

FARMERS ADAPTATION OF POST CONVERSION LAND IN SUBANG DISTRICT, WEST JAVA, INDONESIA

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ABSTRACT

Subang Regency has an important role as the rice supplier area. As one of the rice production centers in Indonesia, rice farmers address rice fields as an asset or resource. As an asset, farmers conduct rice farming activities in the rice fields with economical orientation and rely on their food source mainly from the rice production. Conversions of paddy fields have changed the socioeconomic balancing amongst the farmers. They responded to the changes by adapting to new conditions, thus farmers' post-conversion responses are an interesting aspect to study. This research aimed to understand the rice farmers adaptations, which was involved 15 key informants using in-dept interviews and purposive sampling method of 164 respondents. The analysis of the interview results used the concept of adaptation based on objectives, timing, and then strengthened with relevant documents for the study area. This study found, that: 1) farmers tried to make adjustments in using the compensation funds, livelihood, professions, farming, and household needs; 2) farmers' adaptation are their way to earn the income and maintain their livelihood, and 3) some farmers firmly stated that their adaptations have made newly more prosperous conditions for them.

Keywords: farmer adaptation, farmer's welfare, business diversification, land conversion

INTRODUCTION

Farmers produce rice for consumption, food reserves for their family, and as a source of cash for non-food needs [1]. The progress of food production, especially rice, is constrained by the interaction of very complex factors. Conversion of paddy fields is one of the factors affecting the growth of rice production. The increasing demand for non-agricultural land has decreased the paddy field area, thus impacting on the decreasing rice production capability [2]. Beside the land availability factor, the productivity of rice production is also influenced by natural variability such as climate, water availability, soil fertility, population pressure and economic growth [1]. The role of those variabilities would affect the efforts to improve the efficiency of rice farming in terms of increasing rice production capacity and its productivity [1].

The usage of land around rice fields for industries, settlements, and transportation infrastructures might incline the possibility of paddy fields conversion [2];[3];[4]. The paddy field area would get more pressure when the level of productivity of the surrounding area are economically higher. Productivity level of a land will affect its value. The higher level of the productivity means the higher value of a land. Differences of land values are causing the competition between land use. Changes will occur due to its competition from lower to higher land value [5];[6]. The level of productivity of a land is the determining factor of land conversion. Land as a commodity has its own price value determined based on the level of productivity, location, and activities on it. Thus, productivity level is one of the parameters or reasons of the functional change of rice fields. This is because the productivity level of lands surrounding the paddy fields tends to cause paddy fields conversion for other usages to increase the land's productivity and increasing its value. The value of land might

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alter along with the changes occur within the community.

Farmers require the interaction of six elements to make adjustments to their available assets and resources, as follows: assets, strategies, results, rules, risks, and influence [7]. Conversions towards the paddy field area negatively impact the farmers' condition, socio-economically, by potentially reducing their welfare [8]. Meanwhile, various socio-economic and socio-cultural conditions among the farmers are determined by how they respond to the conversions. Different with farmers in other areas, farmers in Subang district are dealing with a specific situation to access the assets and resources of land.

In West Sumatra, the access to land for Minangkabau communities is determined by the tribe membership [9];[10]. While, in Papua, the access for indigenous peoples in the CAPC (Cycloop Mountain Nature Reserve) area is determined by the Ondoafi (Tribal Chief)[11]. Furthermore, within the Soppeng society of South Sulawesi, the determination is based on their local wisdom [12]. The abovementioned differences would, of course, causing different adaptations among the farmers toward the paddy fields conversion. An evaluation to the adaptation will determine the subjects of, to what, and how the adaptations occur [13]. Farmers in Subang District had to adjust their manner to access paddy fields because of the existent conversion for the construction of barrier-free transportation and industrial facilities located on their land.

Several previous studies have examined how adaptation occurs, who adapts, and what stimulates the adaptation. There are adaptation researches related to who adapted, such as: farmer response [14];[15];[16];[17], fisherman's response [18];[19], stimulus for adaptation by climate change [20];[16];[21];[22];[23];[24], and ecosystem management [12];[20];[25];[26];[27]; [9];[24]. The above researchers are part of those who have revealed interesting phenomena in their researches, as well as the phenomenon of the farmers' adaptation found in Subang Regency, which is important and interesting to be studied. The farmers' actions are a strategy to respond with the conversion of paddy fields. This study is important because the farmers' adaptation to the land conversion stimulus has not been done much by previous researchers. This study examines the

adaptation of the farmers on how they access paddy fields and how it is implying towards the existing policy. The study focused to analyze the forms of the farmers' adaptation in using the compensation funds and how is their efforts to diverse business. The study adopted the concept of adaptation proposed by [13], which is to examine the adaptation of farmers, that can occur, whether in a responsive, anticipatory, spontaneous, or planned manner.

MATERIAL AND METHOD

This study was taking place at Subang Regency of West Java. The area located in 107°31'-107°54' East Longitude and 6°11'-6°49' South Latitude (Figure 1).

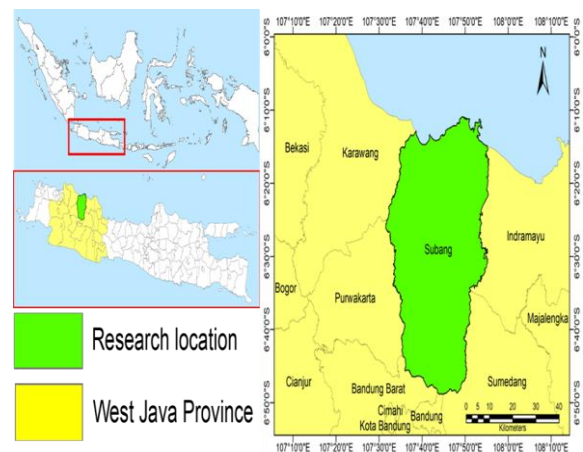


Figure 1. Research location. Subang Regency, West Java, 2017

Data Collection

Data collection used an in-depth interview technique with key informants. The key informants were the farmers, particularly the rice farmers, who master the problem and were willing to provide the required data for the in-depth interviews. The in-depth interviews were assisted by the guidance of survey forms and recorded voice, which then were transferred into transcripts. The survey forms had three main sections, i.e.: 1) informant characters, 2) histories of the researched area, and 3) the farmer's financial conditions. The interviews were conducted in November 2016 and involving 15 key informants. The interview results were obtained from the key informants, which subsequently

used for research purpose as the evidence of the farmers' condition [28].

concept of adaptation [13];[30] as presented in Table 1.

Table 1. Operational definition of the adaptation of the farmers after land conversion in Subang Regency, West Java, 2017

Attribute	Adaptation	Operational definition	Concentration
<i>Purposefulness</i>	<i>Spontaneous</i>	A goal-oriented farmer's action to adjust income or meet family needs	buying livestock, making fish ponds, improving the quality of the house, paying off debts, financing the pilgrimage, buying consumptive goods
	<i>Planned</i>	Purpose-oriented farmers' actions to retain their profession as farmers	Renting the land, profit sharing, land pledge
<i>Timing</i>	<i>Responsive</i>	The farmers' actions when they were able to access land resources	buying rice fields
	<i>Anticipatory</i>	The farmers' actions when they were less able to access paddy field resources or simply utilize resources other than available paddy fields and try to survive in hazardous conditions	saving the compensation fund from the sale proceeds in the bank, conducting activities beside the farm business,

Source: Developed from [13];[30]

Primary data were also obtained by interviewing 164 respondents from 11 selected sub-districts within the period of October – November 2017. Purposive sampling method was used because there was no available sample of the farmers whose fields were converted. Several relevant documents complemented the understanding of the current review [29]. The aforementioned documents were including all of the written materials related with the research focus and publication.

Adaptation means an attempt to do something more appropriate to change or modify, referring to adaptation processes and conditions that have specific interpretations in certain disciplines [13]. Adaptation analysis requires an operational definition to describe the subject and boundaries of the unit of analysis. Subject focus and limitations of the unit of analysis require attributes to differentiate processes and forms of adaptation [13]. The common used differences are purposefulness and timing [13];[30]. This study selected the purposefulness attribute as a differentiator between the spontaneous adaptation and the planned adaptation, while the time-setting attribute referred the activity as the differentiator between the responsive adaptation and the anticipatory adaptation. The operational definitions in this study were developed from the

The completion of research objectives used primary data both qualitative and quantitative. Graphically the methodology in this study is presented in Figure 2.

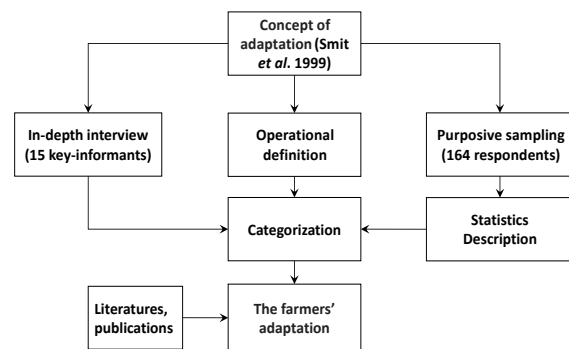


Figure 2. Framework for the farmers' adaptation of post-conversion in Subang Regency, West Java, 2017

RESULTS AND DISCUSSION

Adaptation through the Use of Compensation Funds

The result based on the interviews with 164 respondents showed, that the farmers used compensation funds for various purposes. i.e.: buying another paddy field, renovating dwellings, business capital, buying transportation vehicle, for tuition fees, renting land, bank savings, paying off debts, building houses, and for religious needs.

Table 2. Farmers' adaptations in using the post-conversion compensation fund in Subang Regency, West Java, 2017

Attribute	Adaptation	Farmers' response	Proportion
Purposefulness	Spontaneous	House renovation	15%
		Buying a vehicle	9%
		Building a house	7%
		Tuition fee	7%
		Paying off the debt	4%
		Pilgrimage	1%
	Planned	Renting other farmers' fields	7%
Timing	Responsive	Buying rice fields in other locations	35%
	Anticipatory	Venture capital	10%
		Saving in the bank	5%

Source: survey results, n=164, (2017)

Meanwhile, most of the farmers, 35%, allocated the fund to purchase paddy fields in other locations. The farmers' response to buy paddy fields in other locations are categorized as the form of responsive adaptation within the time arrangement attributes. Some farmers are trying to maintain access to land resources of rice production by renting a land owned by other farmers (7%) rather than to buy paddy fields in other locations to produce rice. This effort is to keep their profession as farmers and categorized as a planned adaptation. Table 2 summarizes the forms of farmers' adaptations in using the compensation fund after conversion.

The study also found that the use of the compensation fund especially for business capital, either on agricultural or non-agricultural sectors, could be categorized as businesses. Most of the farmers used the fund for the non-agricultural business sector, such as trading, tent renting, or being a traditional artist. Also, there are farmers who used compensation funds for venture capital in the agricultural sector that is not related to the land access, such as sheep and poultry rearing. Some other farmers are utilizing the compensation fund for businesses that directly related to the paddy rice production activities, e.g. purchasing hand tractor and building a rice mill. Result of the interviews indicated, that 43% of farmers responded the compensation fund for the goal-oriented spontaneous actions, either to adjust incomes or to meet their family needs. From the aforementioned portion, most of the household used the fund to renovate their houses (15%), while some other farmers used it to build a house (7%). There are also farmers who used the fund to pay their debts (4%). The goal-oriented

farmers' actions to retain their profession as farmers were categorized as planned adaptations. In total there are 7% of farmers, who responded the compensation funds to stay as farmers.

Farmers' actions when they are able to access the land resources are categorized as responsive adaptations with timing attributes. Based on the data analysis, there are farmers who adapt responsively (35%). Those farmers are able to access the land resources using the compensation funds and purchased paddy fields in other locations. In contrast with the responsive adaptation, farmers with anticipatory adaptation are those whose actions are less able to access the land resources, or use only the land resources not for the paddy fields with struggling livelihood. Farmers within this category responded the obtained compensation fund for venture capital (10%), and bank savings (5%). The farmers' action to use the fund for rent other paddy fields or to manage other farmers' land with profit sharing showed that they have a planned adaptation. In general, there are two embedded attributes of farmers based on their response towards the compensation fund, i.e.: 1) purposefulness, consists of two categories spontaneous and planned adaptation, and 2) timing, which consists of responsive and anticipatory adaptation.

Flexibilities in managing the money determines various adaptation forms of the farmers. Based on the purposefulness attribute, farmers who received big compensations able to access paddy fields by purchasing new fields at different locations, wider than they previously had. Some of the farmers saved a part of their compensation money in a bank. This is an

anticipative action to avoid possible financial failure in the future. They postpone to use the fund, so thus they able to draw the fund back from where they store it. This type of action is a form of anticipatory adaption with timing attribute. Also, there are farmers that used some of the fund to improve the quality of their homes, which is a form of spontaneous adaptation based on the purposefulness attribute.

The second type of farmers, which have no longer paddy fields resource due to conversion, were having less option to respond. Some of them used the fund to rent other field or to manage other farmer's field by profit sharing mechanism. This response indicated that the farmers still wanted to retain their profession as farmer, which is categorized as a goal-oriented with planned form of adaptation. Some farmers who were less flexible in managing the funds, while at the same time, not be able to access paddy fields adapted with doing business in the non-agricultural sectors, i.e.: tent renting and being traditional artists.

Adaptation through Diversification of Employment and Endeavor Opportunity

Resource and financial constraints force households to implement various strategies to survive [26]. Paddy fields scarcity or loss have forced farmers to seek the alternative livelihood

additional work, while most of them, 68%, persist to keep the rice farming as the only source of income. Some of those who do the additional job keep their direct access to land by planting vegetation, however most of them are working without the need of a direct access to land, i.e.: livestock rearing, freshwater fisheries, artistry or trading agricultural machineries. Being based on the purposefulness attribute this action is categorized as spontaneous adaptation, characterized by the farmers' capability lacking to access the land directly.

For farmers, paddy fields are viewed as assets due to its economic value. Paddy fields are also viewed as a resource because farmers rely on the land to cultivate rice as their food source. Thus, paddy fields conversion means problems for the farmers since it could potentially eliminate their assets and resources. To respond to the existent land conversion, farmers diversify their businesses as an effort to avoid greater loss [31];[32];[33]. Another reason for the farmers doing agricultural diversification is to meet their household spending [34];[35]. Most of the farmers are no more considering important factors while performing the diversification, such as: water availability, land suitability, crop varieties, and market needs [34];[35]. To overcome the insufficient water supply, they drill wells or utilize the unused excavated wells owned

Table 3. Farmer post-conversion response and adaptation through diversification of employment opportunities in Subang, West Java, 2017

Attribute	Adaptation	Farmers' response	Proportion
Purposefulness	Spontaneous	Farmers struggle to maintain the existence of paddy fields to preserve their income	52%
	Planned	Livelihood diversification with direct access to land, i.e.: intercropping or diversify commodities.	14%
Timing	Responsive	Utilize the compensation fund for converting abandoned land	2%
	Anticipatory	Livelihood diversification without direct access to land, i.e.: fishery, livestock rearing, and gardening.	32%

Source: survey results n=164, (2017)

in or out of agricultural sectors. This study found that 87% of the respondents still retain their profession as farmers, while 13% of them decided to work outside the agricultural sector. Job diversification is one of the strategies carried out by the farmers to fulfill their household needs. However, there is no clear relationship between diversified sources of income and increased household income. Based on the observation, there are 32% of the rice farmers that do

by a company.

These diversification activities can be characteristically divided as: 1) spatial-location based business variation, and 2) input-output based business variation. The spatial-location based business is characterized by the use of different area to carry out various agricultural activities. In contrary, the input-output based business does not need different area for the

farmers diversify their agricultural activities. Intercropping activities could be used as an example of the input-output based business

constraints, such as: land unsuitability for vegetable commodities, and higher risk than rice. Not only by intercropping, the input-output

Table 4. Farmers' expectations after land conversion related to policy interventions in Subang Regency, West Java, 2017

Type of intervention	Intervention desired	Proportion
Output production (Grain)	Increasing the price of grain rice (Output), Grain prices stabilization	21%
Direct access to land resources	Moratorium of rice fields conversion, No paddy fields eviction policy, Buying more paddy fields, Government to provide substitution for converted paddy fields to the farmers, Government to provide paddy fields for farmers, Government to give higher compensation fund	15%
Farming profession	Able to re-farm, Maintain farmer profession	10%
Subsidy Input production	Subsidy of seeds and fertilizers, Capital assistance for farmers, Business capital assistance, Assistance to farmers whose land are converted, Government to provide cheap and available fertilizer, Government to provide cheap production tools	10%
Farmers' welfare	Government to pay attention to farmer's fate, Increasing farmers' welfare	21%
Production facilities	Agricultural development, Agricultural mechanization, Improvement of irrigation channels	12%
The efforts	Market availability, Government to facilitate the entrepreneurship, Agriculture and industry Sinergy	5%
The increasing of the farmers' capacity	Skills training	3%
Labor	Jobs, Job opportunities for children	3%

Source: survey results n=164, (2017)

variation. In order to maximize their income, farmers cultivate commodities that are economically beneficial [36], such as: vegetables or different types of rice that have higher selling value. Not only intercropping, usually, farmers also cultivate a short living crops to gain the same, or even higher, incomes as before the conversion occur. Unfortunately, due to various limitation of access to the converted paddy fields, not all of the farmers are able to do diversification.

The increasing level of consumption and the existent market opportunity of fresh vegetables and fruits has encouraged farmers to work on the aforementioned commodities that are economically higher than rice [37]. However, market opportunities are not the main consideration for the farmers since crop diversification is only to complement their incomes. Thus, being based on the aforementioned explanation, diversification is considered only as a spontaneous adaptation. Nevertheless, the interviews revealed that the farmers are also facing with some technical

based business variation is also done by integrating crops with livestock. The crop-livestock integration system is an alternative that potentially optimize the production of available land resources to increase farmers' income. Vertical diversification could potentially increase the farmers' income [32], but still it has small opportunities for the farmers due to its unaffordable prerequisites, i.e.: the availability of market and processing technology, as well as, the simplicity of technology adoption [34];[35].

After the conversion, farmers are still able to broaden their paddy field in one or many ways, such as: 1) purchasing new paddy fields; 2) renting paddy fields, or 3) converting abandoned lands to paddy fields. The above action could ensure the farmers to adapt with the conditional changes, while retaining their profession as a farmer. According to [2], agricultural extensification is a method to increase the agricultural yield by broadening the agricultural area. Based on the observation, some of the farmers were extending their paddy fields by utilizing an abandoned area owned by a company. There is no available

irrigation system at such area, nor water storage. The only source of water is from the precipitation during the wet season. Thus, to cope with the dry season the farmers drill wells for the water source and irrigation. Adopting such irrigation system is strategically important, even might potentially develop the agricultural diversification [38]. Some fortunate farmers could access abandoned artesian wells, owned by a company, for irrigation purpose. The farmers' responses are categorically presented in Table 3.

Post-Conversion Political Supports

The paddy field conversion is a problem for the food sector due to its potential to decrease the rice production, while the level of productivity is stagnant. The conversion could also affect the farmers' livelihood and their family wealth. Further, the above situation forced the farmers to expect changes and supports from stakeholders for their living standard improvement, which is presented in Table 4. In order to adapt with the paddy field conversion, various income adjustment has been carried out by the farmers. They also expect a stable condition for their agricultural livelihood and rice production continuities.

There are challenges for the farmers to adapt, while at the same time they have strategies to fulfill their household spending. Interaction changes occur between the farmers and their paddy fields due to farmers' activities alteration. They address the dynamics with new strategies to adapt with the occurring changes. Farmers' strategies are based on the allocation of their available resources to overcome limitations that affect their livelihood. Their adaptations are always to gain more income, i.e.: 1) regaining paddy fields as assets in other location; 2) gaining access to resources with polyculture method, and 3) converting abandoned land to paddy fields. Some of the farmers fail to manage the compensation fund and used it for consumptive purpose instead, so they no more having capital to transfer to new assets. This type farmers is expecting facilities to convert their old livelihood.

Due to the existing financial pressure, farmers are struggling to increase the productivities of their commodities, also with diversification. Knowledge limitation encourages the farmers to improve their skills and knowledge more, so the yield from commodities could meet the needs of

their households spending. The farmers are also aware, that due to the knowledge and resource limitation they would not be able to suffice their households spending. Due to the aforementioned limitation, some of the farmers (3%) are also expecting skill trainings to improve their land.

CONCLUSIONS

This study is the first empirical research applying both qualitative and quantitative approaches which systematically analyzes farmers' adaptation when their paddy fields were converted. This research identified two ways how farmers adapt the situation, namely: (1) in responding compensation funds; (2) in searching for job and business opportunities. In responding compensation funds the research showed in term of purpose, 43% of the respondent responded the situation spontaneously and 7% with plans. Meanwhile, in term of timing, 35% of the respondents were responsive and 15% were anticipative. In searching for job and business opportunities, the research found that in term of purpose, 52% of the respondents have spontaneous adaptation and 14% have plan. Meanwhile, in term of timing, 2% were responsive and 32% were anticipative. These findings suggested implications of policies which facilitate farmers to access paddy field resources and alternative jobs.

Policies require service concentration on and government's investment in agricultural development, namely: (1) the need to improve accesses to paddy field resources (financial and technical aspects), opportunities to get alternative jobs, and improvements of paddy field infrastructures; (2) the need to improve access to formal and non-formal education for famers' families; and (3) changes to policies related to paddy fields and any search for new locations for paddy fields.

These findings provide sufficient information on condition of farmers in accessing paddy field resources and in searching for jobs contributing to their earning strategies. Further resarches are required to focus on livelihoods identified as targets to provide prosperity for famers.

REFERENCES

- [1]. Saptana. 2012. Konsep efisiensi usahatani pangan dan implikasinya bagi peningkatan

- produktivitas. *Forum Agro Ekonomi*. 30. 2. 109-128.
- [2]. Widiatmaka, Ambarwulan, W., Munibah, K., Santoso, P.B.K. 2013. Analisis Perubahan Penggunaan Lahan Dan Kesesuaian Lahan Untuk Sawah Di Sepanjang Jalur Jalan Tol Jakarta-Cikampek Dan Jalan Nasional Pantura, Kab.Karawang. *Prosiding Seminar Nasional & Forum Ilmiah tahunan Ikatan Surveyor Indonesia*. 7-14.
 - [3]. Xu, Y., McNamara, P., Wu Y., Dong, Y. 2013. An econometric analysis of changes in arable land utilization using multinomial logit model in Pinggu district, Beijing, China. *Journal of Environmental Management*. 128. 324-334.
 - [4]. Santoso, P.B.K., Widiatmaka, Sabiham, S, Machfud, Rusastra, I.W. 2017. Analisis Pola Konversi Lahan Sawah dan Struktur Hubungan Penyebab dan Pencegahannya (Studi Kasus Kabupaten Subang, Provinsi Jawa Barat). *Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan*. 7. 2.184-194.
 - [5]. Barlowe R. 1986. Land Resource Economics: The Economics of Real Estate. Prentice-Hall Inc. New York.
 - [6]. Rustiadi, E., Saefulhakim, S., Panuju, D.R. 2011. Perencanaan dan Pengembangan Wilayah. Yayasan Pustaka Obor Indonesia. Jakarta.
 - [7]. LaFlamme, M. 2010. Sustainable Desert Livelihoods: A cross-cultural framework, DKCRC Working Paper 69. Desert Knowledge CRC. Alice Springs.
 - [8]. Ruswandi, A., Rustiadi, E., Mudikdjo, K. 2007. Dampak Konversi Lahan Pertanian Terhadap Kesejahteraan Petani Dan Perkembangan Wilayah: Studi Kasus di Daerah Bandung Utara. *Jurnal Agro Ekonomi*. 25. 2.207 – 219.
 - [9]. Asmin, F., Darusman, D., Ichwandi, I., Suharjito, D. 2016. Local Ecological Knowledge on Forest Clearing: A Case Study of Parak and Rimbo Practices in Simancuang Community, Indonesia. *Komunitas: International Journal of Indonesian Society and Culture*. 8. 2:208-220.
 - [10]. Asmin, F., Darusman, D., Ichwandi, I., Suharjito, D. 2017. Elaborating the Attributes of Local Ecological Knowledge: A Case Study of Parak and Rimbo Practices in Koto Malintang Village. *Advanced Science Letters*. 23. 4:2812-2817.
 - [11]. Ngutra, R.V., Putri, E.I.K., Dharmawan, A.H., Darusman, D. 2017. Ekstraksi Sumberdaya Alam dan Perubahan Sistem Nafkah Masyarakat di Kawasan Cagar Alam Pegunungan Cycloop Jayapura Papua. *Sodality*. 5. 1.36-42.
 - [12]. Mulyadi. 2011. Pengaruh Kearifan Lokal. Locus of Control, dan Motivasi Terhadap Perilaku Berwawasan Lingkungan Petani Dalam Mengelola Lahan Pertanian di Kabupaten Soppeng. *Jurnal Manusia dan Lingkungan*. 18. 1.60-67.
 - [13]. Smit, B., Burton, I., Klein, R.J.T, Street, R. 1999. The Science of Adaptation: A Fremework for Assessment. *Mitigation and Adaptation Strategies for Global Change*. 4. 199–213.
 - [14]. Putri, F.A., Suryanto. 2012. Strategi Adaptasi Dampak Perubahan Iklim Terhadap Sektor Pertanian Tembakau. *Jurnal Ekonomi dan Studi Pembangunan*. 13. 1. 33-42.
 - [15]. Sumaryanto. 2012. Strategi Peningkatan Kapasitas Adaptasi Petani tanaman Pangan Menghadapi Perubahan Iklim. *Forum Penelitian Agro Ekonomi*. 30. 2. 73-89.
 - [16]. Sumaryanto. 2013. Estimasi kapasitas Adaptasi Petani Padi Terhadap Cekaman Lingkungan Usahatani Akibat Perubahan Iklim. *Jurnal Agro Ekonomi*. 31. 2. 115-141.
 - [17]. Udmale, P., Ichikawa, Y., Manandhar, S., Ishidaira, H., Kiem, A.S. 2014. Farmers' perception of drought impacts, local adaptation and administrative mitigation measures in Maharashtra State, India. *International Journal of Disaster Risk Reduction*. 10. 250–269.
 - [18]. Pranata, R.T., Satria, A. 2015. Strategi Adaptasi Nelayan Terhadap Penetapan Kawasan Konservasi Perairan Daerah di Missol Selatan, Raja Ampat. *Kebijakan Sosek KP*. 5. 2.13-128.
 - [19]. Panjaitan, N.K., Adriana, G., Virianita, R., Karlita, N., Cahyani, R.I. 2016. Kapasitas Adaptasi Komunitas Pesisir Pada Kondisi Rawan Pangan Akibat Perrubahan Iklim (Kasus Sebuah Komunitas Nelayan di Jawa Barat). *Sodality*. 4. 3.281-290.
 - [20]. McDowell, J.Z., Hess, J.J. 2012. Accessing adaptation: Multiple stressors on livelihoods in the Bolivian highlands under a changing climate. *Global Environmental Change*. 22. 2.342–352.
 - [21]. Amdu, B., Ayehu, A., Deressa, A. 2013. Farmers' Perception and Adaptive Capacity to Climate Change and Variability in the Upper Catchment of Blue Nile, Ethiopia. *African Technology Policy Studies Network ATPS WORKING PAPER*77.

- [22]. Lobell, D.B. 2014. Climate change adaptation in crop production: Beware of illusions. *Global Food Security*. 3. 72–76.
- [23]. Jacobsen, J.K.S., Leiren, M.D. , Saarinen, J. 2016. Natural hazard experiences and adaptations: A study of winter climate-induced road closures in Norway. *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography*. 70. 5.292–305.
- [24]. Harvey, C.A., Martínez-Rodríguez, M.R., Cárdenas, J.M., Avelino, J., Rapidel, B., Vignola, R., Donatti, C.I., Vilchez-Mendoza, S. 2017. The use of Ecosystem-based Adaptation practices by smallholder farmers in Central America. *Agriculture, Ecosystems and Environment*, 246, 279–290.
- [25]. Ahmad, N., Yanuwadi, B., Soemarno. 2012. Adaptation of Public Adaptation of Public Perceptions of Coastal Ecology and Conservation Efforts In Mangroves In Hamlet Klayar Village District Sidokelar Paciran Lamongan. *Wacana*. 13.3:12-36.
- [26]. Tridakusumah, A.C., Elfina M., Murdiyaningsih, D.I., Pioke, J., Bumulo, S. 2015. Pola Adaptasi Ekologi dan Strategi Nafkah Rumah Tangga di Desa Pangumbahan. *Sodality*. 3. 3.85-90.
- [27]. Carolina, Novianti, F. 2016. Koadaptasi Petani Dalam Pengelolaan Ekosistem Pertanian Pada Budidaya Ubi Kayu Di Desa Rancamanggung Kabupaten Subang. *Manusia Dan Lingkungan*. 23. 2.241-248.
- [28]. Berg, B.L. 2001. Qualitative Research Methods for the Social Sciences. Allyn and Bacon Publisher. Boston.
- [29]. Bryman, A. 2004. Social Research Methods (second edition). University Press Inc. New York.
- [30]. Smit, B., Pilifosova, O. 2003. Adaptation to Climate Change in the Context of Sustainable Development and Equity. *Sustainable Development*. 8. 9. 879-912.
- [31]. Tarigan, D.D. 2005. Diversifikasi Usahatani Kelapa Sebagai Upaya untuk Meningkatkan Pendapatan Petani. *Perspektif*. 4. 2. 71–78.
- [32]. Hanafie, R. 2010. Pengantar Ekonomi Pertanian. CV Andi Offset. Yogyakarta.
- [33]. Kawau, D.S., Pakasi, C.B.D., Sondakh, M.L., Rengkung, L.R. 2015. Kajian Pendapatan Usahatani Kelapa Dengan Diversifikasi Horizontal Pada Gapoktan Petani Jaya Di Desa Poigar 1 Kecamatan Sinonsayang Kabupaten Minahasa Selatan. *ASE*. 11. 3. 41–52.
- [34]. Rusastra, I. W., Sumaryanto, Simatupang, P. 2005. Agricultural development policy strategies for Indonesia: Enhancing the contribution of agriculture to poverty reduction and food security. *Forum Penelitian Agro Ekonomi*. 23. 2. 84–101.
- [35]. Sudaryanto, T., Rusastra, I.W. 2006. Kebijakan Strategis Usaha Pertanian Dalam Rangka Peningkatan Produksi dan Pengentasan Kemiskinan. *Jurnal Litbang Pertanian*. 25. 4. 115-122.
- [36]. Hidayati, H.N., Kinseng, R.A. 2013. Konversi Lahan Pertanian Dan Sikap Petani Di Desa Cihideung Ilir Kabupaten Bogor (Conversion of Agricultural land and Farmer's Attitude at Cihideung Ilir Village Bogor Counties). *Jurnal Sosiologi Pedesaan*. 1. 3.222-230.
- [37]. Natawidjaja, R.S. 2007. Pengembangan Komoditas Bernilai Tinggi (High Value Commodity) Untuk Meningkatkan Pendapatan Petani. In Suradisastra, K., Yusdja, Y., Hutabarat, B. (Eds.), Paper presented at Prosiding Seminar Nasional Dinamika Pembangunan Pertanian dan Pedesaan: Mencari Alternatif Arah pengembangan Ekonomi Rakyat, Bogor (pp.17-29). Center for Socioeconomic and Agricultural Policy. Bogor.
- [38]. Sumaryanto, Friyatno, S., Pakpahan, A. 1995. Adaptasi dan Inovasi Kelembagaan Dalam Sistem Irigasi Pompa: Studi Kasus di Subang, Gunung Kidul, Kediri, dan Pamekasan. *Forum Penelitian Agro Ekonomi*. 13. 1. 40-57.