially paddy fields have great benefits and functions in improving food in Bali, as well as having enormous benefits in all aspects of Balinese life. So to be able to overcome a shortage of productive land, especially paddy fields in Bali, the government made a policy that is based on the local wisdom that is in Balinese life in which there is a good balance relationship between humans and their environment contained in the *Tri Hita Karana* and *Sad Kertih*, then it should also indigenous peoples' participation in creating and implementing a customary laws relating to the control of land conversion, and in support of government policies and the existence of a mechanism for landowners are not necessarily easy to do a land conversion that will have an impact great for food security in the future.

References

Dinas Pariwisata Daerah Provinsi Bali,2014, Pariwisata Bali Siap Hadapi MEA 2015, Available at: http://www.disparda.baliprov.go.id/id/Pariwisata-Bali-Siap-Hadapi-MEA-2015-, accessible at 12 May 2015

I Gede Parimartha, 2009, *Memahami Desa Adat, Desa Dinas, dan Desa Pakraman*, Suatu Tinjauan Historis-Kritis), dalam Pemikiran Kritis Guru Besar Universitas Udayana, Bidang sastra dan Budaya, Denpasar

I Gede Pitana. 1993. *Subak sistem Irigasi Tradisional di Bali Sebuah Canang Sari*, Upada Sastra, Denpasar

I Gusti Gde Ardana, 2000, *Babad Bali, Pura Kahyangan Tiga (Bagian 2)*. Available at http://www.babadbali.com/pura/pura-kahyangan-tiga-2.htm. accessible at 27 May 2015

I Made Oka Parwata, 2014, *Lahan Pertanian Pangan Berkelanjutan*, http://distanprovinsibali.com/lahan-pertanian-pangan-berkelanjutan/ accessible at 13 Februari 2015

I Nyoman Darmanta, I Ketut Sudiatmika, I Nyoman Pursika, 2013, *Peranan Subak Pulagan-Kumba Dalam Penanggulangan Alih Fungsi Lahan Pertanian Di Desa Tampaksiring, Kecamatan Tampaksiring, Kabupaten Gianyar, Bali*, Artikel Jurusan Pendidikan Pancasila Dan Kewarganegaraan Fakultas Ilmu Sosial Universitas Pendidikan Ganesha, Singaraja, Bali

Iwan Isa, 2004, Strategi *Pengendalian Alih Fungsi Lahan Pertanian*, Badan Pdertanahan Nasional, Jakarta

Miguel Covarrubias, 1950. *Island of Bali*. Alfred A. Knopf, New York, USA

Peraturan Daerah Provinsi Bali No. 3 Tahun 2001 Tentang Desa Pakraman

Peraturan Daerah Provinsi Bali No 16 Tahun 2009 tentang Rencana Tata Ruang Wilayah Provinsi Bali Tahun 2009-2029

Tolib Setiady,2013, *Intisari Hukum Adat Indonesia*, Alfabeta, Bandung

GOVERNMENT POLICIES IN PROTECT THE PRODUCTIVE AGRICULTURAL LAND IN CONNECTION WITH FOOD SECURITY

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Abstract

The use of agricultural land in Indonesia is set in the state constitution Indonesia, which is contained in Article 33 paragraph (3) which is then translated into the various legislations such related Government Regulation No. 12 of 2012 on Agricultural Land Protection Incentives Husbandry, Government Regulation No. 30 Year 2012 on Financing Sustainable Agricultural Land Protection, a legal instrument in supporting the Protection of Agricultural Land for the creation of National Food Security. The existence of such legal instrument on the other hand does not necessarily make the protection of agricultural land to be optimal because on the other hand high over the land in Indonesia has become a reality that is unavoidable at this point. Against this phenomenon with research using empirical juridical research that looks at the phenomenon of law is not only concerned with the formal legal side alone, but also look at the phenomenon of the law on the symptoms that arise in the application of law in society can be seen that the provisions juridical created to achieve resilience food is not matched by the policies of provincial government and district / city that supports the protection of agricultural land. On the basis of economic development and modernization of inconsistency arise Local Government in supporting the food security. Determination of Regional Regulation contrary to the principles of food security, weak law enforcement against violations of land conversion and granting a major factor causing the high conversion of agricultural land.

Keywords: Food Security, Agricultural Land Protection, Government Policy.

I. Introduction

Indonesia is an agricultural country or the majority of the population depend on agriculture, good agricultural fields and wetlands or dry land agriculture or plantations. Besides the agricultural land, including agricultural land is also in the fishing grounds and farms. In today's era of wealth and land is a basic capital in the good life by individuals, groups and nations. In an effort to meet the needs of the life of each individual and the group of land serves as a residence or place of business, either as farmland or plantations, or other businesses that require a land plot.

Land as one component in the formation of a state territory or as the object is not moving in the field of civil law as being unable to move or be moved is located, has a high economic value because its value is always increasing. Its presence is often used as an investment for the future by having or working on it. Once the importance of soil for human makes a lot of problems that then arise. Begins when the perpetakan on the ground in a region or followed granting of land

rights by the authorities to the people, until the transfer of the rights issue on the ground better implemented with positive provisions that already exist or only conducted with customary conditions prevailing in the region.

Included are problems of agricultural land conversion, in essence the government to provide protection to agricultural land proved to tertuangnya protection of agricultural land in the constitution of the Republic of Indonesia in the Constitution of 1945, Article 33 paragraph (3), which essentially states that the Earth, Water and Space controlled by the State and used by the magnitude for the welfare of society. Using this constitution as a legal umbrella to create the rule of law and government policy that applies directly to the public will then be legally required implementing regulations on the basis of the norms that will govern the provision specifically concerning the protection of agricultural land for the realization of food security.

In the development of law in Indonesia appears Law of the Republic of Indonesia Number 5 of 1960 concerning Basic Agrarian, which specifically regulate the issue of Sustainable Agricultural Land protection is the Law of the Republic of Indonesia Number 41 Year 2009, where the Act specifically stipulates agricultural land protection issues sustainable food, which is derived through the Republic of Indonesia Government Regulation No. 12 of 2012 on Agricultural Land Protection Incentives Sustainable and Government Regulation No. 30 of 2012 on Financing Sustainable Agricultural Land Protection, a legal instrument in supporting the Protection of Agricultural Land sake the creation of a National Food Security.

Seeing the fact that we can see the government actually made an effort to protect productive agricultural land for the creation of food security through public policy sector issued by the government, in line with the spirit of the principle of land protection based on customary law, where the concept of customary law, land has an influence outstanding in the preservation of customary law, because the indigenous territorial is agricultural land used by indigenous people to continue their lives as farming and animal husbandry. religio magical side also exists in customary land used as objects that can be passed on to descendants later. Along with the development of human civilization, the human population increasingly growing year, inversely proportional to the availability of land for settlements. it is one of the factors driving the conversion of productive agricultural land, besides the zone change land status issued by the local government.

II. Problems

Based on this it becomes interesting to discuss Consistency Agricultural Land Protection Demi Food Security Through the creation of government policies Using direct observation method to the society in which the rule of law was applied by the community.

III. Discussion

Discussing the issue of farmland protection Protection of agricultural land for the sake of food security can not be separated from government interference in this case as policymakers, both central government and local government. The principle in food security is not apart from the availability of agricultural land as a base for the supply of foodstuffs. The central government

has indeed sought the protection of agricultural land for the sake of national food security which has been proven through the issuance of Government Regulation of the Republic of Indonesia Number 12 of 2012 on Agricultural Land Protection Incentives Sustainable and Government Regulation No. 30 of 2012 on Financing Sustainable Agricultural Land Protection, but in development society, the phenomenon of conversion of agricultural land is very common, factor booster, among others, the need for land settlement, economic pressure and local government policies that provide legal protection for the agricultural land conversion.

Economic Factor

Many people want to have some money in a quick way, do not want to work hard cultivate his farm so came the purchase of agricultural land either with individuals or with residential developers or developer, considering the land has tremendous economic value in the lives of farmers. Most of them claim to tired to keep agricultural land because of the income they get from farm crops hers is not able to make ends meet, of unbalance tillage production costs to the falling value of sales of agricultural products of food that they manage, it is into public complaints of farmers who lamented the lack of attention from the local government in agricultural assistance and control of food prices of agricultural products, so they prefer to sell their farmland to others or developer[30].

Requirement for Residential Land Factor

Every year the number of population growth has increased significantly, as evidenced by the birth rate is growing every year, inversely proportional to the number of deaths each year are not increased. It stretcher is a good thing for the terms of viability in the health sciences but has other impacts such as land clearing for settlement to their residence. Not only because of the high number of births per year that cause the conversion of agricultural land, population distribution factors also play a role in the conversion of agricultural land, for people to be able to say as a resident should inhabit the occupied territories for memetap there, inevitably they will build house for shelter and make sure using existing land, they often use agricultural land to build homes. Examples of cases in transmigration areas, the migrants would open the land to the place they lived before opening the garden soil or moor.

[30] Interview Result with farmer at Cepaka Vilage Tabanan Regency.

Chart 1. Baby Birth Rate[31]

Chart 2. The rate of infant mortality[32]

[31] Angka Kelahiran (Total Fertility Rate, TFR) (diolah), sumber : Statistik Indonesia (BPS) Tahun 2014

[32] *Ibid*

Picture 1. Population Distribution and Transmigration Map[33]

Government Policy Factor

In the government's own policies are overlapping, where indeed the central government has issued Government Regulation of the Republic of Indonesia Number 12 of 2012 on Agricultural Land Protection Incentives Sustainable and Government Regulation No. 30 of 2012 on Financing Sustainable Agricultural Land Protection, which actually is an attempt to give the protection of agricultural land for the creation of national food security, which is a continuation of the Republic Indinesia Act No. 41 of 2009 on the Protection of Agricultural Land Sustainable who all have the same passion to preserve agricultural land for the sake of food security, while the reality in society is still very often going over the agricultural land use legal umbrella of the Regional Regulation both provincial and district / city, as an example for the Badung regency of Bali Province agricultural land conversion given the way through the emergence of Badung District Regulation No. 26 Year 2013 on Spatial Badung that connection refers to Regulation Bali Provincial Government Number 16 Year 2009 on RTR province of Bali in which both these Regulations do not yet have Detail Spatial Subdistrict Plan (RDTRK) so it has not been able to determine a spatial use directives adapted to the carrying capacity of each region - each district[34]. Based on the above, the case looks inconsistencies Local Government in maintaining agricultural land in strengthening food security.

Due to the existing local regulation arrangements regarding changes in agricultural land provided that certain conditions as specified in the regional regulation, but because of Badung has not had Detailed Spatial Plan which is under the authority of the District of Regents and DPRD Badung create a design. In addition, in terms of the relationship of coordination between Bappeda and

[33] Statistics Indonesia (Badan Pusat Statistik Indonesia)

[34] Made Yuni Lestari dkk, *Pengaturan Alih Fungsi Lahan Pertanian Untuk Lahan Permukiman Di Kabupaten Badung,* Research From administrative law Udayana University

BPN associated with the Spatial and rampant conversion of agricultural land in Badung namely coordinating relationships created maps each - each party, Bappeda has maps and spatial BPN has maps of land ownership. Both maps are interrelated and a reference associated with granting permission soil amendments.

In terms of land use change permits the applicant filed a petition to the BPN and then technical considerations land committee conducted a review of the location. If the land petitioned to change the land to non agriculture to construction of private residential houses with an area of 5000 m2 is then given permission change of use of land and if the land applied for the change of use of agricultural land to non-agricultural to housing built by a legal entity or developer with a land area exceeding 1 ha then the permission granted that permission locations. Local Government through SKPD (Local Government Unit) control efforts is through the mechanism of licensing and monitoring efforts is through the actions of monitoring, evaluation and reporting measures. If violations are found in the field by the public, it can be worn disincentives, and if the breach was caused by the Local Government officials who give permission, it can be subject to criminal or disciplinary punishment[35].

If you look at the chronology of the case in the county this naughty look between HR enforcement of rules with the rule itself does not occur kesepamahan, because of the government agency that gives permission for the change of agricultural land into land for settlements.

IV. Conclusions

In essence the government has given guarantees protection of agricultural land through the State Law of the republic of Indonesia Number 41 of 2009 on the Protection of Agricultural Land Husbandry, which is followed by the birth of Government Regulation No. 12 of 2012 on Agricultural Land Protection Incentives Sustainable and Government Regulation No. 30 Year 2012 About Financing Sustainable Agricultural Land Protection, but it can not be denied on the government's efforts to keep agricultural land is still a lot going on agricultural land conversion phenomenon caused by several factors, such as economic factors, the need for housing and government policy itself. May mean that local government policies that permit conversion of agricultural land is a clear evidence that there is inconsistency in government policy on the protection of agricultural land for the sake of food security.

V. Suggestions

So from this we provide input for both central and local government to jointly committed to ensuring that agricultural land for the sake of food security, related to the phenomenon of conversion of agricultural land each year has increased the role of the regional government here is very important in terms of supervision, licensing and prosecution of phenomena agricultural land conversion, by publishing a Local Regulation on the prevention of agricultural land conversion with strict sanctions in case of conversion, both the perpetrators and local government agencies that provide agricultural land conversion permit.

[35] *Ibid*

References

Yuni Lestari, Made dkk, *Pengaturan Alih Fungsi Lahan Pertanian Untuk Lahan Permukiman Di Kabupaten Badung,* Penelitian Bagian hukum Administrasi Universitas Udayana Denpasar

Biro Pusat Statistik, *Angka Kelahiran (Total Fertility Rate, TFR),* Statistik Indonesia (BPS) Tahun 2014

----------, *Angka Kematian Bayi (rate of infant mortality)* Statistik Indonesia (BPS) Tahun 2010

Kelompok Tani Desa Cepaka Kabupaten Tabanan, *wawancara tentang pendorong alih fungsi lahan pertanian*, Bulan Mei 2015

THE INTEGRATED FARMING SYSTEMS PROGRAM FOR DEVELOPMENT AND IMPROVEMENT OF FOOD PRODUCTION IN BALI

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Abstract

The purpose of this study was to determine the development and improvement of food production that are successfully implemented through integrated farming systems program in Bali. This research is a descriptive study. It was conducted on farmer group participants integrated farming systems in 2012. The study found that the activities program integrated farming systems successfully develop and improve crop production, horticulture, cattle farms, fisheries and plantations. Food production program of integrated farming system does not use chemical fertilizers and pesticides. Consequently, it is safe for consumption for human health, food production activities can be done in a sustainable and environmentally safe. For the success of an integrated farming system program, determining the location and the participants of the program should be more selective, especially for the carrying capacity of the biophysical and socio-economic support farmers.

Keywords: food production, integrated farming system.

I. Introduction

Integrated farming systems approach developed in Bali called Simantri program. Simantri program is one of the flagship activities of the Provincial Government of Bali in an effort to increase food production and income as well as reduce the number of poor people in Bali. The complexity of the problem of agricultural development would be required model and a strong commitment to be able to enhance a breakthrough in the field of agricultural development (Irsal, 2002a; 2002b Irsal; and the Departemen Pertanian, 2012), Simantri program emphasizes not only from the aspect of integration of livestock and crops, but also from the aspect integrated crop management (Department Pertanian, 2002).

Agriculture as a driver of economic sectors of society should receive primary attention in efforts to increase food production and farmers' income. The fundamental problem faced by farmers include lack of access to sources of capital, technology and markets. Economic development based on agriculture and rural areas directly or indirectly, will have an impact on reducing poverty. While the concept of rural agribusiness development today is still partial, unfocused and unguarded sustainability.

Conditions and problems that are specific to the development of agricultural businesses in rural areas, among others, (1) the use of land for farming activities where the intensity is not optimal

planting crop reached an average of 240%, it can still be improved if irrigation and capital is guaranteed; (2) the activities of intensive farming has not been implemented so that productivity is still relatively low (yet optimal according to the potential outcome); (3) the limited ability of human resources because there is intensive coaching and mentoring; (4) and conventional livestock farming is still small in scale, as well as feeding livestock production is not proportional so not optimal; (5) animal waste (solid and liquid) have not managed / processed well to fertilizer quality and also for biogas; (6) Waste plants that can be used as animal feed have not managed / processed well into feed quality and shelf life for the needs of the dry season; (7) lack of infrastructure, particularly farm roads, building water conservation and other infrastructure; and (8) not yet developed agricultural processing activities and constraints in marketing the results, especially at harvest time.

Based on the above mentioned problems, the provincial government of Bali, since 2009, launched a program of development of an integrated farming system called Simantri program. It combines agricultural activities in the broad sense in one area according to the potential of the region with diversified business both vertically and horizontally with other related sector support beyond the agricultural sector so as to awaken agribusiness in the area concerned. The purpose of this study was to determine the development and improvement of food production are successfully implemented through Simantri program in Bali.

II. Methods

This research is a descriptive study. The research was conducted in the village / Gapoktan Simantri program participants in 2012 are scattered in 100 villages across Bali, with details of 15 villages in Buleleng, 8 villages in Jembrana district, 15 villages in Tabanan, 5 villages in Badung, 3 villages in Cities Denpasar, 18 villages in Gianyar, 16 villages in Bangli regency, 8 villages in Klungkung and 12 villages in Karangasem. The research location is determined 20% proportional random sampling. Data collected by survey techniques based on the questionnaire. The data is on development activities and an increase in food production that is successfully implemented through an integrated program of agricultural systems (Simantri).

III. Results and Discussion

3.1 Activity Increased Production of Food Crops

Types of activities to increase production of food crops and horticulture were successfully implemented in Simantri program in 2012 include: food crops (sweet corn, composite maize, hybrid maize, peanuts, and soybeans, rice) and horticultural crops (beans, peas, potatoes, peppers and scallion). Figure 1 shows the number of food crop production. Largest food production for hybrid maize produced is reached 1,222 tons, located in 22 villages spread over three districts, namely Buleleng, Bangli and Karangasem, while the lowest soybean production is 3.66 tons, located in two villages each in Klungkung and Karangasem. In the future soybean production is expected to be increased due to the demand of soybean in both local and regional markets is quite high

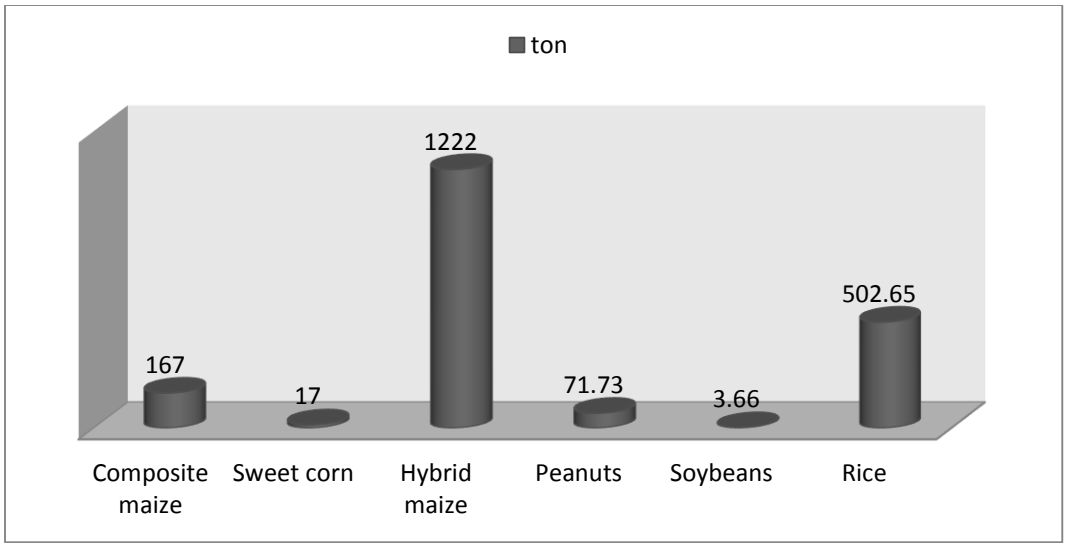

Figure 1
Production of Food Crops

Production of food crops and horticulture are produced using organic farming system, which does not use chemical fertilizers and chemical pesticides. Fertilizers used are organic fertilizer processing result of solid waste (feces) cattle farm that has been developed previously, as well as used biopesticide is the result of processing liquid waste (urine) cow. So that food production and horticulture in the program of integrated farming system is safe for consumption because free of residues of chemicals that are dangerous to human health.

Development of food crops and horticulture with an integrated farming system in addition to produce food products that are healthy and safe for human consumption as well for food crop farming production costs become cheaper, because farmers can reduce the cost of the purchase of fertilizers and pesticides. Farmers have been able to produce fertilizer and biopesticides itself from the cattle, and guaranteed fertilizers will continue to be available on time throughout the year, as a fertilizer factory of cattle farms has never stopped production, the research found the average organic fertilizer produced from each cow every adult day 4-5 kg. So the development of crops with the integrated farming system will continue to grow and sustainable.

3.2 Livestock Development activities

Implementation of the development of the livestock in the program Simantri fiscal year 2012 in the 100 Gapoktan / Village using the Bali provincial government grants amounting to Rp 18,001,846,450.00. Many livestock development is successfully implemented 1,960 tails cows, cattle stud 98 tail, 80 female goat, and the goat 8 tail as seen in Figure 2. And supporting facilities, namely cattle colony cage 98 units, 2 units goat colony cage installations 1 m3 of biogas as many as 100 units. Feed processing building 100 units, compost processing building 100 units, 166 units of water tanks, fermenters 100 units, 2,126 pairs eartag, 2,121 cattle card sheet, sprayer 100 pieces, Crete thrust 5 pieces, 5 pieces shovel and water installations of the unit.

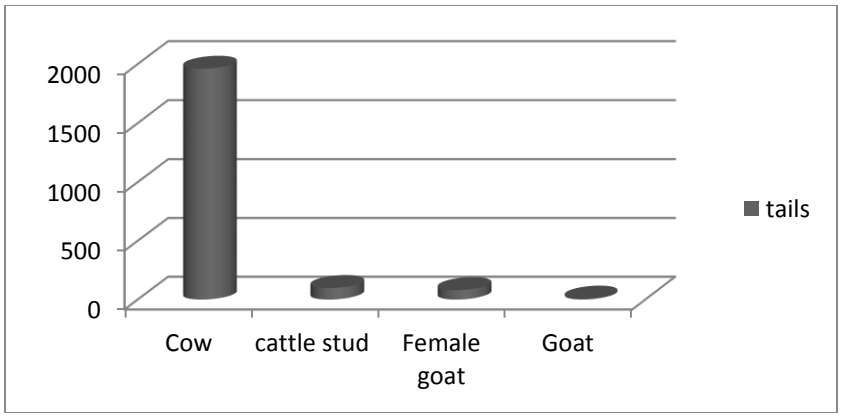

Figure 2
Number of livestock that developed in the Simantri Program in Bali in 2012

Development of cattle in the Simantri program is the development of livestock breeds productive cows that aims to increase the livestock population in the villages / locations as well as to preserve the purity of Bali cattle. Cows kept together in colony cages (Figure 3), home to a colony of population 20-24 cows, built in accordance with the size of the technical specifications of the Department of Animal Husbandry. Help cows given as many as 20 cows per Gapoktan female seeds. Solid waste animal feces and further processed into biogas processed into organic fertilizer in the form of urine while waste water is processed into biourine. Biogas produced can be used to turn on biogas stoves and lamps. While organic fertilizers and biourine generated can be applied to farming activities and plantation crops.

Figure 3
Cows kept together in colony cages

Raising cattle in pens very conducive colony developed in paddy fields at lower altitudes, because the ownership of land by farmers is relatively narrow and the distance a farmer living relatively close, making it very efficient in training, education and development and technology transfer conducted by government personnel assigned companion, feeding, cattle raising, and supervision of livestock carried out jointly, as well as in the processing of livestock waste. However, cattle development program in the area of dry land Simantri scattered in mountainous areas not suitable cows developed in the colony cage system, because the farmers live far from each other, the average farmer's land is relatively larger than the wetland, so it is more suitable to be developed in individual cages / single.

Distance remote farmer takes time and costs are high, especially in providing livestock feed together in colony cages, the results of the study found farmers using motorcycles to transport feed cows to the stable colony since a considerable distance from where she lived. And it is done every day so that no additional costs incurred for the maintenance of cattle together in colony cages, so many farmers do not utilize colony cages which have been provided by the government and choose to bring cows into individual cages in farmers' fields respectively.

Cattle development using concrete-floored cage specifications, enabling farmers to clean stables, cattle raising, and facilitate farmers to better accommodate the solid waste such as feces and liquid waste in the form of cow urine. The study found the impact of the use of concrete floored cage colony, when cows give birth to many calves are born dead, due to hit the concrete floor, and found also calves suffered broken bones due to hit the concrete, therefore, when the cows that give birth soon be moved from colony cage, and the cage is placed on a single / individual with no specification of concrete floors, wider space so that the cows are born free to move and collide with a concrete risk can be avoided.

The implementation of the Simantri program at the location farmer distance is too far away and had to use the tool in transportation to the colony cage, animal waste either feces, urine and supporting facilities such as biogas installations, biourine may not work as expected from the Simantri program. Therefore, the development of cows with the colony cage system needs to be selectively carried out in accordance with the conditions and potential of their respective regions, as well as in determining farmers Simantri Program participants need to be done selectively. Because it found some Simantri Program participants do not have agricultural land that crop livestock integration cannot be done well, and biourine organic fertilizer produced from livestock waste cannot be applied to the development and improvement of food production.

Furthermore, the biogas produced at Simantri program cannot be distributed to members of the group optimally, the biogas produced is limited only to the common interest in a cage colony, so that in the future to think about how to distribute biogas technique to group members for example to make the packaging easy biogas shelter brought home by each member of the group. Stoves that use biogas as an energy source makes the stove burner stove easily damaged so that the furnace needs to be modified by using steel, furnace stoves thus more robust and durable.

For the success of the Simantri program in the future, before determining the location and participants need to be verified on the carrying capacity of the biophysical and socio-economic support farmers. Biophysical carrying capacity that needs to be verified is Climate Based on climate data can be determined the time of planting or Simantri program implementation, the potential of the plant, can determine the most profitable crops to increase farmers' income, the potential of the feed to obtain a specific feed source potential of the research sites, so as to prepared animal feed rations (cattle, goats, pigs, etc.) are inexpensive, carrying capacity, to determine suitability with forage production capacity at each location Simantri program.

Socio-economic support farmers need to be verified is the attitude and knowledge of farmers to Simantri program, attitudes and knowledge, farmers on Simantri program includes an assessment of the level of satisfaction and Simantri program and aspects of knowledge especially

emphasized in cognitive mastery against Simantri program development, human resources potential, especially emphasis on the availability of the amount of productive labor, diversification of livelihoods and the distribution of the allocation of working time, tradition and work habits of the population. Institutional potential of farmers. Potential institutional emphasized primarily on the existence of form and function as well as the institutional activities of farmers.

Goat types developed in the Simantri program is the kind Ettawah. Type ettawah has several advantages able to produce better (milk and children). Expected with the development of goat ettawah able to meet the needs of increasing the availability of mutton and goat population in the province of Bali. Goats development carried out in the Umejero village, Pucak Sari village in Buleleng, Mundeh Kangin village and Karya Sari Village in Tabanan. The fourth locations are considered sufficient potential for the development of goats.

3.3 Fisheries Development Activities

The selected fisheries development is catfish, conducted in 9 villages, namely: 5 villages in Tabanan (Timpag village, Kediri, Nyitdah, Tegal So, and Mekar sari), 2 villages in Gianyar (Manukaya, and Petak Village), 1 village in Klungkung (Village Gelgel). Catfish is a fish that has several features and demanding public. Catfish is more easily maintained and quickly growth, with poor water conditions catfish can still be alive and able to breed. Cultivation method used tarpaulins (Figure 4) as a solution for the narrow land conditions, capital is not too large areas of water minimal.

A short maintenance period only 2.5 - 3 months. Problems faced in the development of catfish on Simantri program is marketing. It is mainly the availability of catfish (size) in accordance with market demand and production continuity, high feed prices to the detriment of farmers. Therefore, marketing is not just rely on traders catfish collectors, and the group is expected to sell directly or members of the group can act as merchant wholesalers, necessary for the development of innovation for the development of alternative feed such as earthworms, termites, snails or slugs.

Figure 4
Catfish farming using tarpaulin pool

3.4 Plantation Crops Development Activities

Plantation species Simantri Program successfully developed the program in 2012 is early coconut, arabica coffee, robusta coffee, nutmeg and cashew located in 93 villages / Gapoktan in detail shown in Table 1. In Table 1 appears most plantation crops can be developed is coconut. A coconut plantation crops much needed community in Bali, in addition to the consumption needs, especially for the needs of the ceremony, almost every activity of religious ceremonies in Bali requires coconut as a complement to the ceremony. Next followed arabica coffee as seen in Figure 5, arabica coffee is the main export commodity plantations sector Bali Province, Arabica coffee exported to Korea, Taiwan Europe and America. Arabica coffee from Bali in great demand in the international market because it has a high quality taste, and is produced without the use of chemical fertilizers and pesticides.

Table 1
Plantation species successfully developed
Simantri Program in Bali in 2012

No	Type Plantations	Volume (tree)	Village/Gapoktan
1	Coconut	45.931	77
2	Arabika coffee	24.470	9
3	Robusta coffee	13.762	7
4	Nutmeg	150	1
5	Cashew	1.500	1

Source: Dinas Pertanian Tanaman Pangan (2012)

Crop plantations developed on Simantri program without using chemical fertilizers and pesticides. Fertilizers and pesticides used are organic fertilizers and biopesticides result of processing solid waste (feces) and liquid waste (urine) from cows that have been developed previously. So that the resulting production of plantation crops are safe for consumption without containing residues of chemicals that are harmful to human health. Crop plantations developed on Simantri Program is also safe for the environment and farming activities can be carried out in a sustainable manner, because of the factors of production used continuously available at the location of farming activities without dependence on outside parties.

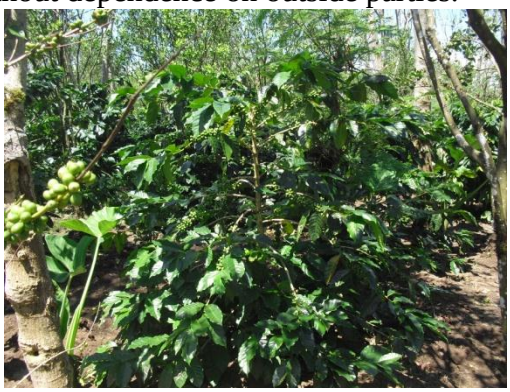

Figure 5
Arabica coffee export mainstay of the plantation sector
Province of Bali

IV. Conclusion

Based on the results of research and discussion, it can be concluded as follows.

1. Activities integrated farming systems program (Simantri) successfully develop and improve crop production, horticulture, cattle farms, plantations and fisheries
2. Production of food produced Simantri program without using chemical fertilizers and pesticides, so it is safe for consumption for human health
3. Activities Simantri Program food production can be done in a sustainable and safe for the environment
4. Determining the location and program participants must be made more selective, especially for carrying biophysical and socio-economic support farmers for a successful Simantri program.

References

Departemen Pertanian, 2002. *Panduan Teknis. Sistem Integrasi Padi-Ternak*. Badan Penelitian dan Pengembangan Pertanian. Departemen Pertanian.

Dinas Pertanian Tanaman Pangan, 2012. Laporan Pelaksanaan Kegiatan Simantri Tahun 2012 di Provinsi Bali. Dinas Pertanian Tanaman Pangan Pemerintah Provinsi Bali

Irsal Las, 2002a. *Panduan Teknis Pengembangan Pengelolaan Tanaman dan Sumberdaya Terpau (PTT).Kegiatan Pengembangan Produktivitas Padi Terpadu (KP3T).* Hand out pertemuan tim pengawal teknologi Proyek P3T. Badan Litbang Pertanian.

Irsal Las, 2002b. Alternatif Inovasi Teknologi Peningkatan Produktivitas dan Daya Saing Padi. Hand out pertemuan tim pengawal teknologi Proyek P3T. Badan Litbang Pertanian.

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LOCAL INSTITUTION'S ENGAGEMENT THROUGH DIVERSIFICATION OF PRODUCT

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Abstract

The important strategy for the existence of small enterprises in Bali is product diversification. This strategy will drive to the power of market which is make the stabilization of price, supply and demand of the community production. The stabilization of price in market also very important to manage, to make the product of the small enterprise have more power to compete with other product in market price. In Bali, specially for Hindus community almost all of the daily life have to do offering . On the other hand all of the offering preparation need money expenditure. The offering almost contain of many kinds of cake, and other element, that costly expensive. More over the community must have other way to full fill all of the offering cost, further more one of the strategy is through the product diversification. The community development program (IbM) that funded by Directorate General of Higher Education in Samsaman Kaja village have already created the diversification program of offering group such as Prashita Shanti and Mekar Sari.Through this program now a days the two of group can make many kinds of offering and also all of the element such as cakes, and many others. The training and the assistance create the group more powerful to face the market prices.

Key words: Small enterprise, Community development, product diversification, management of production

I. Intorduction

Small and Medium Enterprises (SMEs) have proven because they can exist when the economic crisis that hit some developing countries and developed countries in the last five years . One factor that colaborateborate is the presence of these SMEs because this business is based on people's economy so that it has the flexibility to changes in the global economy . Despite the fact that small and medium enterprises is still often overlooked by the government as well as in Bali Province, including Tabananregency, especially in West Selemadeg district. Number of small industries and cottage industries in Tabanan reach 5,600 recorded in the Department of Industry and Trade (2010). However, this sum is believed to be much less than the reality on the ground. This is because there are many small industries and cottage industries which have not been recorded, and grow more in the countryside. From the observations made by the team in the site reseach villages Selemadeg West in District, Tabanan Regency turns out there are many groups of women who seek domestic industry with technology and management are still very modest. This study is targeted to two partners and Mekar Sari Enterprise and.Prahita Santi enterprise who seek households to own industry economic value that can be developed namely the production of various types of cakes or snacks as supplementary material offerings for Hindus in Bali.

The two interprises product cakes or snacks for offerings (Hindu Bali residents call it " Banten)") they also product many kinds of trays from bamboos as complementary offerings to those very economic value that can be used as a work area by the majority of mothers in the village farmers. The Basic material "offerings" is much needed by all Hindus to various types of religious ceremonies, where religious ceremonies are not familiar with the season, but will conduct throughout the year with varying intensity. From these situastion the products equipment of offerings in the form of cakes or snacks offerings and other religious ceremonies fixtures provide business opportunities and guaranteed good business to be sustainable. More over, this effort will provide business benefits when managed by skilled and always follow consumer demand.

The production process has been done by the group (offerings group) is usually seasonal , with sales from house to house and still the local level . Product manufacturing technology is still very simple, including packaging. These groups consist of several women who have skills in making cake for the purposes of offerings. Because as we know Bali is inseparable from the ceremony, so the actual need for snack offerings will occur continuously. However, because these groups do not yet have good management, so often there is a shortage of products in moments of the ceremony.

On the other hand there will be excess product during the ceremony interval is reduced . From field observations known to the problems faced practiced by partners are as follows : UD . Mekar Sari since three years ago has increased the order, but has not been able to be fulfilled, whereas UD. Mekar Sari only one domestic industry that make snack offerings in these locations. UD. Prasita Shanti own special customers for the manufacture of snacks and offerings, but still could not save the stock. This is because not have the ability in good packaging techniques revenues both partners is still very dependent on product orders. SME partners need assistant in management skill in order to operate the business.

II. Materials and Methods

2.1. Location Research and object of research

Research in places on UD.Mekar Sari which is located in the village of Bengkel Sari and UD.Prasita Santhi which is located in the hamlet Samsaman angkah Kaja village, District West Selemadeg, with the object of research Tabanan product diversification and empowerment of women.

2.2. Focus Group Discussion (FGD)

One method used in the implementation of science and technology program for the community (IBM) by: dividing the members into two groups of SME partners during the training given relates to the problems encountered. The material which is the focus of discussion include a variety of techniques to create cake or snack. Technical for "offerings" preparation that is due to the Hindu Bali belief. In this training practices implemented immediately for example constructing various kinds of cakes or snacks besides also by way of Generating speakersor instructors who are experts in the field of "offerings". On the implementation of management

training use such as daily cash book example, book sales and book purchases. implementation of management training use such as daily cash book example, book sales and book purchases.

2.3. Partisipation Research Action (PRA)

The other method used in implementing research by involving all members directly in workshops or facilitation to practice the whole process of making "offerings" andcake , including the workshop various techniques of management effort.

2.4. With the method of FGD and PRA

Then direct the data collection can be done by observation, interviews and discussions with members of the group

2.5. Data analysis technique

Used was qualitative descriptive analysis techniques , and comparative descriptive is by way of explaining the various solutions with qualitative approaches and menjelaksan with mebuat comparison between productivity before this program implemented.

III. Result and Discussion

a. Research result

Table 1. Small Entreprise Profile

No	Description	Mekar Sari Group	Prasita Shanti Group	Additional
1	Member's	20 person	11 person	
2	Kind of Product	Traditional cake	Traditional cake	
3	Variant of product	Offering	Offering	
4	Name of product	*sirat, rengginang, uli, nagasari, semar mendem*	*sirat, rengginang, sesajen, uli, kembang goyang*	
5	Omzet	Rp. 8.000.000,-	Rp. 10.000.000,-	The omzet is very frluctatif depend on the intencity of ceremony

Sumber:. Mekar Sari and Prasita Shanti Group

3.2. Disscussion

All members of the group were women which also have role as housewife in the village. Being a member of a group that later formed the trading business is a sideline activity. Field work done is produce various kinds of snacks to complement the offerings or "offerings" for Hindus of Bali. Members of the group SME partners also produce various kinds of "offerings" or various ornaments offerings.

Besides make a traditional cake the group also produced many thing of offering that must still be guided by the rules contained in the teachings of Hindu Bali. Proses group work is done with the participation of the system, meaning that every member of the group can produce various kinds of snacks and ornaments "offerings" and then deposited into their products UD.Mekar Sari and UD.Prasita Santhi, and the production process is done on the basis of orders. Because the production process on the basis of the order there will be fluctuations in earnings. Income members will increase when Hindus celebrate temple ceremony.

While among the snack products are also manufactured ornaments "offerings" No one can survive for a long time so that it can be produced continuously. To strengthen and improve the knowledge of members in making the snack, that whay IbM team training make snack / cake by bringing instructur who are experts in making snacks. Kind of snack made: *Jajan sirat, rengginang* snack, snack *uli*, *nagasari, semar mendem.* Besides training makes no allowance was also held training packaging. IbM team that has made plastic packaging label content production so in terms of marketing then the diversification of production, so that production of each business group is increasingly recognized by the public. An effective way to introduce the product snack each partner SMEs has been facilitated by the team IbM to participate in exhibitions at district level and the level Kabupaten Pemberdayaan female member of the group of SMEs carried out by implementing partners are also assisting efforts to ensure the sustainability of the members.

For products " offerings " or offerings can be used immediately in addition there is also Part of ornament offerings " jejahitan " also can be made to be sold in the long term, it means there are a variety of offerings ornaments can be stored until came the order. To avoid mistakes made product offerings, the team IbM give the assistance to all members of the SME partners on how or techniques to create the right offerings by bringing in instructors who are experts and understand every meaning of offerings so that for each member going on perception and how to make offerings for Hindus. In the implementation of this training partner SME members are given assistance in the form of all ornaments trinkets offerings including equipment that can support the creation of offerings. The most important in this training is that every member is given a module that contains the procedure for making the right offerings.

From the observation of the activity of SMEs in marketing or sales partners in mind that the average income ranges between Rp.8.000.000 SME partners , - a / d Rp . 10.000.000 , - per year . Even though relatively small in number but the result is quite meaningful for members of partner SMEs because of perceived as an additional income for their families o increase knowledge of

SME members in the financial field , the team IbM provide training in simple book keeping so that the members can know for sure whether the business can be profitable or even loss . The main emphasis in training in finance is a member taught in theory and practice how to record all costs and revenues in the production cycle so that by comparing the records of cost and revenue records will evaluate the level of profit or even the level of losses incurred. Props used are : daily cash book and a book sale .

IV. Summary

a. Group members, Mekar Sari and Prasita Shanti get the right knowledge and technology of processing offering pocket , a better understanding of the meaning -making " offerings " (offerings) based on the guidelines of *Parisada Hindu Dharma Indonesia* (PHDI) and not based on the habitual local customs. The whole process has been documented in the form of modules .
b. Th partner knowledge in the field of business management increases include: financial management techniques (able to make cash books and book sales) . Capable of calculating gains or losses of business and marketing management techniques (Each group was given assistance in making the Cash Book , Book Sales and Business Management Training Module) .

References

Husnan, S. 2002. *Manajemen Keuangan.* BPFE. Yogyakarta

Sudarsana, IB. 2010. *Kumpulan Tetandingan Upakara Yadnya.*

POTENTIAL OF SIMPLE CARBOHYDRATES TABAH BAMBOO SHOOTS FLOUR (Gigantochloa nigrociliata BUSE-KURZ) AS PREBIOTIK

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Abstract

Tabah bamboo shoots (Gigantochloa nigrociliata BUSE-KURZ) is one of the local varieties of bamboo shoots commonly consumed and has a lot of nutritional content. The aims of this research are (1) to identify the components of corbohydratestabah bamboo shoots flours and (2) determine the potential prebiotic tabah bamboo shoots flours. This research consistedof three stages: to identify the components of carbohydrates with High Performance Liquid Chromatography (HPLC) and prebiotic in vitro testing. The experimental design used was a single-factor randomized block design (RBD). The results showed components of carbohydrates content of 0.45% glucose (db), 0.39% fructose (db), 4.55% raffinose (db),0.35% sucrose (db) and 0.04% galactose (db). The content of simple carbohydrates in the flour has a tabah bamboo shoots can be a prebiotic. Components of carbohydrates in the tabah bamboo shoots flour presented descriptive. BAL can grow well and show that the tabah bamboo shoots flour has potential as a prebiotic. The growth of L. acidophilus, L. brevis, L. casei rhamnosus highest at the apical and the middle 2.8 x 10^{10} – 5.8 x 10^{10}CFU/ml. Bifidobacterium bifidum highest at the basal 3.6 x 10^{10}- 3.7 x 10^{10} CFU/ml.

Keywords: tabah bamboo shoots flour, carbohydrates, prebiotics, in vitro

I. Introduction

The community later it has been much aware of information that a function food not only can fulfill the nutritional needs of the body, but is expected can also provide benefits to health. The changing lifestyle characterized by the community became much understand it really in maintaining health through the functional consume food. Functional food products that many have developed among others of foods containing probiotics, prebiotik, sinbiotik and fibers.

Prebiotik is food materials that could not be digested but having the beneficial effect the host through stimulation selectively against growth and / or the activity of one or a number of limited bacteria in the colon, so as to increase the health of the host (Manning and Gibson, 2004). Prebiotik most frequently used is a substrate carbohydrates, for example, fruktooligosakarida,

galaktooligosakarida, inulin, lactose, and oligosakarida. In general, prebiotik classified as of fibers that is soluble, who had a distinctive nature that cannot be digested (Roberfroid, 2002).

Tabah bamboo shoots (*Gigantochloa nigrociliata* kurz) is one of the varieties of bamboo shoots local ordinary consumed and community popular (Putra, 2009). Tabah bamboo shoots having protein 2,29%, carbohydrates 1,53%, fat 0,22%, fiber 3,14%, vitamin C 4,65mg (Shi and Yang, 1992 in Kencana, 2009). Tabah bamboo shoots potentially processed into various kinds of processed food and flour. Tabah bamboo shoots processing into flour is expected to simplify in the application of the community as an ingredient of the substitution of a variety of food products.

Thammawong (2009) Research, known to the content of sucrose, glucose and fructose in bamboo shoot different during storage. Differences of sucrose content, glucose and fructose is found in every part of the bamboo shoots (*Phyllostachys pubescens* Mazel) which is divided into four parts of the end to the base of each the size of 2 to 3 cm.

So far there has not been a complete information on the utilization of flour tabah bamboo shoots as prebiotik to stimulate the growth of bacteria lactic acid bacteria. Saw it was necessary further studies about potential flour tabah bamboo shoot covering analysis of the carbohydrate component authors and testing prebiotik in invitro, so obtained a complete information about the potential of flour tabah bamboo shoots as prebiotic.

II. Problem Statement and Research Questions

2.1 Problem Statement

1. The constituent components of what is contained on starchy carbohydrates tabah bamboo shoots every different parts (apical, middle and basal) ?
2. If flour tabah bamboo shoots every different parts (apical, middle and basal) potentially as prebiotik ?

2.2 Research Aims

1. Undertook the identification of the constituent components carbohydrates flour tabah bamboo shoots every different parts (apical, middle and basal).
2. Examine the potential prebiotik flour tabah bamboo shoots every different parts (apical, middle and basal) in vitro.

2.3 Benefits of Research

Tabah bamboo shoots known containing carbohydrates with the research is expected can be obtained information on the content of the constituent components of carbohydrates flour tabah bamboo shoots and the potential prebiotik flour tabah bamboo shoots so that information obtained can be used as a base that supports that flour tabah bamboo shoots as prebiotik have the potential.

III. Material and Methods

3.1 Material

The main ingredient that is used is tabah bamboo shoots obtained from the farmers woman bamboo shoots Padangan village, Pupuan, Tabanan, Bali. Bamboo shoots that is used with criteria : the color of the skin bamboo shoots before shelled bright yellow, 15-20 cm long, bamboo shoots after shelled and obtained the edible part of white ones bright afterwards cut into three parts (apical, middle and at the basal). The culture of lactic acid bacteria (BAL) that is used is *Lactobacillus acidophilus, L. casei subsp. Rhamnosus, L. brevis, bifidobacterium bifidum* and obtained from PAU Gadjah Mada University.

3.2 Statistical Analysis

Analysis was conducted using data obtained by statistical social sciences (SPSS) 16, ANOVA (variance method of analysis) and further test the first trust 0.05 duncan .

3.3 Research Procedures

3.3.1 Tabah Bamboo Shoot Flour making

Washed and peeled bamboo shoot, continued with the division of rebung (into three parts apical, middle and at the basal,) sliced thin 0,1 cm, steamed bamboo shoots 5-10 minutes, dried with temperature oven 50^{o}C on for 12 hours. A wedge bamboo shoots dry ground, sifted 60 mesh so obtained flour bamboo shoots .

3.3.2 The Analysis of the Carbohydrates Tabah Bamboo Shoots

Analysis of the carbohydrate component authors simple tabah bamboo shoots flour with the high performance of liquid chromatography (HPLC) according to AOAC (1998). A column that is used is the type of column metacharb 87C with a detector refractive index (RID), flow rate (FR) 0,6 ml/minute. Phases of the motion that is used is H2O with the temperature a column 85^{o}C. The volume of injection sample is 25µl. standard of sugar used is rafinosa, sucrose, glucose of galactose and fructose. Any peak shows one kind of components sugar. Time retention (RT) of every other component sugar compared with standard time retention sugar. The retention of time that is almost the same indicates the type of components an estimated same.

3.3.3 Potential Prebiotik Tabah Bamboo Shoots Flour Testing

Media MRSB modification (MRSB-m) made with formulations (g/100ml): peptone protease 1 g, meat extract 0,8 g, yeast extract 0,5 g, $K_2HPO_4.3H_2O$ 0,2 g, tween 80 0,1 g, sodium acetate 0,5 g, ammonium citrate 0,2 g, $MgSO_4.7H_2O$ 0.02 g, $MnSO_4.4H_2O$ 0,005 g and tabah bamboo shoots 2g.

Lactic acid bacteria is used lactobacillus acidopilus, *L*. Subsp *casei*. Rhamnosus, *L. brevis*, and *bifidobacterium bifidum*. Growing media (MRSB-m) where the components of sugars replaced by tabah bamboo shoots flour. Control without MRSB used is that while standard component of the sugar glucose sugar is used .

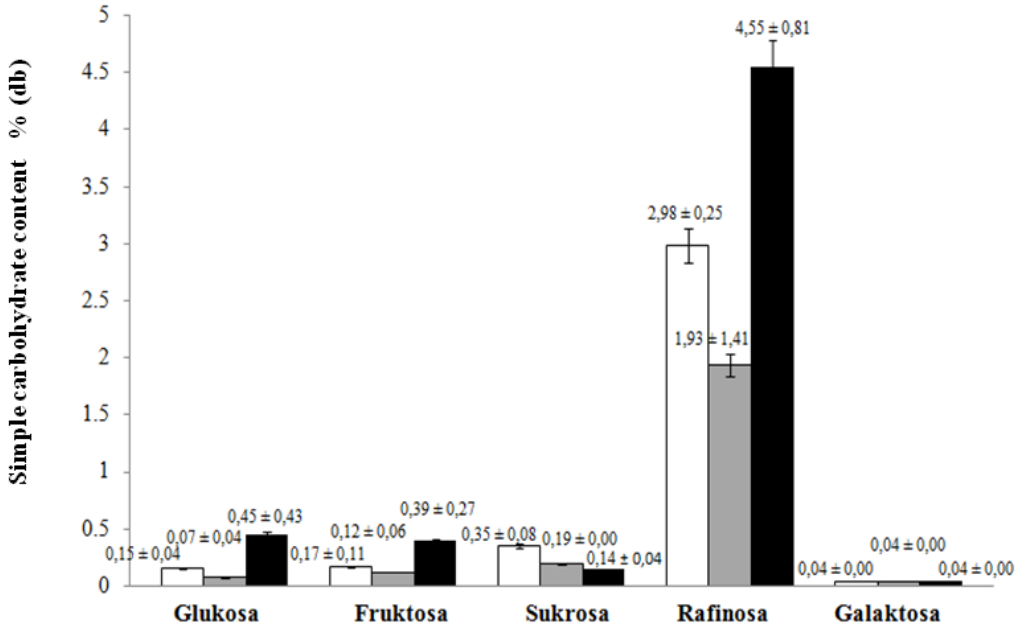
The number of BAL according to calculations AOAC (1999). A suspension of the sample in a solution of physiological NaCl 0,85% (dilution 10^{-1}) 0,1 ml and put into 0,9 ml solution physiological NaCl 0,85% 10^{-2} dilution so obtained, then with the same way made dilution 10^{-3}, 10^{-4} and so on until the level of dilution 10^{-8} (expected the results obtained between 25-250 colony) for plating.

Calculation of BAL done with the methods spread. A petri dish containing sterile grown 0,1 ml MRSA atau 100 µl suspension of the dilution 10^{-6} sample, 10^{-8} and 10^{-7}, at a temperature spread and diinkubasi 37ºC for 24 hours. Calculated of growing colony in BAL CFU/g.

IV. Results and Discussion

4.1 The Components Simple Carbohydrates Tabah Bamboo Shoots Flour

The components in simple carbohydrates in Tabah bamboo shoots flour containing a monosaccharide (glucose, fructose and galactose), oligosakarida (sucrose and raffinose). The content of the components were different in each part of bamboo shoots (apical, middle and basal) (figure 1).



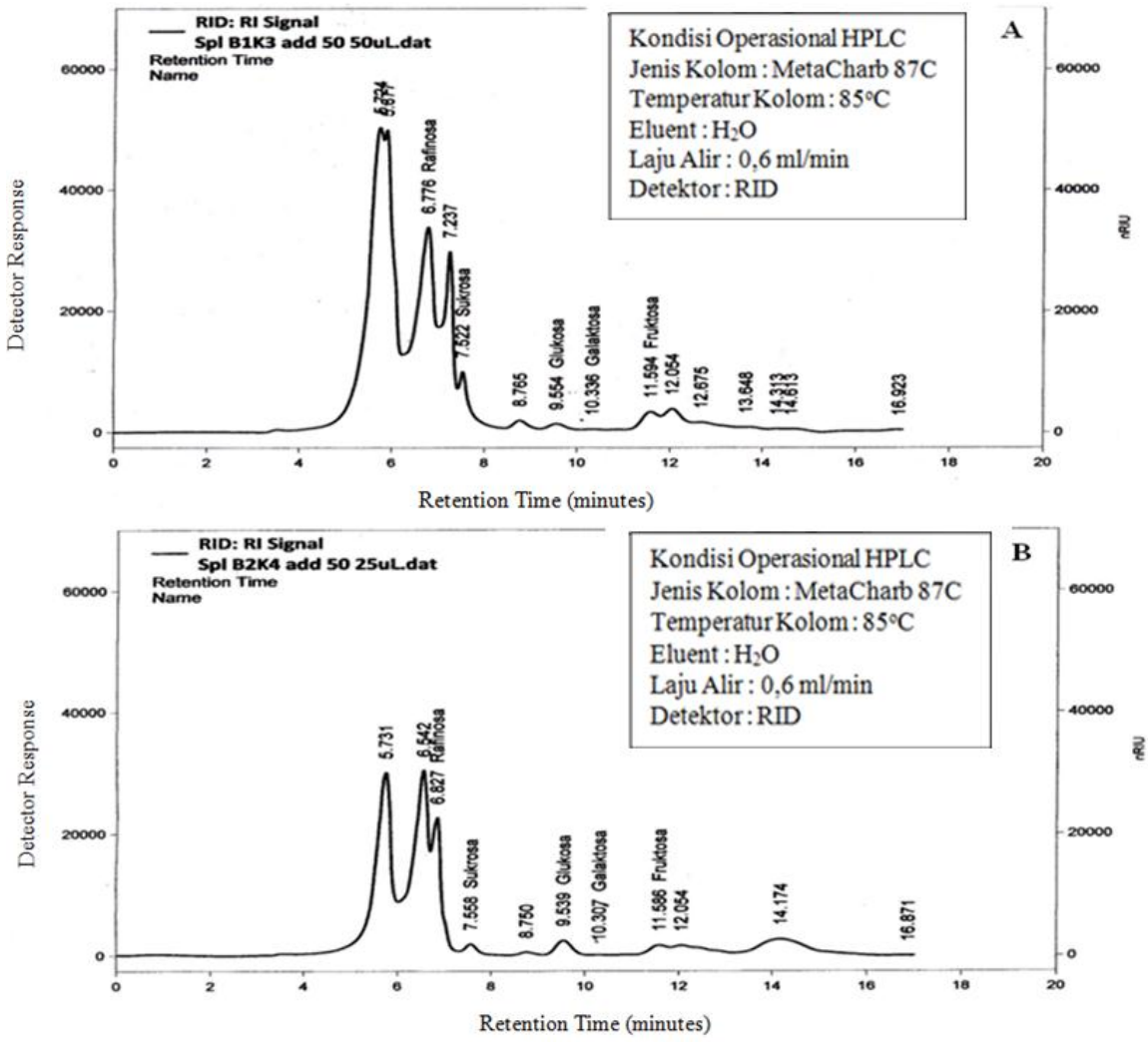


Figure 1. Charts Levels of a Carbohydrate Component Simple in Tabah Bamboo Shoots Flour in different parts (Apical, Middle and at Basal)

The difference of glucose, fructose, sucrose and galactose contents in every part of bamboo shoots possible because of differences in the nature of physiological and biochemical between the parts on shoots and histological (depends on the part of the apical, middle and the basal of bamboo shoots). Data from chromotogram can be seen on a picture of 1 .

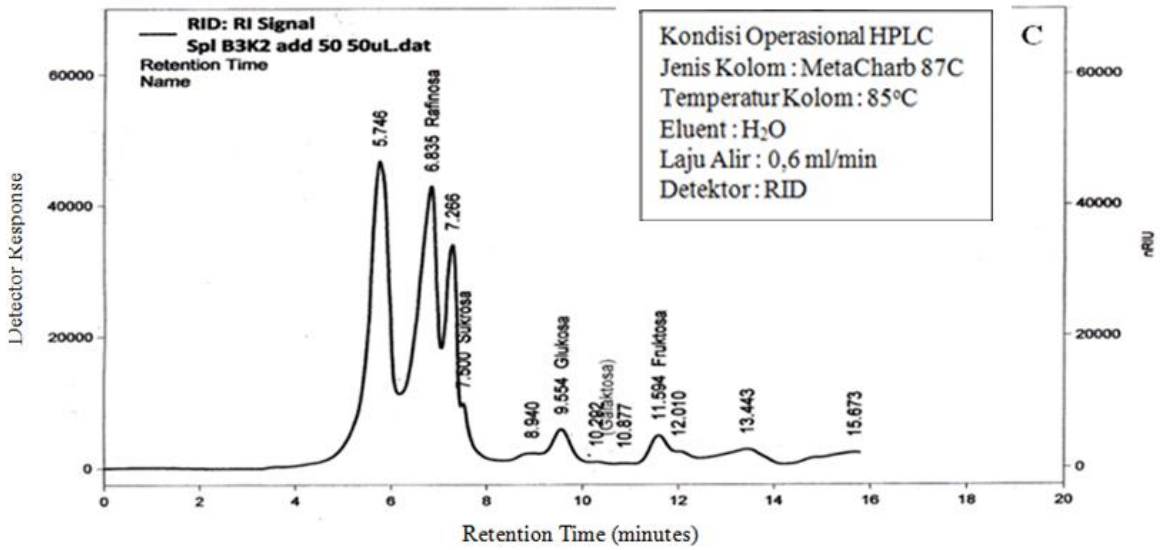


Figure 2 Chromatogram Tabah Bamboo Shoots Flour (A) Apical Part, (B) Middle Part and (C) Basal Part

Tabah bamboo shoots processed into flour on the basal part the components of sugar obtained the highest namely containing 0,45% (db) glucose, 0,39% (db) fructose and 4,55% (db) rafinosa bk. The content of sucrose is highest in tabah bamboo shoots flour at the apical is 0,35% (db). The content of galactose for the third part tabah bamboo shoots flour is the same namely 0,04% (db).

Tabah bamboo shoots who processed into flour at the apical part is high concentration of sucrose obtained because it occurs in the higher fission of cells and cell organelles able to absorb sucrose, that accumulates at the apical, accumulation of sucrose of being many. The data is also backed by the Thammawong (2009) that the content of sucrose fresh bamboo shoots more seen at the apical from crop over fresh bamboo shoots and over the ground, level of glucose and fructose on tabah bamboo shoots flour more found in the basal part.

The content of glucose in tabah bamboo shoots flour influenced by the content of cellulose. According to Fengel and Gerd (1995), cellulose is the development of the glucose into a compound of macromolecules not miscible in all commonly used a solvent, in plants and increased glucose content cellulose content also will increase.

Raffinose is trisaccharide consisting of monomers fructose, galactose and glucose. When viewed from the content glucose, fructose and galactose on tabah bamboo shoots flour on each part we can see that the content raffinose hanging from the existence of three of the components were, so that it can be answered that the content rafinosa highest obtained at tabah bamboo shoots flour part is as much as the basal of 4,55 % (db).

The analysis result of against simple carbohydrate component of tabah bamboo shoots flour show that component oligosakarida of tabah bamboo shoots flour consist of: sucrose and

raffinose. This indicates that tabah bamboo shoots flour can be used as a source of prebiotik form oligosakarida of the sukrosa and rafinosa family.

4.2 Determine The Potential Prebiotic Tabah Bamboo Shoots Flours

Lactobacillus acidophilus show good growth in MRSB-m from each of tabah bamboo shoots flour part. Growth in the number of parts MRSB-m the apical namely 2,8 x 10^{10} CFU/g, in the middle part of 2,6 x 10^{10} CFU/g and at the basal of namely 2,5 x 10^{10} CFU/g, while on the media control 1,7 x 10^{6} CFU /g (MRSB without sugar) and 6 x 10^{10} CFU /g (MRSB).

Lactobacillus brevis capable of growing on MRSB-m of tabah bamboo shoots flour each part, in MRSB-m from the middle part is having the highest growth 5,5 x 10^{10} CFU/g. Growth in MRSB-m not markedly dissimilar part on the apical and of the basal namely 2,8 x 10^{10} CFU/g (the apical part) and 2,7 x 10^{10} CFU/g (the basal part). In a media control 1,9 x 10^{6} CFU/g (MRSB without sugar) and 5,5 x 10^{10} CFU/g (MRSB).(Figure 2).

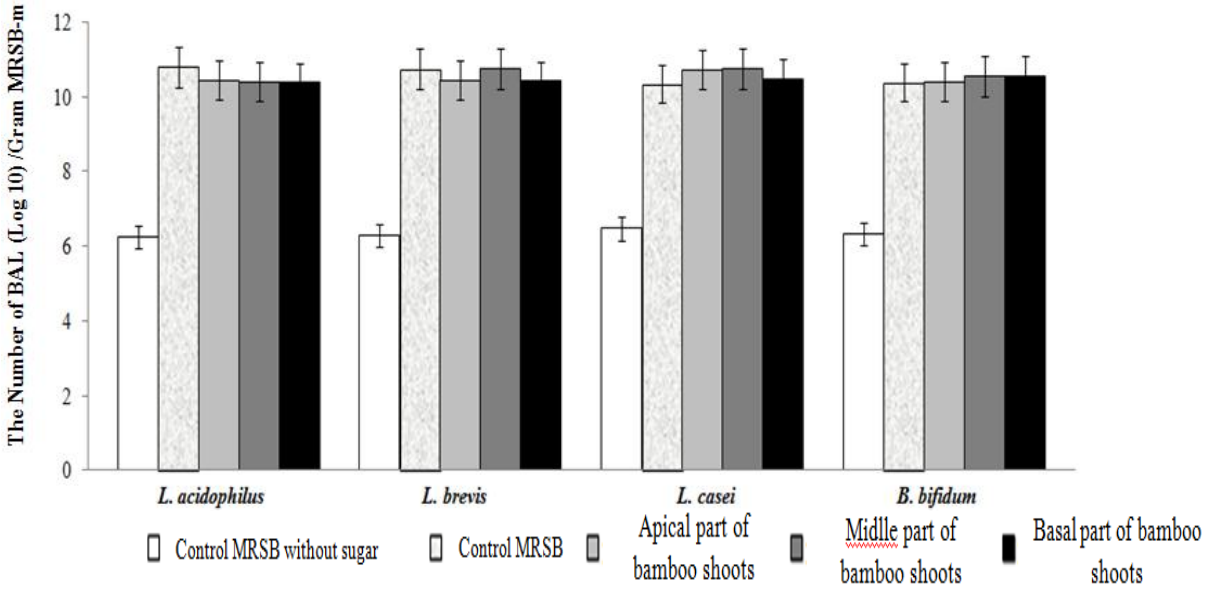


Figure 3 BAL Growth (Log 10)/Gram in MRSB-m Tabah Bamboo Shoots Flour in different parts (Apical, Middle and at Basal)

The growth of *lactobacillus casei* Rhamnosus on MRSB-m not markedly dissimilar on the apical and of the middle part namely 5,4 x 10^{10} CFU/g (the apical part) and 5,8 x 10^{10} CFU/g (the middle part). Growth in MRSB-m the basal part lower of two parts that others are 3,1 x 10^{10} CFU/g. Growth in a media control 2,9 x 10^{6} CFU/g (MRSB without sugar) and 2,3 x 10^{10} CFU/g (MRSB).

Bifidobacterium bifidum show good growth in MRSB-m do not differ in the middle and base part which is 3,6 x 10^{10} CFU/g (the middle part) and 3,7 x 10^{10}CFU/g (the base part). Growth in MRSB-m the apical parts lower than of two others part are 2,6 x 10^{10} CFU/g. Growth in a media control 2,2 x 10^{6} CFU/g (MRSB without sugar) and 2,8 x 10^{10}CFU/g (MRSB).

Based on the data, the growth of the genus *lactobacillus* higher MRSB-m happened at the basal and the middle part, this caused *lactobacillus* more easily use glukosa oligosakarida compared to support growth. Tabah bamboo shoots flour containing glucose, fructose, sucrose and raffinose. Sucrose content higher on the apical and the middle when compared with the content of glucose and fructose little nevertheless still have a role as a source of energy for growth. The existence of the glukosa causing bales can grow well, characterized by increasing the population of bacteria during the incubation 24 hours.

The growth of the genus *bifidobacterium bifidum* higher mrsb-m happened to the middle part of and base of, it is because the media they contain several components glucose and fructose and also containing oligosakarida like sucrose and rafinosa. *B. Bifidum* very able to use oligosakarida to support its growth.

The growth of bacteria lactic acid (BAL) in a media containing tabah bamboo shoots flour caused in the media that contains several components oligosakarida like sucrose and rafinosa. Oligosakarida is a carbohydrate simple short chain with the chemical structure of unique, this compound could not be digested by enzim-enzim digestion, by its very nature resembling a dietary food so that cannot absorbed in the small intestine, which in turn will enter into the large intestine. Will then fermented by good bacteria in the colon, so that oligosakarida referred to as prebiotik. Oligosakarida can serve as prebiotik because he could not digested, but able to stimulation the growth of bacteria lactic acid as *lactobacillus* and *bifidobacteria* in the digestive tract (Weese, 2002).

This is supported from the identification simple carbohydrates in tabah bamboo shoots flour identified having some sugar content namely glucose, fructose, sucrose and raffinose. The existence of the total carbohydratesBAL to grow well, characterized at the rising population bacteria during the incubation period is complete 24 hours.

V. Conclusion

Tabah bamboo shoots flour having component parts making up the simple carbohydrates are composed of 0,07%-0,45% (db) glucose, 0,12%-0,39% (db) fructose, 0,04% galactose, 0,14% - 0,35% (db) sucrose, 1,93-4,55% (db) raffinose. This shows that simple carbohydrates in tabah bamboo shoots flour can be as a candidate prebiotik.

Simple carbohydrate content that is a monosaccharide (fructose and glucose) and oligosakarida (sucrose and rafinosa) of tabah bamboo shoots potentially used as prebiotik because it can support development of *lactobacillus acidophilus, L. brevis, L . casei* rhamnosus highest on the apical of and middle and *bifidobacterium bifidum* highest on the basal part of. The growth of *L . acidophilus* range 2,5 x 10^{10} - 2,8 x 10^{10} CFU/g, *L. brevis* 2,7 x 10^{10} – 5,5 x 10^{10} CFU/g, *L. casei* rhamnosus 3,1 x 10^{10} – 5,8 x 10^{10} CFU/g and *bifidobacterium bifidum* 2,6 x 10^{10} - 3,7 x 10^{10} CFU g.

Reference

AOAC (Association of Official Analytical Chemist). 1998. Official Methode of Analysis of the Association of Official Analytical Chemist. Virginia: Arlington Inc.

Daud, M. 2010. Potensi Oligosakarida Eekstrak Tepung Buah Rumbia (Metroxylon sagu Rottb) Sebagai Prebiotik Dan Simbiotik Dalam Ransum Ayam Pedaging. Disertasi. Tidak dipublikasikan. Program Studi Ilmu Pangan. IPB. Bogor.

Dwiari, S.R. 2008. Pengujian potensi prebiotik ubi garut dan ubi jalar serta hasil olahannya (*Cookies dan sweet potato flakes*) [Tesis]. Ilmu dan Teknologi Pangan. IPB. Bogor.

Fengel, D. dan W. Gerd. 1995. Kayu, Kimia, Ultrastruktur, Reaksi-Reaksi. Gadjah Mada University Press. Yogyakarta.

Kencana, P.K.D. 2009. **Fisiologi Dan Teknologi Pascapanen Rebung Bambu Tabah** *(Gigantochloa Nigrociliata Kurz) Fresh-Cut. Disertasi. Program Pascasarjana Fakultas Pertanian. Universitas Brawijaya.*

Krisnayudha, K. 2007. Mempelajari Potensi Garut (*Maranta arundiacea* L.) dan Ganyong (*Canna edulis*, Kerr) untuk Mendukung Pertumbuhan Bakteri
Asam Laktat. Skripsi. Tidak dipublikasikan. Fakultas Teknologi Pertanian. Institut Pertanian Bogor.

Manning, T.S. and Gibson, G.R. 2004. Prebiotics. Best Practice and Research Clinical Gastroenterology 18(2): 287-298.

Manning, T.S., Rastall R., and Gibson G. 2004. Prebiotics and Lactic Acid Bacteria. *Di dalam* : Salminen S., Wright A. dan Ouwehand A. (editors). 2004. *Lactic Acid Bacteria Microbiological and Functional Aspects*. Ed ke-3, Revised and Expanded. New York: Marcel Dekker, Inc. hlmn 407-418.

Putra, I N. K. 2009. Efektivitas Berbagai Cara Pemasakan Terhadap Penurunan Kandungan Asam Sianida Berbagai Jenis Rebung Bambu. Agrotekno 15 (2): 40-42.

Roberfroid, M.B. 2002. Functional Food Concept and its Application to Prebiotics. Digest Liver Dis. 34 (21):105-108.

Shi, Q.T, and Yang, K,S. 1992. Study on Relationship Between Nutrients In Bamboo Shoots And Human Health. Proceedings of the International Symposium on Industrial Use of Bamboo. International Tropical Timber Organization and Chinese Academy, Beijing, China: Bamboo and its Use; p 338–46.

Thammawong, M., Daisuke. N., Poritosh. B., Nobutaka, N., Takeo. S. 2009. Characteristics of sugar Content in Different Sections an Harvest Manturity of Bamboo Shoot. Hort Science. 44(7): 1941-1946.

Weese, J.S. 2002. Probiotics, Prebiotics, and Synbiotics. Elsevier Sci. 22(8).

Wells, A.L., Saulnier, D.M.A., Gibson, G.R. 2008. Gastrointestnal Microflora and Interactions with Gut Mucosa. Di dalam : Gibson, G.R., Roberfroid, M.B, editor. Handbook of Prebiotics. New York : CRC Press. Hlm 13-38.

TECHNOLOGY AND EXTENSION IN ACHIEVING FOOD SECURITY IN INDONESIA

I Wayan Alit Artha Wiguna and Tatik Inggriati
Bali Assesment Of Agriculture Technolgy

Peliminary

Indonesia's population reached 253.60 million in 2014, is the 4th largest after China, India and the United States (Herdaru Purnomo, 2014). The condition causes such great need of Indonesian food. In 2010 rice consumption between 109-139 kg per cavita per year, and with a population of 237 million inhabitants Indonesia, the national rice requirements are or 32.943 million tons. If the average yield of 60%, it is necessary to 54.905 million tons of dry milled rice.

Average production per hectare is 5 tons of paddy rice per harvest, the rice demand was 54.905 million tons of dry milled rice, requiring as much as 10.981 million ha of wetland, assuming only one harvest a year. If the year, the harvest as much as two times the required 5.490 million ha of wetland. On the other hand vast rice fields in Indonesia in 2005 reached 7.8 million ha, so the dry milled rice production reached 78 million tons (BPN 2005 in Anon, 2005). Based on a simple calculation, the actual Indonesian rice surplus of about 23 million tonnes. In line with the statement Dahlan Iskan (2013) that in 2013 Indonesia does not need to import rice anymore, because Indonesia's rice production has been insufficient. The same thing also expressed by Khudiri (2013), that the national rice production is actually sufficient to meet domestic needs. In fact, according to BPS (2013) in Ridho (2014) states that Indonesian rice surplus. Furthermore also stated that, beginning in March 2013, BPS released provisional figures, that the production of milled rice, the year 2012 amounted to 69.05 million tons, equivalent to 40.05 million tons of rice. While the rice consumption of Indonesian society around 139 kilograms per capita per year, or 34.05 million tons per year. Based on these figures, the Indonesian exist in a state of surplus rice.

But in reality, according to Ruslan Kadir (2012) Indonesia is still importing rice. Until July 2011, BPS recorded that Indonesia's rice imports have reached USD 829 million or around Rp 7.04 trillion rupiah, to bring in as much as 1.57 million tons of rice, which comes from Vietnam (892.9 thousand tons), Thailand (665, 8 thousand tons), China (1,869 tons), India (1,146 tons), Pakistan (3.2 thousand tons), and some other countries (3,2 thousand tons).

Whatever the reason, obviously Indonesia is still importing rice. In six months in 2014 (January-June), Indonesia has imported 176 227 tonnes of rice equivalent to US $ 76.2 million (BPS, 2014 in Ridho, 2014). There are five major countries as suppliers of rice into the country. The five countries are: Thailand (90 763 tonnes), India (61 546 tonnes), Pakistan (8,950 tons), Vietnam (6,206 tons), Myanmar (8,136 tons) and others as much as 675 tons. The fact is obviously very concern for Indonesia, as an agricultural country with a land area of 1,910,931 km2, with 17,508 islands. Therefore, the Indonesian government, seeking to reduce rice imports, even determined

to achieve rice self-sufficiency by 2017, through a special effort to increase production of rice, corn and soybean, which is known as "*Upsus Pajale"* or "*Upsus PJK"* (rice, corn and soybean).

Such efforts, undertaken to achieve food security in a sustainable. Because food security is a very important factor in maintaining the stability of the Indonesian state is very complex in many ways. One of the important factors that need attention in order to achieve food security for Indonesia is technological factors. In line with Dahruh Shah (2010) which states that strengthening the role of technology is crucial in strengthening food security. Furthermore also stated that technology can play a role as a driver of growth of the local agro-food that can drive the local economy and diversification simultaneously.

Food Security

Dahruh Shah (2010) states, that food is a basic human need that fulfillment into a fundamental right of every people of Indonesia. Internationally, food security is defined as a condition that allows each individual to have access to sufficient, to food that is nutritious, healthy and safe so that it can run optimally life activity. Law No. 7 of 1996 on Food defines food security as food fulfillment of conditions for households which is reflected in the availability of sufficient food, both in quantity and quality, safe, equitable and affordable. The law also stated that the Government organized setting, guidance, control and supervision. While society organizes the production process and supply, trading, distribution and function as consumers who are entitled to adequate food in quantity and quality, safe, nutritious, diverse, equitable, and affordable to their purchasing power (Anon, 2010).

Food security is a system consisting of subsystems availability and distribution of food and consumption subsystems. The availability and facilitate the distribution of food supplies stable and evenly distributed throughout the region; whereas the consumption subsystem allows each household to obtain sufficient food and utilize it responsibly to meet the nutritional needs of all its members. Thus, food security is an issue at the regional level to the family level, with two important elements, namely food availability and access of every individual to adequate food (Dahruh Shah, 2010). Furthermore Anon (2010) states that the purpose of development of food security is to achieve resilience in the food sector in the fulfillment of the conditions of food for every household of the national food production is reflected in the availability of sufficient food, quantity and quality, safe, equitable and affordable as mandated in the Act food.

Dahruh Shah (2010), explicitly states that food availability related to the business of food production, distribution and trade, including the implementation of reserves, export and import. Population access to food is related to the ability of food production at household level, employment and family income. In this regard, food not just rice or food crops (rice, corn, soybean), but includes foods and beverages derived from plants and animals, including fish, both primary and derivative products. Thus not only the food produced by agriculture, animal husbandry, fishery, plantation and forestry, but also by the food processing industry.

Furthermore, sufficient food not only in number but also its diversity, as a source of macro-nutrient intake (carbohydrate, protein, fat) and micronutrients (vitamins and minerals); for

growth, health, physical endurance, intelligence and human productivity. Food is also a strategic commodity in maintaining the sovereignty of a nation. As previously explained that the technology has a very important role in maintaining the food security of a nation, including Indonesia.

The Role of Technology in Supporting Food Security for the Indonesian Nation

Anon (2010) stated that in order to improve the food security needs to be done with due regard to resource diversification, institutional and local culture through increased processing technology and food products as well as increased public awareness to consume a diversity of foods with balanced nutrition. Government Regulation on Food Security is also to achieve food security underscores the need to develop human resources which include education and training in the field of food, the dissemination of science and technology in the field of food and counseling in the field of food. In addition, international cooperation is also carried out in the fields of production, trade and distribution of food, food reserves, prevention and mitigation of the problem of food as well as research and food technology. Similarly, the wide scope of food security, the successful development of food security is determined by many factors, one of which is a factor of technology.

Various definitions of technology, one of whom stated is Miarso (2007) which states that the technology is to increase the value-added process, and the process uses or produces a product. The resulting product is not separate from other products that already exist, but an integral part of a system. While the Big Indonesian Dictionary (1990) provides a definition of the technology are: 1) The scientific method to achieve the goal of practical applied science, 2) Overall the means to provide the goods necessary for the survival and comfort of human life. Meanwhile, according to Saliman (1993) that technology is the science of development and industrial.

From the various definitions of the technology can be summarized that the technology is a method to increase the added value of a product, which can be justified scientifically. Thereby the technology is associated with science. The necessary technology and related to food security is a technology that can increase the value-added food products, can be justified scientifically, and can improve the comfort of human life. Thus the technology should be able to support and meet the needs of everyday life.

Various institutions have a role in generating technologies related to food, including universities, research institutions and government and private companies related to the food. One government research institutions have the duty and function to produce the technology in the food sector in Indonesia is the Agency for Agricultural Research and Development (AARD) with various ranks at the regional level. Till the year 2013, the Agency for Agricultural Research has been able to produce 400 kinds of technologies relating to agriculture.

The technologies include: food crops as many as 62 kinds of technology, technology 74 horticultural crops, plantations 47 technologies, 32 breeding technology, fertilizers as much as 23 technologies, 42 biological pesticide technologies, information technology as much as 11 basis, about the environment as much as 3 technology, agricultural mechanization technologies 58 ,

bioenergy 4 technologies, and the development of agricultural products 44 technologies (Agency for agricultural Research, 2013). But not all of these technologies can be adopted by users, especially farmers as a major business players in the agricultural sector.

In fact, probably no more than 20% of the technologies adopted by farmers, for various reasons or constraints. Some of these include difficulty level technology applications, technologies that are less profitable, less according to user needs or technologies that are less innovative. Obstacles are no less important is the lack of agricultural extension system in Indonesia, especially in Bali that inhibit the transfer of technology to farmers as users. Therefore, agricultural extension should receive serious consideration by the government. Not only in organizing the extension system is good and right, but also in providing human resources or agricultural extension agricultural extension.

Related to this, the college as one of the institutions that are important in producing quality agricultural resources, should also have a high concern in producing quality agricultural human resources, in line with the needs of the field. Thus there needs to be alignment or synergistic relationship between the role of universities and research institutions and training institutions and agricultural extension.

Implementation of Extension to Achieve Food Security in Indonesia

Suparno (2001) states that, any means used to develop the human being, the necessary knowledge, skills, and abilities as hinted to achieve the goal. In line with Mardikanto (1993) that, increase farmers' skills can be done through training (training) in a counseling process which aims to improve the knowledge, attitudes, and skills.

Furthermore Mardikanto (1993) also stated that agricultural extension is a non-formal education for farmers and their families which includes activities in the transfer of knowledge and skills of field extension to the farmer and his family that goes through the learning process. Furthermore Mulyono (2011) states that the purpose of education is to change knowledge, attitudes, and skills objectives for munuju farming system better (better farming), farmer economics more favorable (better business), tarap farmers a better life (better living), public relations better (better community) and a better environment (better environment).

Ridha (2014) states that one of the primary obligations of agricultural extension is to provide excellent service to farmers and other agricultural communities. The ministry is in the form of information needs and technologies as a solution to the problems faced by farmers in the working area. Tatik (2015) stated that in order to produce a good education necessary extension inovative materials. While the material inovative extension will be generated by a sub-system of research and development of agricultural technology professionals.

Find innovative outreach materials, extension materials that are able to increase the added value of a business, in this case is a value-added product development efforts of food, particularly rice. Extension materials capable of increasing the added value of a business, means it must have an element of efficient and effective, and in line with the vision and mission of the business (not

counter-productive). Furthermore Anon (2013) in Tatik (2015) also gives an understanding of the inovative extension materials, ie materials that are always market-oriented education, which refers to the concept 5C namely: Competitor (competitors), Competition (competition), Change of competition (competition changes), change of driver (determination of the direction of change) and customer behavior (consumer behavior).

Tatik (2015) also stated that in order to move and run the extension system, must be supported by three sub-systems, among others: (1) sub-system of education and training; (2) sub-systems and the standardization of work procedures; (3) sub-system of research and technological development. Each sub-system must be supported by adequate financing. Therefore, it is necessary to develop a system extension that is good and right. Extension system should pay attention to every component in a system extension.

A counselor should have a much better knowledge than the target. Tatik (2015) suggested that knowledge to master a technology that will be delivered to the target, must be owned by an extension. Such knowledge among others: the knowledge and ability to communicate, the ability to convey an idea or message to be conveyed, the ability to conduct discussions, so that the target has confidence in the extension. The existence of more capabilities within an extension would cause the target to have a positive attitude and perception of the extension itself, so it will be easier to motivate the target in adopting a the technology.

For the extension to be equipped with such capabilities. If not then the probability of failure in the development of extension systems will be even greater, including in achieving food security in a sustainable. Meet the food needs of more than 230 million people in Indonesia, is not easy. Therefore, the implementation of good agricultural extension and the right is one key to success is a must-have in achieving food security in a sustainable success

No matter how good the technology, produced by researchers from various research institutions such as the Agricultural Research in the Ministry of Agriculture, universities and private research institutions, will not have any meaning if it is not adopted by users. Adoption of agricultural technology innovation will be able to run well, if the technology is inovative as previously described. One of the properties or requirements inovative the technology is in accordance datau in line with user needs. Therefore, the technology generated by researchers through a variety of studies in various research institutions and universities should be synergistic with the needs of farmers.

To that end, the education system should also be developed in line or in synergy with the training system (training) and extension (extension), which was developed by the government. Because these technologies should also be disseminated, through the agricultural extension system is good and right. Dissemination can be done through various means and methods of counseling in accordance with various factors, both from within the user's environment or the farmer himself, or from external factors farmers.

One of the external factors that are important in the implementation of the extension system is a factor of education for agricultural extension. Agricultural extension should have a good ability

to conduct information, such as the ability to master the technology, the ability to communicate with farmers, the ability to prepare extension materials. Related to this, the system of education and training for agricultural extension is also very important to be aware, to produce agricultural extension professionals and qualified.

In line with Wiguna (2011) which states that the Field Extension Workers (FEW) not only as an educator, but also as a companion to the farmers, so it takes a professional and qualified PPL. Tatik (2015) states that an agricultural extension professionals must have the education and knowledge in their respective sectors in order to improve the knowledge and skills of farmers as a target. Wiguna (2014) also states that it is similar to the ongoing implementation of good extension, the extension must be professional.

At least two important conditions relating to professionalism: education and labor standards. Associated with an agricultural extension education, the College as an institution of higher education has a very important role in generating agricultural human resource professionals in the field of agricultural extension. Therefore the education system in college, especially with regard to agriculture peyuluhan must synergistic or consistent with agricultural development in Indonesia. If not, then the ability of human resources produced by universities would be less professional, so will inhibit agricultural development, including in ensuring the sustainability of food security in Indonesia.

Conclusion

Indonesia as the country's 4th largest in the world, with a population of more than 230 million people, need food which is very large. Even the stability of food or food security becomes a very important factor in maintaining national stability. To achieve sustainable food security in Indonesia, the role of technology and the provision of good education systems, becoming one of the important factors. Related to this, the role of research institutions to produce agricultural technology that is inovative be very strategic. In addition to generating agricultural extension porofesional in organizing agricultural extension, the role of higher education, is very important.

Therefore synergism between the education system with the needs of human resources in generating technology and the implementation of agricultural extension in Indonesia, it is important to note, in achieving sustainable food security. If there is no alignment of education and training systems to agricultural development, food security in a sustainable so reactive it will be difficult to achieve

References

Anon. 2005. Kebutuhan Beras Nasional, Luas Sawah dan Kebohongan Publik. http://padiberas.com/?p=314

Anon. 2010. Ketahanan Pangan. http://4higea.blogspot.com/2010/11/ ketahanan- pangan.html BPS [Badan Pusat Statistik]. 2005. Proyeksi Penduduk menurut Provinsi, di Indonesia 2010-2035

Badan Litbang Pertanian. 2013. Empat Ratus (400) Teknologi Inovatif Hasil Badan Litbang Pertanian, Kementerian Pertanian Republik Indonesia.

Dahlan Iskan. 2013. http://bisnis.tempo.co/read/news/2013/03/24/090469092/2013 -Indonesia-Bebas-Impor-Beras\

Dahrul Syah. 2010. Pemanfaatan Teknologi dalam Pembangunan Ketahanan Pangan.https://seafast.ipb.ac.id/articles/116-pemanfaatan-teknologi-dalam-pembangunan-ketahanan-pangan/?showall=1

Herdaru Purnomo. 2014. Negara dengan Penduduk Terbanyak di Dunia, RI Masuk 4 Besar. http://finance.detik.com/read/2014/03/06/134053/ 2517461/4/ negara-dengan-penduduk-terbanyak-di-dunia-ri-masuk-4-besar.

Kadir Ruslan. 2012. Impor Beras Indonesia Mencapai 7 Triliuan. http://menulisdikoran.blogspot.com/2012/04/impor-beras-indonesia-mencapai-7.html

Khudori. 2013. Produksi Beras Nasional.http://bisnis.tempo.co/read/news /2013/03/24/090469092/2013-Indonesia-Bebas-Impor-Beras

Miarso, 2007. *Menyemai benih teknologi pendidikan*. Jakarta: Pustekom Diknas Annonimous. 1990. Kamus Besar Bahasa Indonesia.

Mardikanto, T. 1993. *Penyuluhan Pembangunan Pertanian.* Surakarta: Sebelas Maret University Press.

Mulyono. M. 2011. *Membangun Penyuluhan Pertanian Profesional Dalam Mewujudkan Masyarakat Madani.* Perhimpunan Penyuluhan Pertanian Indonesia. Cetakan I. Jakarta: CV Poin Plus Asia.

Ridha, I. M. 2014. Pusat Penyuluhan Pertanian, Badan Penyuluhan dan Pengembangan SDM Pertanian. Jl. Harsono RM No.3 Pasar Minggu Jakarta Selatan, Telp/Fax. 021-7804386 http://cybex.deptan.go.id/ penyuluhan/ profesionalisme-penyuluh-pertanian-bagian-1

Ridho Syukro. 2014. Jumlah Penduduk Miskin Indonesia Capai 28 Juta. http://www.beritasatu.com/nasional/193810-bps-maret-2014-jumlah-penduduk-miskin-indonesia-capai-28-juta.html

Saliman. 1993. *Kamus Pendidikan Pengajaran dan Umum*. Jakarta: Rineka Cipta.

Suparno, S. 2001. *Membangun Kompetensi Belajar*. Jakarta: Direktorat Jendral Pendidikan Tinggi. Departemen Pendidikan Nasional

Tatik Inggriati. 2015. Perilaku Peternak Sapi Bali Perbibitan Dalam Sistem Penyuluhan di Bali. Disertasi Program Pasca Sarjana, Universitas Udayana, Denpasar

Undang-Undang Negara Republik Indonesia Nomor 7 Tahun 1996 tentang Pangan. Kantor Menteri Negara Pangan RI

Wiguna, A.A.I.W. 2011. Usulan Pembentukan Lembaga Penyuluhan Pertanian Kepada Gubernur Bali. (*Naskah*). Denpasar:Perhimpunan Penyuluh Pertaniaan Indonesia.

_____. 2012. “Penyuluhan Mati Suri”. Bali Post, 3 Mei 2012, Hal 5, kol 4.

_____. 2014. Peran Penyuluhan Pertanian dalam Proses Diseminasi Inovasi Teknologi Pertanian. Makalah Seminar tentang Akselerasi Inovasi Teknologi Pertanian Melalui Komunikasi Penyuluhan di Kabupaten Tabanan, 8 Mei 2014.

Wiguna, A.A.I.W, Inggriati, T.N.W, Budiana, I.N, Widianta, I.G.M, Sudarmini, N.K. 2013. Peran Penyuluh dalam Mendukung Program Swasembada Daging Sapi Secara Berkelanjutan.(*Laporan Hasil Kegiatan).*Denpasar: Balai Pengkajian Teknologi Pertanian Bali (BPTP-Bali)

THE FEASIBILITY STUDY OF STRAWBERRY CULTIVATION AS A SUPPORTING FACTOR FOR FOOD ENDURANCE AND SUSTAINABLE AGRICULTURE AT BALI PROVINCE

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Abstract

This paper is aim to analyze the feasibility of strawberry cultivation as an effort for supports the food endurance and continuing agriculture at Bali Province. The population covered the strawberry farmer at strawberry production center at Bali Province, i.e : Baturiti, Tabanan and Pancasari, Buleleng. While banks had provided loan for farmers, hotels, restaurants, supermarkets, strawbery wine refineerings, agents and retailers of strawberry fruit at traditionally markets. The samples were selected through judgemental sampling method. The sample size are 100 respondents of farmers, 3 bank's personels, 30 respondents of hotel manager, restaurants, supermarkets, strawberry wine refineers, agents and retailers at traditional markets. The results showed that the strawberry market's potential at Bali Province was highly enough, even the demand from strawberry wine refineerings at Canggu, PTPN XII Kalisat Jampit Ijen dan PT Welco Surabaya were not fulfilled. The method of analysis which used were Net Present Value, Net Benefit Cost Ratio, Gross Benefit Cost Ratio, Profitability Ratio and Payback Period; showed that strawberry cultivation at production center in Baturiti, Tabanan and Pancasari, Buleleng, both with green house cultivation, and 'bedengan' plastic mulch with containment and without containment, were feasible. However, the 'bedengan' plastic mulch with containment is the highest feasibility, because it had Net B/C, Gross B/C and Profitability Ratio higher than the others. Almost of farmers required loan from bank to develope their businesses. The credit scheme were : non collateral, grace period payments which adapted to production cyclus, fast, interest rate under 1,00%/month and the tenors at least 2 years. Base on the demand and the feasibility of this cultivation, has to considerate to develope the strawberry production center in Baturiti, Tabanan and Pancasari, Buleleng become a strawberry agrotourism area. For this, it needed a earnestly movement by all of people, authorized by Local County Government, through a more intensive study, coordinatively and comprehensive, so this sector can grows become a agroturism area which would supports the locally generated revenues. Decision for that place as a strawerry agrotourism area has to legalized by Perda. So that should provide an impact for reducing the diversion land usage for others usage, gives a positive impact for food endurance and continuing agriculture in Bali. Beside that, the success of this program should provide a positive impact for enlargement of employee oppotunities, and should rise the strawberry farmer's income and the agricultural's contribution to PDRB Bali.

Keywords: Feasibility Analysis, Strawberries, Food, Sustainable

I. Introduction

Agriculture at Bali had an important meaning and closely related to tourism sector. It had proven by the foreign tourists which visited to Bali and admired the 'subak' systems, which controlled the water management; and the diversity of crops. Beside that, the way of life of Bali people (specially Tri Hita Karana concepts, mainly related to relation between human and nature, plants), they have a strongly basic principle to support the agrotourism with agrobusiness base.

The important role of agriculture sector at Bali can be sought from the contributions of agriculture sector (farming, fattening, forestry and fishery) to Produk Domestik Regional Bruto (PDRB) Bali, which high enough with mean as 20,41% from total PDRB Bali in 2003-2007, although appeared the decreasing at mean as 2,16%/year in the same year. This role of agriculture sector occupants on second rank, after tourism sector which covered: trading, hotels and restaurants, the contribution was mean as 28,96% form total PDRB Bali in 2003-2007, growed at mean as 0,39% a year in the same year (BPS Provinsi Bali, 2008).

The decreasing of contribution of agriculture sector to PDRB Bali has to anticipated through the developing the main product of Bali, i.e : strawberry. Strawberry is the one of plant which has an appeal for agrotourism packet as appear at Candikuning, Baturiti Tabanan. At this area, the visitors not only receives the beauty of Bedugul, but more than that, they can see, taste and even buy the strawberry fruit as a gift. The farmer at Pancasari, Buleleng had conduct the strawberry cultivation. In Indonesia, even though the strawberry still six years ago be cultivated, it's growth was rapidly, but not optimal. It had conducted by the farmers in West Java, i.e : Sukabumi, Cianjur, Cipanas, Lembang, Magelang and other cities with has cool climate at Middle Java, and at Batu Malang, East Java. The strawberry farmers in Indonesia, basically still used the conventional cultivation technology, it caused of low knowledge of strawberry. This weakness had negative impacts : low productivities and low qualities. The farmer used the local bibit diperbanyak sendiri dengan stolon, meanwhile the farmers at foreign countries imported seed form US and New Zaeland and they producted the highly qualities strawberry.

The farmers began to switch to strawberry because the demand from consumers were rise from time to time. The increasing demand of strawberry correlated with the increasing society welfare, education and increasing awareness about the need of qualified fruits for human healthy. The research proceedings which represented on Conference of American Diatetic Assosiation Food and Nutrition, showed that the strawberry fruit is low fat, and low calories and also contains C vitamin, pholat acid, kalium and antioxidants. That ingredients causes strawberry as an alternative fruit which is good for heart, reduce the risk from cancer and positively pushes for healthy.

Business opportunities for strawberry can also seen from developing of production centers at much of areas and much of firms which transforms strawberry to food and beverage products, i.e : syrup, 'dodol', juice, jelly, pie, ice cream and wine. Also can be seen from growth and development of houses of beauty care and houses of skin care which need strawberry as raw. The strawberry is also needed by cafes, restaurants, hotels, supermarkets and conventional markets in Indonesia. Accordance with the large potential of strawberry market, the development of strawberry businesses has a very good prospective.

The whole world's demand of strawberry fruit tent to increase, and also much of strawberry farm owners offered the 'self crop' packet, it makes interesting to people for come in and buy the self crop packet where they can pick the fruit directly. This kind of packet is much interesting for the tourist and provides more profit for the farm owners. The still opened opportunities for strawberry businesses were more interesting, and at some villages the strawberry cultivation is very feasible to conduct.

One hectare of farm plot with plastic sack technology, where in each sack containts 4 strawberry seeds, will provides profit as Rp. 59.582.400,00/year, B/C ratio = 2.47 and ROI = 1,474 %. That means from Rp.1.000,00 capital will provides profit as Rp. 1.474,00. The cultivation which examines at Rancabali, Ciwidey Kabupaten Bandung, 1.400 m^2 plot, using 2.000 unit of sack, provides profit as Rp. 16.345.000,00 a year . B/C ratio = 1,374 and ROI = 0.374.

The grade A and grade B strawberry demand from big hotels at Pecatu and Jimbaran reaches up to 15 kg-25 kg/day, also the demand from Carrefour Supermarket and Makro for the same grade reaches up to 12 kg- 36 kg/day. More high demand was come from wine refineerings CV Bali Wein which located at Canggu, Badung = 500 kg/week. This manufactur specially buys the grade B strawberry from Baturiti, Tabanan. Purchasing price for Grade B directly from the farmer = Rp. 11.000,00/kg, and they sell the strawberry wine at selling price as Rp. 80.000,00 - Rp. 100.000,00/bottle. Potential demand up to 500 kg/week, but the supply still 200 kg/week.

The strawberry demand comes directly from Malang at mean as 100 kg/day, comes from Perkebunan Tanaman Pangan Nasional XII Kalisat Jampit Ijen, Jatim at mean as 2 tons/week, but it covered by only 200 kg/week. PT WELKO - Surabaya also required strawberry from production center Pancasari, Buleleng at mean as 4 tons/month, it priced at mean as Rp. 10.000,00/kg. The Bali Strawberry is most needed because it's taste, and nonorganic fertilizer usage was minimized. This strawberry businesses very strategic to developed, and also to anticipate the classical problems which faced by agricultural sector, where almost 1/3 of agriculture area switch to be real estates, villa and so on, including the land plots for strawberry. On the other side, the low quality of human resources and the business size was small, and production cost was increase: These various threats cause the strawberry supply from the production centers Batruriti, Bedugul and Pancasari, Buleleng still not enough to fill the demand from Bali itself and other counties at Java and Kalimantan.

The future strawberry demand indicates a rising trend, and on other side probable for developing plots at Baturiti, Bedugul and Pancasari, Buleleng. Information from Kepala Desa Pancasari, Buleleng office states that land area for agriculture at Pancasari, Buleleng is 470 Ha.,and be used for strawberry cultivation only 50 Ha., so there available as 420 Ha. for strawberry. Similarly at Candikuning, Baturiti, available as 450 Ha., be used for strawberry only 25 Ha. so there available 425 Ha.,for strawberry. The total land area available = 845 Ha.,for strawberry. Yet, the constraint is almost of strawberry farmers have low knowledge accordance to strawberry. The investment and working capital were percepted high, so required optimal supporting from local government.

Related to investment and working capital requirement, Bank Indonesia Denpasar have an important role to help and build the development of strawberry cultivation, through operational banks i.e : Bank Mandiri, Bank BRI, Bank BPD Bali. All this time bank loan had distributed for agriculture sector at Bali were increase at mean as 13,36%/year in 2005-(Juli) 2008, though the proportion was small if compared to the other economic sectors (Bank Indonesia Denpasar, 2008). The problems rise not from the value of loan only, but also from the payment scheme, and collateral.

The Problems

1.Is the strawberry cultivation at production center of Baturiti, Bedugul and Pancasari, Buleleng feasible to conduct ?
2.What kind of strawberry cultivation technology which provide optimal productivities and good quality ?

The Goals of Research

1. Examining the feasibility of strawberry cultivation at production center Baturiti, Bedugul and Pancasari, Buleleng.
2. Examining the strawberry cultivation technology whice provides optimal productivity and good quality fruit.

Research Benefits

1. This research was a technical aid for Bank Indonesia Denpasar, where the result can be expected to contribute to speed up the economic empowerment of Bali specially for the developing of UMKM in agriculture sector..
2. This research can be used for push the aknowledgment and confidence to banking world and other financial institutions in financing thestrawberry cultivation.
3. The result can be a reference for financing pattern on strawberry cultivation specially for local government and related parties for supporting and build the strategic and synergic partnership in developing the strawberry businesses, and to motivate the people that strawberry businesses have a bright prospect.
4. Strawberry farmers can be pushed to optimizing their businesses through diversification and intensification, so the producton was stable and there was a positive impact for food endurance and sustainable agriculture at Bali Province.

II. RESEARCH METHOD

Research Design

This research is a survey, where the informations were collected through a quesionair and a lot of samples be selected from the population.

Population

The population was covered :
1. The strawberry farmers at production centers, Baturiti, Bedugul, and Pancasari, Buleleng.
2. Banks which had poured the loan for the farmers.
3. Hotels, restaurants, and supermarkets which be the consumers of strawberry, strawberry wine refineerings, agents and retailers at traditional markets.

Sample

The respondents as sample in this research be selected by judgemental sampling technique The sample size are :
1. Strawberry farmers = 100 respondents which distributed on both production centers.
2. Banking = 3 banks which have poured the loan to the farmers.
3. Hotels, restaurants, supermarkets, strawberry wine producers, agents, and the retailers at tradional markets = 30 unit.

Kind of Data

The data was covered : (1) Primer data which be collected from the strawberry farmers, banking world and commerce institutions for strawberry commodities, using the questionnaire; (2) Secondary data were the number of strawberry farmers at both production centers, collected through the group leader of that farmers.

Method of Data Analysis

1. The study of feasibility at each production center was analyzed using methods of NPV, B/C ratio, Profitability ratio, and Pay Back Period on basic of one production cyclus (three years).
2. The technology of strawberry cultivation which provided optimal productivity and good quality fruit is the applications of MPHP with containment and without containment and green house techniques.
3. Financing pattern which match for strawberry cultivation development at production centers, decided based on descriptive analysis.

III. The Result and Discussion

The Profil of Strawberry Farmers at Bali Province

The production center of strawberry cultivation of Bali Province were located at two villages, Pancasari, Buleleng and Candikuning Baturiti, Tabanan. This research was conducted in August - September 2008.

Almost of strawberry farmers at Pancasari, Buleleng were in productive age, where the number of family members about 4-6 men, their education were almost elementary and secondary schools, then senior high school and Diploma. Only small number up to scholar.

Almost of strawberry farmers at Pancasari, Buleleng began their businesses in 2003. Land area for strawberry, almost about 10 – 20 ares and only a small number which have land area up to more than 20 ares, where the status of ownership are almost their own and lease. The number of workers was almost less than 6 men, while the number of worker about 6 – 19 men, still little, so ut means that strawberry businesses at Pancasari still small businesses criterion.

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Analysis of Strawberry at Bali Province

The analysis of strawberry businesses described the cost aspect, production values and profit in a year. In this part, we compares the strawberry businesses at Pancasari, Buleleng and at Candikuning Baturiti, Tabanan, through three patterns of cultivation, i.e: green house, ‘bedengan’ plastic mulsch with containment and without containment.

Table 1. The Investment, Production Cost and Profit For Three Cropping at Pancasari, Buleleng

No	Description	Greenhouse (10 ares)	'Bedengan' Plastic Mulsch with Containment (20 ares)	'Bedengan' Plastic Mulsch Without Containment (20 ares)
1.	Investment/year	27.134.000	27.802.000	27.098.000
2.	Production Cost/year	44.819.080	26.937.800	30.303.580
3.	Production/year	165.000.000	88.000.000	70.400.000
4.	Profit/year	93.046.920	33.260.000	12.998.420

Source : adapted from research result.

Table 2. The Investment, Production Cost and Profit For Three Cropping at Candikuning, Baturiti

No.	Description	Greenhouse (3 ares)	'Bedengan' Plastic Mulsch with Containment (1 ha)	'Bedengan' Plastic Mulsch without Containment (1 ha)
1.	Investment/year	25.460.000	117.120.000	121.590.000
2.	Production Cost/year	44.192.363	405.992.800	366.207.300
3.	Produkction/year	108.000.000	600.000.000	440.400.000
4.	Profit/year	38.347.637	194.007.200	73.792.700

Source : adapted from research result.

Feasibility of Strawberry Businesses at Bali Province

Feasibility of strawberry businesses at Bali Province analyzed using mthe method of Net Present Value (NPV), Net B/C, Gross B/C, Profitability Ratio and Payback Period. The study was projected up to next 3 years (production cyclus of strawberry plant) and the discount factor (df) is 16,00 %.

Table 3. The Comparation of Feasibility of Strawberry Businesses at Pancasari, Buleleng

No	Criterion	Greenhouse	'Bedengan' Plastic Mulsch with Containment	'Bedengan' Plastic Mulsch without Containment
1.	Net Present Value (NPV)	152.878.320	112.125.989	45.737.260
2.	Net Benefit Cost Ratio (Net B/C ratio)	2,54	5,03	2,59
3.	Gross Benefit Cost Ratio (Gross B/C ratio)	1,72	2,32	1,41
4.	Profitability Ratio	2,57	5,01	2,59
5.	Payback Period	10 months+ 14 days	5 moths+ 15 days	7 months+ 3 days

Source : adapted from research result.

That table above showed that strawberry businesses at Pancasari, Buleleng in three pattern of cultivation, were feasible if reviewed from financial aspect. Though all of this patterns were feasible, yet it seems that 'bedengan' plastic mulsch with containment is the best, because it provided Net B/C, Gross B/C, Profitability ratio higher than the two other patterns. On other side, green house pattern had to received

more attention, because it very efficient in land usage. The vertical crop (pyramidal) was probable to plant more number of seeds than horizontal crop as in the 'bedengan' opened plot systems. The comparation of number of strawberry plants in vertical crop systems with green house technology and horizontal crop systems with opened plot up to 3,75 : 1. With the same number of plants, plots can be optimized through the green house technology is on mean as 30 ares. Indeed, the green house technology needs high investment, because on land area = 10 ares requires investment cost for a greenhouse about Rp. 80 millions. Base on Payback period, that cost can be returned during only 10 months and 14 days, whereas the economic life of the greenhouse about 10 years, it means that for next 9 years the strawberry businesses didn't beared more investment, except the maintenance cost which requires only up to Rp. 550.000,00/year.

Table 4. The Comparation of Feasibility Of Strawberry Businesses at Baturiti, Tabanan

No	Criterion	Greenhouse	'Bedengan' Plastic Mulsch with Containment	'Bedengan' Plastic Mulsch without Containment
1.	Net Present Value (NPV)	61.786.180	539.478.400	120.221.331
2.	Net Benefit Cost Ratio (Net B/C ratio)	1,67	5,61	1,63
3.	Gross Benefit Cost Ratio (Gross B/C ratio)	1,27	1,66	1,14
4.	Profitability Ratio	1,68	5,61	1,99
5.	Payback Period	11 months+ 23 days	3 months+ 12 dyas	4 months+ 24 days

Source : adapted from research result.

That table above showed that strawberry businesses at Candikuning Baturiti, Tabanan in three pattern of cultivation, were feasible if reviewed form financial aspect. Yet, it seems that that 'bedengan' plastic mulsch with containment is the best, because it provided Net B/C, Gross B/C, Profitability ratio higher than the two other patterns. On other side, green house pattern had to received more attention, because it very efficient in land usage. The vertical crop (pyramidal) was probable to plant more number of seeds than horizontal crop as in the 'bedengan' opened plot systems. The comparation of number of strawberry plants in vertical crop systems with green house technology and horizontal crop systems with opened plot up to 3,75 : 1. With the same number of plants, plots can be optimized through the green house technology is on mean as 30 ares. Indeed, the green house technology needs high investment, because on land area = 10 ares requires investment cost for a greenhouse about Rp. 56 millions. Base on Payback period, that cost can be returned during only 11 months and 23 days, whereas the economic life of the greenhouse about 10 years, it means that for next 9 years the strawberry businesses didn't beared more investment, except the maintenance cost which requires less than Rp. 1 million/year.

The discount factor used for both locations = 16,00%. Nevertheless, feasibility with discount factor = 18% (same as the interest rate for commercial loan at this time), showed that the strawberry businesses at Bali Province is still feasible. Even with discount factor = 24% (same as the interest rate for small businesses loan or KUR at this time), also showed that businesses is still feasible.

Market Aspect and Post Harvest of Strawberry Commodities at Bali

The marketing of strawberry fruit of Candikuning Baturiti ,Tabanan and of Pancasari, Buleleng, largely sell to the agents, and the rest were sold to the fruit and vegetable retailers at Bedugul, and restaurants. The strawberry which producted through the green house technology, usually sold to supermarkets at Denpasar, i.e : Tiara Dewata, Makro, Carrefour, Hero, Pepito, also sold to hotels and restaurants at

Denpasar, Sanur, Kuta and at Nusa Dua. The average of strawberry demand was shown on the table below :

Table 4.19. The Average of Strawberry Demand/week at Each Market

Market	Grade A Kg/ Week	Grade A Price Rp/kg	Grade B Kg/ week	Grade B Price Rp/kg	Grade C Kg/ week	Grade C Price Rp/kg	Bulk Kg/ week	Bulk Price (kg)
Hotel	70	52.000	175	47.500	28	40.000	25	10.000
Supermarket	105	25.000	105	17.500	84	15.000		
Restaurant/	4	30.000	30	20.000				
Supplier							100	12.500
Agent	375	22.500	285	15.000	340	10.000		
Retailer							12	16.000
CV Bali Wein			500	11.000				
Trader from i								
Malang							700	10.000
PTPN XII							2.000	10.000
PT Welko							1.000	10.000
Total	**554**		**1.095**		**452**		**3.873**	

Source : adapted from research result.

The table above showed that the maximum demand of bulk strawberry up to 4 ton/week, most of all come from PTPN XII Ijen Jatim and PT Welco Surabaya in form prozen and the traders form Malang. The demand of bulk strawberry which come from hotels, agents, and retailers at Badung's traditionally market were low as 137 kg/week. The second higher demand is grade B strawberry at mean as 1,095 tons/week. The highest proportion come from CV Bali Wein, the strawberry wine refineers at Denpasar, up to 500kg/week. The demand which come from hotels, restaurants and supermarkets at Bali reaches up to 310kg/week, and the last, the demand which come from the agents reaches up to 285 kg/week. The grade A strawberry demand was reach up to 554kg/week, where almost come from hotels and supermarkets at Bali,at mean as 180kg/week, while the demand from the agents reach up to 375kg/week. The grade C strawberry demand reach up to 452kg/week; and most of all were the demand from the agents at Bali reach up to 340kg/week, and the rests were the demand which come from hotels and supermarkets.

Almost of strawberry farmers sell the strawberry in bulk form, while the farmers which have big land area sell in plastic packing - ¼ kg, and then packaged in a carton box - 3 kg (each box contain 12 packs - ¼ kg). The rest sorting strawberry (blister, and broken) usually be frozen, and sometimes used for as fertilizer, animal feed and juice, jam and wine.

The Constraints of Strawberry Cultivation at Bali Province

The main constraint which be faced the strawberry farmers at Candikunign Baturiri, Tabanan and Pancasari, Buleleng; basically was lack of excellent seeds, price of seedt, fertilizer, pesticide, price of plastic mulsch, labor cost (the cost up to Rp. 600.000,00 - Rp. 1 million/month) and marketing problem specially at big harvest.

The strawberry seed which used by the farmers for all this time were rosalinda and sweet charlie which reproduced by the farmers it self and use stolon, hereditary; cause the number of seeds were limited. Because usage in many times, then the productivity and the quality were diminished, so it requires the new excellent seed. To fulfill this seed requirement, usually the farmers reproduce it through plant tissue isolation method. For that, it requires help from Dinas Pertanian Tanaman Pangan.

As long as the price of fertilizer and non organic pepticide were increase at mean as 30,00 %/year, create increasing production cost, while the selling price still fixed. That condition would reduce the profit and can reduce the farmer motivation to optimizetheir businesses. The solution is : the farmers have to use cheaper organic fertilizer mainly in liquid form (it has proven can increase the productivity up to 40% - 100%).. The organic fertilizer also environmentally friendly, so the strawberry fruit was save to consump, and also can fertilize the soil and increase protecion from plant disease, mainly boletus.

The higly labor cost can be anticipated by daily wages up to Rp 20.000,00 - Rp. 25.000,00. And it can optimize the effectivity, because the labor only used on land processing, maintenance and harvest and post harvest.

The bad climate seldom happen at Baturiti, Bedugul, bad fog which cause damage to the leafs, then foul, and damage the flower and can't produce bear fruit. However, a strawberry farmer at Baturiti, Bedugul successes ward the damage which caused the fog, he used vegetable pesticide, made from mixing intaran leafs and sengenge leafs.

The big harverst usually conducted in three months, i.e : June, July and August in a year, and it seems also happen on other production centers at Indonesia. In big harvest time appeared over production, cause be needed to product diversificate for post harvest, like as : jam, 'dodol', wine and so on. It requires technical help and additional working capital from related institutions. Also it requires a cold storage for save the excess production, so the durability was longer and it resold on the big harvest end. Also requires net work for distribution, where the local government can take role as the container for excess production (similarly to BULOG). The excess production only happen on big harvest; so, on September – May, usually happen lack of production, and it causes the demand from PTPN XII Ijen Jatim and PT Welco Surabaya and Pabrik Bali Wein cannot fulfilled. Through developing the strawberry businesses in future, can be expected all of demand which come from hotels, restaurants, supermarkets at Bali and come from outer Bali could be fulfilled.

The Farmer's Expectation to Bank Loan Pattern

Almost of the strawberry farmers require loan from bank, and they expect a loan pattern without collateral, grace period payment which adapted to production cyclus, quickly processs, interest rate below 1,00 %/month, minimum tenor = 2 years. Nevertheless, a small number of farmers which have their own land expect the bank loan with collateral, i.e : BPKB, and so on.

Banking world as a respondent in this research (PT Bank Mandiri (Persero) Tbk, all this time have poured loand for panili, vegetable and starwberry. Bank Mandiri ready to pour working capital loan for strawberry farmers from the two regions at Bali, because it percepted very potential to develope. But the bank still use the 5 C aspects. The loan plafond is Rp 1 million - Rp. 20 million for each and the maximum tenor is 3 years, interest rate = 6,00%/year. The target customers are the strawberry farmers for additional working capital.

Bank BRI also have poured the loan specially for rice intensification, corn and soy. Nevertheless this bank ready to pour the loan for the strawberry farmers at Bali Province without collateral. Scheme of credit is KKP (Kredit Ketahanan Pangan) Holtikultura, where the the loan plafond up to Rp. 5 billions and the tenor up to three years.

PT Bank Pembangunan Daerah Bali also ready to help through loan pouring, specially for rice, corn, herb and spice. PT Bank BPD Bali did not interest to finance the strawberry businesses, because still there's no a manufacture to process the post harvest strawberry commodities.

IV. Conclusions

Base on the problems, goals and the result of this research, we can state the following :

- Reviewed from feasibility aspect, the strawberry business at Pancasari, through all of technology usage, were feasible to develop. The 'bedengan' plastic mulsch with containment is the most feasible .
- Reviewed from feasibility aspect, the strawberry business at Candikuning, through all of technology usage, were feasible to develop. The 'bedengan' plastic mulsch with containment is the most feasible .
- The strawberry production at Pancasari, Buleleng and Candikuning Baturiti, Tabanan ready to fulfill the demand which come from hotels, villas, restaurants, supermarkets, bakery at Jimbaran, Pecatu, Sanur, Kuta, Nusa Dua and Denpasar. Similarly, the demand which come from agents have fulfilled. But, the highly demand which come from CV Bali Wein at Canggu, Badung, PTPN XII Kalisat Jampit Ijen East Java and PT WELKO Surabaya cant be fulfilled.
- The main constraint be faced by the farmer at Candikuning Baturiri, Tabanan and Pancasari, Buleleng, basically are : lack of excellent seed, seed price, fertilizer, pepticide, plastic mulsch price, containment price, highly labor cost and marketing problems specially on the big harvest Also bad climate seldom happen at Baturiti, Bedugul, i.e : bad fog which damage the strawberry leafs, then foul, and damage the flower and can't produce bear fruit.
- Almost of the farmers at both areas require bank loan to help the business financing. The main reason are : highly production cost (specially in green house technology), and highly maintenance cost. Almost of the farmers also expect that the bank loan are non collateral, grace period payment adapted to production cyclus, quick pouring process, interest rate less than 1,00 %/month dan the minimum tenor = 2 years.
- Accordance to highly demand for the both production centers, so this region have potential opportunities to develop and become strawberry agrotourism.

Recommendations

- Accordance to the research results, the strawberry businesses were profitable and have a bright prospect to developed in the future. The banking world have to sure for strawberry businesses financing at Bali. The things have to considerate are : payment scheme, non collateral, grace period payment adapted to production cyclus, fast process, interest less than 1,00%/month, and the tenor as long as minimum 2 years.
- Base on the demand and profit of strawberry businesses, then the decision makers at strawberry production centers have to considerate the opportunities of Baturiti, Bedugul and Pancasari, Buleleng be an strawberry agrotourism. For this, it required a earnestly movement by all of people, including farmer/farmer group of strawberry, 'Desa Ada't at that region, Dinas Pertanian Tanaman Pangan under Local Government coordination, have to begin to conduct a more intensive and comprehensive study, so this sector could be developed to become agrotourism area which helpful to support the locally generated revenue.
- The determination of that regions as strawberry agroindustries had to legalized by Perda., so would impact to reduce land diversion. The success of this program can give a positive impact to employment opportunity enlagerment, increase the strawberry famer's income and guaranteed the food endurance at Bali, increase the contribution from agriculture sector to PDRB Bali, and last creates a positive impact to sustainable agriculture at Bali Provice.

References

Darwis, Valeriana. 2007. *Budidaya, Analisa Usahatani dan Kemitraan Stroberi di Tabanan, Bali*. Departemen Pertanian

Gunawan, L.W. 1996. *Stroberi*. Penebar Swadaya, Jakarta.

Ibrahim, Yacob. 2003. *Studi Kelayakan Bisnis*. Rineka Cipta, Jakarta

Indraningsih, Kurnia Suci, Ashari dan Supena Priyatna. 2007. *Strategi Pengembangan Model Kelembagaan Kemitraan Agribisnis Hortikultura di Bali.* Pusat Analisis Sosial Ekonomi dan Kebijakan pertanian. Bogor

Kurnia, Agus. 2005. *Budidaya Stroberi*. Agromedia Pustaka, Jakarta

Rukmana, H.R. 1998. *Stroberi, Budidaya dan Pascapanen.* Kanisius, Yogyakarta.

Setiani, Aries. 2007. *Budidaya dan Analisis Usaha Stroberi*. Sinar cemerlang Abadi,Jakarta

Sinungan, Muchdarsyah. 1992. *Manajemen Dana Bank.* Rineka Cipta, Jakarta

Suta, I Nyoman. 2007. *Budidaya Tanaman Strowberry*. Tabanan, Bali.

Untung, O. 1999. *Stroberi Pagi di Bali Sore di Jakarta.* Trubus No. 350 hal. 52

http://tekben38.blogspot.com/2005/01/sejarah-dan-budidaya-stroberi.html

http://www.ristek.go.id

DEVELOPMENT OF AGROTOURISM-EDUCATION BASED ON DIVERSITY OF SALAK IN THE SIBETAN VILLAGE AS GERMPLASM CONSERVATION EFFORTS

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Abstract

Sibetan village, Karangasem is a centers of Salacca (*Salak*) plant in Bali and is considered the origin of *salak* plant. In this area was found 15 cultivar, but until now has not been developed optimally, on the other hands the visitor in agro-tourism *salak* is very low at 0.008% of the total of 462 233 tourists visiting Karangasem regency. Factors that contribute to the low tourist arrivals to the *salak* agro-tourism were: 1). In addition to the seasonal nature of fruit, quality fruit not meet the standards. 2) There are no collection and a demonstration gardens that can be used as a field laboratory to empowered them in a way characterized of properties agronomic and evaluated the biotic and abiotic stress resistance. 3) The agro tourism object not managed properly , the operational activities of the tour, and lower human resources. 4) The object of Agro-tourism *Sala*k Sibeten no yet marketed optimally, in addition to cooperation among tourism stakeholders still low. The solution offered is the physical revitalization and infrastructure of agro-tourism of *salak* based on educational of *salak* diversity. In this paper were review the matters relating to the design and planning tours based on education and diversity of *salak* cultivar conservation efforts, empowerment, and utilization of germplasm of plant species existing *salak*.

Keyword: Agro-tourism-Education, Diversity, Salak Germplasm, Conservation

I. INTRODUCTION

Tourism has become one of the industries that have a major impact on the growth of the economy of Bali. From GDP Bali amounting to 73478.16 billion dollars, the contribution of trade, hotels and restaurants amounted to 30.62% (Bali in Figures, 2011). However economic benefits derived from the tourism sector is still often accompanied by environmental destruction, land conversion, social and cultural exploitation and criminality (Diparda Prop.Bali 2009; Dharma Putra, 2010). The gap between the agriculture and tourism industry in Bali is also backed by unequal distribution of agricultural products for the benefit of tourism (Astiti, 2011), so that the Bali community are reluctant to develop the agricultural sector. Therefore, Bali is a small island that has natural beauty and unique customs, culture and religion often have to be faced with the difficult choice between developing agriculture and tourism at the expense of the environment or the reverse.

Addressing this phenomenon required a wise choice by developing synergy between agricultural with tourism by establishing a tourism package such as agro-tourism Salak Sibetan. The potential of agro salak in this village was the very wide garden reaching 81.12% of the area of the Sibetan village (Monograpi Sibetan 2010). Genetic diversity of Bali salak reached 15 types and is not owned by other regions (Darmadi et al., 2002), however preservation efforts, empowerment, and utilization of germplasm of plant species of salak there has not been much done (Sumantra et al, 2013; Sumantra et al. 2014).

The uniqueness of the package of Agro salak Sibetan, Karangasem, should be potential combined with attractions and handicrafts. This area is also plantation area an environmentally friendly, because farmers never use chemicals as fertilizers or pesticides. Beautiful panorama in this area with Muding hill at the southern end provide good panorama such as a valley with paddy fields and beach panorama in Manggis districts. This Agro-tourism is also close to Bukit Putung attractions, Candi dasa beach, Tirta Ganga and Besakih temple. This program is one of the main implementation of the Bali Provincial Regulation No. 3 of 2013 on the Protection of Local Fruits, provides opportunities and conducive climate to the development of agro salak (Provincial Government of Bali, 2013). The main problem of Salak Agro-tourism in Sibetan, the number of visitors is very low 0.008% of the total 462 233 visits from 12 destinations in Karangasem (Diparda Bali 2012).

Some factors that contribute to this area was: 1). Travellers difficult getting fruit to be picked directly, especially in off season/ outside harvest (Sumantra *et al* ,2012; Sumantra *et al*, 2014) , 2) There is no orchards collection and demonstration gardens. 3) Collection of salak has not been fully used as source of germplasm and is not fully understood by students and visitors because its place dispersed. 4). Not managed properly from the arrangement of the area the operational activities of the tour, and human resources. 5). Not to be marketed to the fullest, as well as cooperation among tourism stakeholders still low. From the above description the agro-tourism salak Sibetan with the existing diversity is potentially developed as an educational recreation park.

II. RESEARCH METHODS

Thus agricultural environment is not only the manufacturer of concrete goods, but also of intangible goods, especially those relating to culture, education, food, landscapes and environment. Thus to determine the development of agro-tourism, a careful analysis should be conducted, a SWOT analysis which highlights opportunities, weaknesses, strengths and limitations. The SWOT analysis includes: Strong points: development of powerful agro-tourism; involvement of different ways of life and traditions; high quality service, peace and security activities. Weaknesses: Lack of training; lack of legislation regarding the agro-tourism; lack of additional supply; the high cost of accommodation and restoration. Opportunities: Promoting the preservation of customs and local traditions; new opportunities for employment in rural areas; alternative markets for local products. Restrictions: lack of planning and concrete goals; the risk of massiveness; low political awareness.

III. RESULTS AND DISCUSSION

3.1. Soil and Climate

Sibetan area, located at an altitude 450-570 m above sea level, classified into B2 agro-climatic zone with 9 months of wet and dry 3 months. The average annual rainfall 2966.40 mm, the highest rainfall fell in December (404.4 mm) and the lowest in June (73.09 mm). The dry season lasts from June to August, while the rainy season from September-May. The mean temperature was 24,29^{o}C with the highest temperature 25.42 ° C in December and the lowest temperature in July 22,53^{o}C, air humidity 86.57%. Soil texture Clay, with moderate C-organic content, moderate N, P is very high and K soil is very low, soil pH slightly acid.

The analysis of water balance shows, the value of potential evapotranspiration (PE) during the year reached 1282 mm, while rainfall (P) in a year reached 2967 mm. In June and July PE value greater than the value of actual evapotranspiration (ETA) so that in this period the water deficit occurred in succession 9 mm and 2 mm. In August the value of PE equal to ETA in line with the period of recharging so that in September had reached field capacity soil and water surplus periods occur until May, with number reached 1726 mm.

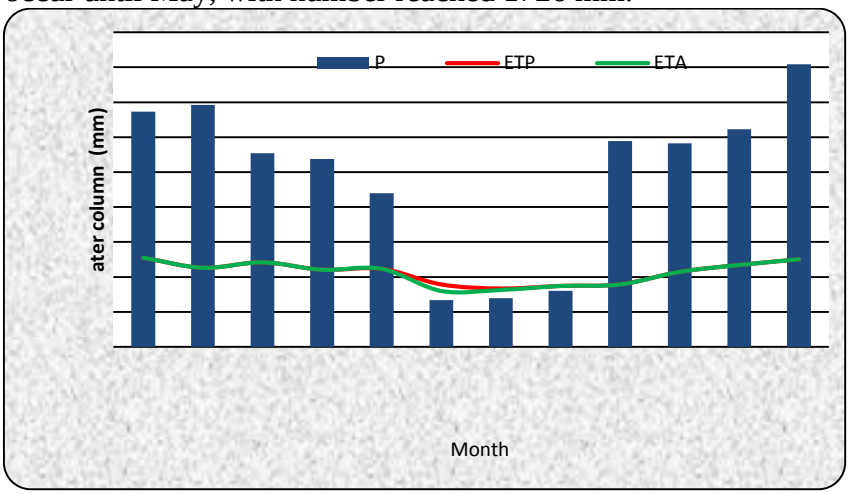

Figure 1. Precipitation (P), evapotranspiration (ETP) and actual evapotranspiration (ETA) Sibetan Karangasem

3.2. DEVERSITY OF SHADE TREES.

The presence of shade trees on the salak plants is very important because these plants do not tolerate full sun. The results showed that the *Erythrina variegata* L. and *Musa paradisiaca* were the dominant shade plants in Sibetan (Table 1)

Table 1. Relative Density (KR), Relative Frequency (FR) Relative Dominance (DR), Importance Value Index (IVI) and the Diversity Index (H) of shade trees in Karangasem (n = 18 plots)

No	Tanaman pelindung	Karangasem				
		KR %	FR %	DR %	VI %	H
3	*Musa paradisiaca* L.	34.95	16.98	6.43	58.36	-0.14
4	*Erythrina variegata* L.	29.13	16.98	20.41	66.52	-0.14
5	*Durio zibethinus* Murr.	4.37	8.49	12.57	25.44	-0.09
6	*Leucaena glauca* Benth.	0.97	1.88	0.51	3.37	-0.02
7	*Glyricidia sepium.*	7.28	10.37	3.08	20.74	-0.08
8	*Cocos nucifera.*	6.31	12.26	5.97	24.55	-0.09
9	*Garcinia mangostana* L.	2.91	5.660	14.17	22.75	-0.08
10	*Albisia falcate.*	3.88	7.547	13.50	24.93	-0.09
13	*Toona sureni* (Bl.) Merr.	1.94	3.774	8.57	14.29	-0.06
17	*Nephelium lappaceum*	3.39	6.604	8.49	18.49	-0.07
18	*Lansium domesticum*	2.43	4.717	2.05	9.19	-0.04
19	*Baccaurea racemosa* (Reinw. Ex. Bl.) M.A	0.48	0.943	0.34	1.76	-0.01
20	*Swietenia sp*	1,94	3,774	3,87	9,59	-0,05
		Total H	0.96			

This area does not have a special character in the development of agricultural commodities other than salak, so the shade plant according to agro-climatic conditions and farmer needs. Therefore salak plants in this area planted intercropped under coconut, durian, banana and *Erythrina* sp. (Sukewijaya et al., 2009).

3.3. DIVERSITY OF SALAK

Based on plant height, leaf shape, the number of thorns, fruit characters include skin color, flesh, fruit taste, farmers in Sibetan differentiate salak into several types such as:

1. **Salak Gondok:** fruit skin reddish brown, yellowish-white flesh.
2. **Salak Nenas:** end of the fruit pointy, fruit skin reddish brown, flesh fruit yellowish-white, flavors such as pineapple.
3. **Salak Nangka,** fruit skin reddish-brown, yellowish white flesh fruit, fruit flavors like jackfruit.
4. **Salak Putih:** white fruit skin, white flesh fruit and people called salak "Bule" (Fig. 5)

5. **Salak Maong:** fruit skin reddish brown with white spots , farmer called Maong or moldy, white flesh and sweet taste (Fig. 2).
6. **Salak Gula pasir:** Fruit skin dark brown , white flesh and sweet taste (Fig.6) . The research already found three types of salak gulapasir are distinguished by the shape of the fruit (salak gula pasir nangka, nenas and gondok Fig 7 – Fig. 9).
7. **Salak sepet:** fruit skin reddish brown, yellowish-white flesh , fruit flavors astringent .
8. **Salak getih or salak Boni :** fruit skin reddish-brown and red fruit flesh (Fig 3).
9. **Salak cengkeh,** Fruit skin brownish red, yellowish-white flesh, rather loud and fruit flavorful like cloves.
10. **Salak Nyuh,** fruit skin brownish red, thorn slightly and shapes like palm trees (Fig. 4) .
11. **Salak Pade,** fruit skin red-brown, yellowish-white flesh, the trees size is short (Fig. 10).
12. **Salak Injin.** Fruit skin brownish red, flesh fruit white blackish like black rice.
13. **Salak Muani** or male salak tree that never fruitful although the plant is blooming. Salak Muani only found in the salak gulapasir and salak nenas (Fig. 11).

Fig.2: Salak Maong

Fig.3: Salak Getih/salak Boni

Fig. 4. Salak Kelapa

Fig.5. Salak Bule

Fig.6 Salak Gulapasir

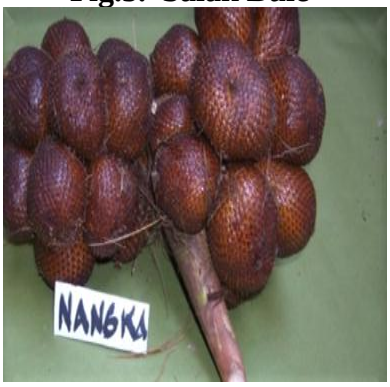

Fig 7. Salak Gondok **Fig 8: Nangka** **Fig. 9. Salak Nenas**


Fig. 10. Salak Pade


Fig. 11. Salak Muani or Male Salak

3.4. SWOT analysis of Agro-tourism base on the diversity of salak

Salak Agri-tourists can choose from a wide range of activities that include picking fruits salak, tasting honey, learning about wine salak, or shopping in farm gift shops and farm stands for local and regional produce or hand-crafted gifts.

For planning and marketing a rural community and weighing the pros and cons of tourism an analysis of potential, opportunities, weaknesses and threats in the development of ago-tourism of salak needs to be done.

a. Strengths

- The diversity of 15 species of salak can be used as a practices for students
- The diversity of 13 species of shade plants potential to be develop as a land concervation.
- On Salak garden will be found rare birds such as punglor birds.
- Regulation of the Bali Provincial No. 3 of 2013 on the Protection of Local Fruits
- The post-harvest products such as wine salak , dodol, pia chips salak .
- The Gardens salak with beautiful landscape
- Ritual culture as a *Ngusabe Dehe, Ngusaba dangsil* etc.

b. Weaknesses

- Implementation of the Bali provincial regulation No. 3 of 2013 is not optimal
- Gardens collection unformed.
- Character of 15 types of salak is not yet known in detail.
- The guest difficult picking fruit out of season harvest
- The combination of shade trees to plant salak has not been much explored

- There are no clear rules on the management of salak agro-tourism
- Planning the area and complete facilities such as toilets, clues to the location and the parking area is still lacking
- Lack of promotion from stakeholders .

c. Opportunities

- Visitor both students, researchers and guests from abroad continues to rise
- Formed agro- torism based on diversity of salak will protect salak germplasm and at the same time the new plants will be found.
- The economy of society will increase by selling food or selling crafts made from salak or plants shade.

d.Threat

- Extinction of germplasm salak.
- The formation of a new tourist attraction will disrupt the sustainability of agro-tourism of salak.

3.5. DEVELOPMENT STRATEGY OF AGRO-TOURISM

A. Planning and Marketing Education Package

- Analysis approach base on 4 P (Product , Price, Place and Promotion)
- Analysis approach base on 4 A (Attractions, Accessibility, Amenitas and Activity)
- SWOT analysis ((Strengths, Weaknesses, Opportunities, Threats)
- Analysis approach to STP (Segmentation, Targeting, Positioning).

B. Preparation Package Education Agro Tourism

- Preparation of appropriate educational tour package price and existing facilities
- Agenda and schedule a tour package.

IV. CONSCLUSION

1. Thera are 15 tyepes of salak cultivars and 13 types of shade plant.
2. The seasonal nature of fruit and quality of fruit not meet the standards.
3. There are no collection gardens and a demonstration garden that can be used as a field laboratory.
4. The agro tourism object do not managed properly , the operational activities of the tour, and human resources
5. The object of Agro Salak Sibeten no yet marketed optimally, in addition to cooperation among tourism stakeholders still low.

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References

Astiti, 2011.*Sinergi Pertanian dengan Pariwisata*.http://asti astiti.blogspot.com /2011 /08/ sinergikan-pertanian-dengan-pariwisata.html (down load 28 Nopember 2013).

Badan Pusat Statistika Provinsi Bali, 2011.*Bali Dalam Angka 2011*. Arysta Jaya Denpasar.

Darmadi, AAK., A. Hartana, J. P.Mogea**.** 2002. *Perbungaan salak bali.* Hayati 9 (2) :59 – 61.

Dharma Putra, 2010. *Pencemaran Lingkungan Ancam Pariwisata Bali,* : Manikgeni.

Disparda Provinsi Bali, 2010.*International Seminar on Tourism Harmonization Development*, Faculty of Tourism, Udayana, Denpasar, 27 April 2010.

Dinas Pariwisata Propinsi Bali 2012.*Jumlah kunjungan wisatawan pada obyek-obyek wisatawan di Bali tahun 2012*.

Labek Suyasdi Pura, K. Sumantra, Sumeru Ashari, 2013. *Potensi hasil dan mutu buah beberapa kultivar salak gulapasir pada habitat baru di Bali dan upaya perbaikkannya*. Laporan Hibah Bersaing. Univ. Mahasaraswati Denpasar.

Sumantra 2010. *Fenotif dan Genotif beberapa salak gulapasir*.Laporan penelitian.LPPM Unmas Denpasar.

Sumantra, K. Sumeru Ashari, T. Wardiyati, Agus Suryanto, 2011. *Hasil dan mutu buah salak gulapasir pada berbagai ketinggian berbeda di daerah pengembangan baru di Bali*. Prosiding Seminar Nasional Perhimpunan Hortikultura.Lembang 23-24 Nopember 2011.

Sumantra, K. S. Ashari, T. Wardiyati, and A. Suryanto.2012. *The agroecosytem approach as a concept in sustainable cultivation of salak trees cv. Gulapasir in new development areas in Bali,* in Proceeding of the International Conference on Sustainable Development (ICSD*)*, Denpasar, Bali, 2012, pp. 348- 364.

Sumantra dan Labek Suyasdi Pura, 2012.*Analisis neraca air lahan pada pertanaman salak gulapasir sebagai dasar unutk pembuahan di luar musim.*Jurnal Agrimeta Vol.02 (03): 1-12.

Sumantra, K. Sumeru Ashari, T. Wardiyati, Agus Suryanto, 2012. *Diversity of Shade Trees and Their Influence on the Microclimate of Agro-Ecosystem and Fruit Production of Gulapasir Salak (Salacca Zalacca var. Amboinensis)Fruit*. International Journal of Basic & Applied Sciences IJBAS-IJENS :12 (06) : 214-221.

Sumantra, K.. Sumeru Ashari, N.Labek Suyasdi Pura, 2014. *Heat unit, phenology and fruit quality of salak (Salacca Zalacca var. Amboinensis) on different elevation in Tabanan regency Bali*. Agriculture, Forestry and Fisheries. (http://www.sciencepublishinggroup.com/j/aff) :3 (02): 102-107.

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