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RICE CULTIVATION OF INDIGENOUS PEOPLE IN MERAUKE REGENCY, PAPUA*

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INTRODUCTION

For a long time, rice has been recognized as world's most important staple crop, providing nourishment for the majority of world population, much greater than any other grains, particularly in developing countries (Blesh 2013). It is not surprising that agricultural development in rice cultivation remains an important issue among developing countries.

In many Asian countries, rice plays an important role both as their staple food and their valuable trading commodity. As a staple food, rice supply or production is a key commodity in determining their food security status. For example, in his work, Clark (2015) argued that rice production has been significantly correlated with food security in the Philippines.

As a trading commodity, rice has been a source of foreign incomes for several Asian countries (Maryono 2014). Due to this important role that rice has played, the issue of sustainable rice cultivation has become a major topic being discussed in developing countries, including and particularly in Asia. An example would be the work by Tereno et al. (2015) which investigated factors influencing the intention to adopt sustainable agriculture practices in Kada, Malaysia. Another example would be the work by Resosudarmo (2012) which is an attempt to understand the success of the 1989-1999 Integrated Pest Management Programme in Indonesia.

In the context of Indonesia, rice too has played an important role as the main staple food in the country. With a population of more than 260 million people, Indonesia has become one of the highest rice consumer countries. The stability of rice supply in the country is expected to determine the level of food security in the country (Timmer 2014). On the rice trading issue, Indonesia has been one of the largest rice importing countries. Hence, the change in world price of rice could affect the level of rice supply in the

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country. It is no surprise then attempts to stabilize the supply of rice in the country, particularly by strengthening domestic production, have been implemented for a long time in Indonesia.

According to Schrauwers (1998), the first attempt to do so was conducted by the Dutch, under the Netherlands East Indies Government, by introducing a by then "modernised" system of wet rice cultivation in Lake Poso, Central Sulawesi in 1908 (Schrauwers 1998). After the country independent from the Dutch, since early 1970, under the "New Order" of President Suharto, the Indonesia Government implemented a "green revolution" of rice cultivation, or rice intensification program, as the country's main rural development program aiming to increase domestic rice production (Veldwisch 2015; Resosudarmo and Yamazaki 2010). In the middle of the 1980s, Indonesia did achieve a self-sufficiency of rice production for a few years. Since end of 1980s, unfortunately, Indonesia has to again keep importing rice to fulfil its domestic demand (Hill 2000; Resosudarmo and Throbecke 1998; Broad and Cavanagh 2012).

During the implementation of rice intensification in 1970s and 1980s, western regions of Indonesia, especially Java and Bali, used to be the main areas where this program was implemented (McCarthy et al. 2012). This intensification program seems to be able to reduce the level of food insecurity in the western part of Indonesia.

In the eastern part of Indonesia, where food security issues have been more crucial than those in the western part of the country, implementation of rice intensification was relatively weak; except probably in South Sulawesi. Lack of human capital in eastern part of the country was argued as the main problem to be able to implement this rice intensification program. In order to resolve this issue, the government introduced a transmigration program, moving people from Java and Bali to outside Java including eastern Indonesia, at the beginning of 1980s. The aim of the transmigration program was to distribute people from high-density population areas to the less populated areas (Manning and Rumbiak 1989). The transmigration program was also aimed to promote agricultural development, especially in the rural areas of off Java-Bali islands.

In Papua, this transmigration program was well received by the then governor of the province, Yacob Pattipy (1992–1998), who placed a top priority on agricultural development in Papua by implementing rice intensification program (Mollet 2011). Transmigration program, particularly in Papua, was designed to involve both local and migrant population. They were located in adjacent areas in which the transfer of technology from migrant to local is expected to happen.

In Papua, Merauke regency has become one of the most important transmigration areas with migrants from other parts of Indonesia, predominantly from Java, Bali and Nusa Tenggara Timur. Meanwhile, the indigenous people in Merauke, the people of Marind was also asked to participate into the transmigration program.

It should be noted that Marind tribe has been for a long time applying a shifting cultivation (slash and burn agriculture) technique, i.e., clearing a patch of forest by felling and burning trees and then cultivating (Seavoy 1973). This pattern of slash and burn agriculture is a similar technique applied by indigenous people in the Pacific region, such as Papua New Guinea, Solomon Islands, and Fiji, as well as by Dayak societies in Kalimantan (Colfer 1991; Siahaya et al. 2014). Since paddy field was introduced during this transmigrantion program in 1980s in Merauke, indigenous people of Marind no longer practice the slash and burn agricultural system. Rice production in Merauke since

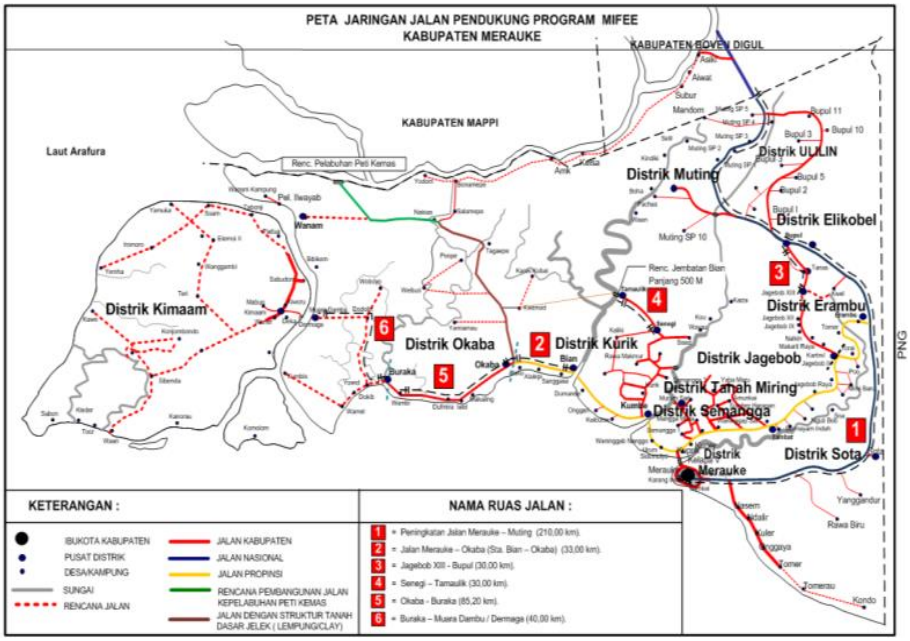
then has been icreasing reaching a surplus of 200 tons in 2016 (BPS Papua 2017) and has been distributed to other parts of Papua. Merauke has been an important rice producer region in Papua.

It has been recognised that the success of the rice cultivation development in Merauke is not only due to migrants, but also due to the roles of indigenous people of the Marind tribes (Mollet 2011). It has been argued that the Marind people have been able to adopt a rice cultivation practice suitable for the region and productive in producing rice. The objective of this study therefore is to understand the practice of the Marind tribes in cultivating rice in Merauke. The practice of Marind's rice cultivation could be a valuable lesson for other tribes in other parts of Papua could learn the lessons from the Marind's rice cultivation. This research is one of the very few research attempting to understand the success of Marind tribes in cultivatin rice and so their success could be a valuable lesson for the rest of Papua.

RESEARCH AREA AND THE FIELD SURVEY

Merauke is a regency (or *kabupaten*) in Papua province covering an area of about 44 thousand km^2 in the southern part of the province, with a population of approximately 240 thousand in 2014. By 2010, migrant population, mostly occupying the coastal areas, has been estimated to reach approximately half of the population in the regency.

Figure 1. Research Areas



The size of rice field in the regency is estimated as large as approximately 38 thousand ha in 2018. Most of these rice fields are located in 50 villages within the five districts which were the main transmigration areas in Merauke. These districts are Semangga, Tanah Miring, Kurik, Malind and Animha districts (KabarPapua.co 11 September 2018). Out of these five districts, three districts of Tanah Miring, Semangga and Kurik were picked as the research areas of this study (Figure 1).

The three districts are located in the north of Merauke city, the capital of the regency. These three districts are the top three rice producer districts in Merauke. Tanah Miring covers an area of approximately 1.5 thousand km^2 and has a population of approximately 7.5 thousand people in 2014. Semangga, a coastal area located on the south of Tanah Miring, covers an area of approximately 300 km^2. Approximately 18 thousand people lived in this district in 2014. Kurik, located on the north of Semangga, has a population of 9.5 thousand people and covers approximately a thousand km^2.

A structured-questionnaire survey of households was conducted from 2014 till 2016 in the three districts. In each district, a village of indigenous famers was randomly chosen: Kampung Tambat with a population of approximately 296 household in Tanah Miring district, Kampung Urum of approximately 369 households in Semangga district, and Kampung Salor Wapeku of 455 households in Kurik district. In each village, 15% of households listed by the head of the village were randomly sampled to become our samples. Hence, a total of 168 farm households were surveyed in this research. Figure 1 shows more or less locations of the households surveyed.

In addition to the household survey, several Focus Group Discussion (FGD) sessions were also conducted in each village to gather community level information and other information that cannot be gathered through the household survey.

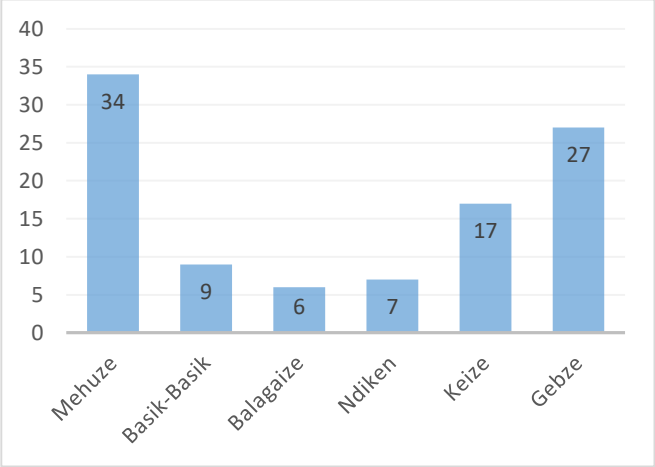
MARIND PEOPLE AND THEIR AGRICULTURAL PRACTICES

This section discusses the outcomes from the household surveys conducted in this research. Commencing with the description of tribes included in this survey, it then discusses agricultural land sizes typically cultivated by each household. To understand the agricultural practices adopted by Marind people, this paper also reports irrigation system adopted by indigenous farmers, the types of fertilizer typically used, types of paddy and the cost and profit structures of indigenous farms.

Farmers of Marind Tribes

Marind people consist of several clans or tribes. Based on the household survey conducted in this study, the six tribes of indigenous farmers in the main rice producer regions in Merauke are the Mehuze, Gebze, Kaize, Basik-Basik, Balagaize and Ndiken. Figure 2 shows that most indigenous farmers are Mehuze constituting of approximately 34% of the total respondents, followed by Gebze (approximately 27%) and Kaize (approximately 17%). Some few other farmers are from the tribes of Basik-basik, Balagaize and Ndiken. It hence can be concluded that the Mehuze, Gebze and Kaize have been playing an important role in developing indigenous rice cultivation culture in Merauke.

Figure 2. Respondents Classified by Tribe in % age (N=168)



Source: Mollet, 2016

Land Tenure Arrangement

In Papuan communities, land is organized by *adat* (local traditional custom). From the Papuan communities' perspective, *adat* means community harmony, family prosperity, environmental preservation and land ownership organization (Howard et al. 2002). It should be noted that *adat* can determine the way indigenous communities manage their land, division of labor between men and women, schedule harvest, perform marriage rites, mediate disputes, pay compensation for crime and, in particularly, land distributed to each household in their communities.

In Marind communities, an area of rice cultivation typically is organized by 3-5 households, where each household is in charge of managing the assigned land within the area. The distribution of land among household is negotiated with the head of the tribe or *Kepala Suku*. *Kepala Suku* of Marind has the power in the distribution of the land and at the same time, has the responsibility in keeping peace and harmony among the people he led. Important to note, nevertheless, land right has becoming a sensitive issue in Papua. Conflicts often arise among indigenous people due to the lack of clarity on land ownership (Tebay 2010).

Based on the FGD sessions and household survey conducted for this study, it is revealed that Marind communities have adopted several different land tenure system: pure tenant, sharecropping, cash lease, combined sharecropping and cash lease as well as own land farmers. The system mostly adopted by all tribes in the sample of the survey in this study is share-cropping farmers. This situation indicates that majority of indigenous farmers do not own land and land ownership has been relatively concentrated among leaders of tribes. This is a reason why land ownership becomes an issue among indigenous people in Merauke.

Farmer Size

The result of household survey reveals that indigenous Marind farmers consist of different sizes of farmers based on the size of land they cultivate Those indigenous farmers could

be classified into four different size groups of farmers: (1) marginal farmers (cultivate < 0.49 acre of land), (2) small farmers (cultivate 0.5 - 1.49 acres of land), (3) medium farmers (cultivate 1.5 - 2.49 acres of land), and large farmers (cultivate >2.5 acres). Table 1 shows the distribution of rice cultivation area among tribes.

Table 1. Distribution of Operating Farms by Land Size Group (in %age of each tribe)

Land size	Mehuze	Basik-Basik	Balagaize	Ndiken	Keize	Gebze
Marginal farmers	32.8	33.2	45.9	36.4	29.6	37.2
Small farmers	43.8	42.5	42.2	47.3	46.3	42.5
Medium farmers	15.6	12.7	8.0	11.5	16.1	11.5
Large farmers	7.8	11.6	4.0	4.9	8.1	8.8
Total	100	100	100	100	100	100

Source: Mollet, 2016, 3.

As indicated in Table 1, it can be seen that land has not been distributed equally among households within each tribe. Majority of households in each tribes are marginal or small farmers having land for rice cultivation as large as either less than 0.49 acre or between 0.5 to 1.49 acres. It hence is not surprising that land distribution has recently become an issue and land conflicts keeps happening from rather frequent. In several cases, these conflicts have been the source of disruption of rice production in Merauke. Strengthening adat institution to be able to fairly resolve these land conflicts is probably important to ensure the sustainability of rice cultivation in Merauke.

It is difficult to conclude which tribe has a tendency to distribute their rice land rather equal among households in their communities. Balagaize tribe, however, seems to be the tribe that distributes its land least equal, i.e., approximately 88% of its farmers are marginal or small farmers. However, there is much information whether or not land disputes have been more frequent happened among Balagaize tribe.

Rice Cultivation System

Based on the FGD sessions, this study found that most indigenous farmers learned how to conduct rice cultivation technique from transmigrants in their areas. It took them a while to be able to adopt and modify the technique of rice cultivation. It started during their childhood period when they played together with the children of migrants and, after school, helping migrant parents managing their paddy fields. When they were older these indigenous children started to develop their own paddy fields using the knowledge they received from migrants. While developing their paddy fields, they kept communicating their problems and experiences with their migrant friends.

Besides learning from their fellow transmigrant farmers, Marind farmers also learn and receive guidance from agricultural extension officers working for the regency government. Up until this research conducted, though the number of agricultural extension officers in Merauke has been still limited, their roles in supporting rice production by Marind farmers has been very crucial. Once a month farmers in a village have the opportunity to consult their problems with an extension person visiting their village.

Marind people try to cultivate rice twice a year. Some, however, can only cultivate their land once a year. They start with plowing the soil in their land using hand tractors. Marind farmers feel that using a hand tractor is more efficient than plowing using buffalo. Approximately two weeks before planting their seeds, organic fertilizer is spread throughout the paddy field. Marind farmers understand that they need to use good quality and healthy seeds. Marind farmers work together in choosing good quality and healthy seeds that they will use.

Most rice fields in Tanah Miring, Semangga and Kurik districts have an irrigation system. They typically alternately irrigate their rice fields. This way a large area of paddy field could be irrigated with a rather limited amount of water. Water availability particularly during the dry season has been an issue in Merauke. Important to note that there are only two seasons in Merauke, the dry and wet seasons.

Marind farmers harvest their paddy plants using serrated sickle stamp farming system. They try to harvest their paddy plants at the most proper timing that they know. Harvest is conducted in a group of 15-20 people. Each group is equipped with a thresher tool paddy machine.

There are several paddy grinder facilities in Merauke regency, which makes it easier for indigeneous farmers to process their harvest. After being grinded, Merauke rice is distributed throughout Papua using the BULOG (national rice distribution management agency) facilities. Detail of irrigation systems as well as seed and fertilizer types utilised by Marind farmers will be described in the following sections.

Irrigation

As mentioned before, water availability has been an issue during a dry season in Merauke. Indigenous farmers in Merauke hence face a serious challenge in relation to water supply for their paddy field during a dry season. During wet season, on the other hand, farmers in Merauke face a challenge of crop damages due to heavy rains and floods.

Having a good irrigation system is hence crucial for Merauke farmers. In general it has been pointed out by rice experts that irrigation is important for rice production (Ahmed and Sampath, 1992). It enables farmers to grow an additional rice during a dry season, thus increasing cropping intensity and easing land constraint. Irrigation also enables farmers to control the flow of water during a wet season. Irrigation eliminates the necessity to rely on weather that might not always produce proper amount of water needed. It should be noted that in Merauke the major issues in rice cultivation are related to rain damage for the crop.

Table 2 shows the types of irrigation adopted by Marind farmers. This information was gathered during the household surveyed conducted in this study. As shown in this table, relatively small portion of farmers in each tribe uses underground irrigation system. The main reason for this is mostly due to a difficulty to extract underground water during a dry season in Merauke. For example, there was no stock water available from underground sources during the 2015 dry season.

The majority of indigenous farmers use rainfed as their source of water irrigation. This is mostly due to a rather limited modern surface water irrigation facility systems still in their areas as well as a rainfed system has been more reliable than an underground

irrigation system in Merauke. Nevertheless, a serious flood problem could be faced by rainfed farmers, which often occurs in a wet season.

Table 2. Sources of Irrigation of Indigenous Farms (in % of Each Tribe)

Source of Irrigation	Mehuze	Basik-Basik	Balagaize	Ndiken	Keize	Gebze
Rainfed	64.6	37.8	67.4	58.9	71.8	50.8
Groundwater	0.5	17.4	5.1	10.7	1.0	16.8
Surface water	34.9	34.7	9.1	8.1	2.4	14.7
Groundwater & surface water	0	10.1	18.4	22.4	24.8	17.7

Source: Mollet, 2016, p.5

Surface water irrigation when available is probably the preference for Marind farmers. However, only Mehuze and Basik-Basik tribes could provide more than 40% of their farmers with surface water irrigation systems. Only relatively small portions of the other tribes could install a surface water irrigation system for their paddy fields. It can be concluded then, although indigenous farmers in Merauke have realised the importance to to have a good irrigation system, yet good quality irrigation system facilities remain scarce in their area.

Paddy Types

It is a commonly known strategy that farmers should select a proper variety of paddy to avoid crop loss due to flood during a wet season, due to drought during a dry season or due to pests and diseases (Myint and Napasintuwong 2016). Indigenous Marind farmers also recognize this strategy. Based on the household survey conducted for this study, they typically choose to plant local varieties of rice, such as Pandan Wangi and Mambramo as well IR series that relatively can resist the flood.

Labor Inputs

Indigenous farmers in Merauke districts use an intensive amount of labour time as the main input in their rice cultivation activities. They spend this labour resource for land preparation, spreading fertilizer, planting, applying pesticides, weeding, maintaining irrigation and harvesting their paddy. Table 3 presents labour time allocation by each tribe in average per cultivation activities.

It can be seen that each tribe in average has different strategy in allocating their labour time. Farmers from the Mehuze tribe, in average, spend the least total hour per hectar in cultivating their rice fields. In total, they only spend as much as approximately 574 hours per hectar. On the other hand, farmers from the Gebze tribe, in average, spend the most hour per hectar in cultivating their rice field. They spend as much as approximately 1,051 hours per hectar, i.e., almost double the amount spent by Mehuze farmers. In all activities, it seems that Gebze farmers have to spend more time than their counterparts from the Mehuze farms. It is not clear in our research why this could happen.

Table 3. Average labor use for rice cultivation by activity (hour per hectares)

Ethnic Group	Land preparation	Planting	Fertilizer application	Pesticide application	Weeding	Irrigation	Harvest
Mehuze	39.2	130.0	15.0	11.4	205.5	11.4	161.1
Basik-Basik	44.0	190.7	14.1	10.6	194.9	16.1	204.7
Balagaize	89.4	215.3	28.6	16.6	226.1	50.1	232.3
Ndiken	72.0	256.6	19.5	13.4	203.7	29.2	226.7
Keize	119.9	241.8	31.3	19.7	272.2	89.6	250.7
Gebze	81.8	277.5	25.8	15.2	263.3	86.9	300.8

Source: Mollet, 2016

Table 3 also reveals that the majority of indigenous Marind farmers spend most of their time for planting, weeding and harvesting. This indicates that introducing modern technologies for planting, weeding and harvesting could significantly save the labour time among indigenous farmers in Merauke.

Fertilizer Use

In rice production, beside labour and water, the other important input to maximize rice yield is the use of fertilizer (Schrauwers 1998). Marind farmers have also used fertilizer to maximize their rice production. Table 4 presents the type and amount of fertilizer used by indigenous farmers classified by the type of rice they planted.

According to Triadiati et al. (2011), the dose of fertilizer use in paddy cultivation for Urea is 250 kg, TSP 100 kg and KCL 75 kg per hectare. Table 4 shows that only marginal and small farms growing Mamberamo rice are able to use fertilizer at the amount relatively similar as the proper amount suggested by Triadiati et al. (2011).

Table 4. Fertilizer Used by Farmers (Kilogram/Hectare)

Type of Rice	Fertilizer	Marginal	Small	Medium	Large
IR	Urea	103	93	97	87
	TSP	50	39	31	15
	KCL	6	13	0	3
Pandan Wangi	Urea	196	175	176	141
	TSP	100	92	72	79
	MP	19	24	19	16
Mamberamo	Urea	252	260	247	227
	TSP	137	122	114	126
	KCL	23	25	24	22

Source: Mollet, 2016

Furthermore, in general, marginal and small farms are using fertilizer at a better amount than those of medium and large farmers. It is hence expected that marginal and small Marind farmers are more productive than medium and large Marind farmers. The success of rice cultivation in Merauke would most likely due to the success of marginal and small Marind farmers.

Cost Structure

Several inputs for production are needed for rice production by indigenous farmers. The inputs, such as seed, irrigation, (organic) fertilizer, manure, pesticide and equipment maintenance and labour hire. Table 5 presents the percentages of cost input for paddy cultivation per hectare. In general, it can be seen that the two largest costs for indigenous farmers are for fertilizer and labour hired. Indigenous farmers from all tribes have to spend more than 30% of their expenses for labour hired. Mehuze, Ndiken and Keize farmers spend approximately a bit more than 30% of the expenses for labour hired, while Basik-Basik, Balagaize and Gebze farmers have to spend more than 40% of their expenses.

Table 5. Costs of Inputs as Percentages of Cash Costs per hectare for Paddy Cultivation

	Seed	Irrigation	Organic fertilizer	Manure	Pesticide	Equipment	Labour hired	Total
Mehuze	11.7	7.3	25.6	1.6	5.2	14.7	33.9	100
Basik-Basik	13.1	1.2	16.9	1.1	4	14.3	49.3	100
Balagaize	18.7	3.7	16.7	1.1	2.1	14.5	43.2	100
Ndiken	10.6	7.8	28.6	1.2	4.7	14.4	32.7	100
Keize	12.3	7.9	22.8	3.8	5.8	14.9	32.5	100
Gebze	14.3	1	16.4	2.5	2.9	20.3	42.6	100

Source: Mollet, 2016

Fertilizer for rice cultivation is another substantial cost for indigenous farmers. Ndiken, Mehuze and Keize farmers spend approximately 29%, 23% and 23%, respectively, on fertilizer. Manure and pesticide costs, on the other hand, have been relatively a trivial cost for all the indigenous farmers. Maintaining cost of equipment in average covers between 14% to 20% for all indigenous farmers. From the cost structure discussed in this section, it can also be concluded that introducing modern technologies that could substitute labour time, i.e., will reduce labour hired cost, would make indigenous farmers much more efficient in cultivating their rice fields.

Costs and Profits

Table 6 presents information on cost and profitability of paddy cultivation for indigenous Marind farmers per hectare. The total cost per hectare is obtained by adding all input costs mentioned in the previous section plus family labour costs and imputed land rent for both farmer-owned and rented-in land. Profit is calculated by substracting total cost to the value of crop per hectar.

Indigenous farmers from Basic-Basic tribe, in average, spend the least total cost in cultivating their rice fields and so they are able to obtain the highest profit compared to farmers from other tribes. Farmers from Balagaize tribe spend the highest total cost for cultivating their rice fields. However, since the value of their crop per hectar is the highest

value among crop produced by other tribes, indigenous farmer from Balgaize tribe get the second highest profit per hectar compared to other indigenous farmers. The least profit is received by, in general, indigenous farmers for Keize tribe. This is mainly due to the low value of crop they produced.

Table 6. Total Cost and Profitability of Rice Cultivation for Indigenous Farmers in Merauke (in IDR Thousand)

Ethnic group	Cash cost per hectare	Total cost per hectare	Value of crop per hectare	Net profit per hectare
	(a)	(b)	(c)	(c)-(b)
Mehuze	33,613	61,206	66,701	5,495
Basik-Basik	26,008	50,328	64,577	14,249
Balagaize	42,948	70,909	81,357	10,448
Ndiken	32,629	61,660	67,207	5,547
Keize	35,135	62,154	65,344	3,190
Gebze	34,635	64,020	68,034	4,014

Source: Mollet, 2016.

CONCLUSIONS

Rice has been an important staple food in many areas and rice availability has been a key in determining the level of food security in the area. In Papua too, rice has been an important staple food for its population. Nevertheless, development of rice production has been an issue in the island of Papua. The transmigration program was introduced in Indonesia with the purpose of distributing the population around Indonesia and promoting agricultural development, particularly the production of cash crops such as paddy.

This transmigration policy was supported by the then Papua Governor aiming to promote agricultural development in the province. Merauke regency is one of the main transmigration program destination in Papua. The program has been successful in increasing rice production from the regency. It should be admitted that the success of the development of rice cultivation in Merauke is also due to the role of indigenous people rice farmers of the Marind tribes in the regency.

The goal of this paper is to understand the cultivation system adopted by indigenous farmers in Merauke. The adoption of cultivation system could be an important lesson for other indigenous farmers in different regions in Papua. Several information gathered from this study regarding indigenous farmers of Marind tribes are the following.

First, it takes time for indigenous farmers to adopt an integrated rice cultivation technique utilized by transmigrant households in the area. They need to learn this technique since they are children playing and working together with their counterparts, children of transmigrant farmers.

Second, agricultural extension officers play an important role in informing indigenous farmers on the proper technique in cultivating rice field. Should more extension officers available in Merauke, the better performance can be achieved by indigenous farmers of Marind people.

Third, based on rice cultivation land they manage, the majority of indigenous farmers are marginal and small farmers. Nevertheless, they have been able to utilize a much proper amount of fertilizer compared to other indigenous farmers. It is expected

that these marginal and small indigenous farmers have been able to better perform than medium and large farmers.

Four, the majority of indigenous farmers adopt rainfed irrigation system which is prone to flooding. Providing a better surface irrigation to them would reduce their probability of crop failure due to the flood.

Five, introducing modern technologies that could substitute labour time, i.e., will reduce labour hired cost, would make indigenous farmers much more efficient in cultivating their rice fields.

Finally, rice cultivation was found to be a profitable livelihood the indigenous farmers of Marind people in Merauke. However, there are still rooms to improve their performances.

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