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RESEARCH ARTICLE

Farming While Aging: Reasons and Strategies for Maintaining Family Farming in Parbotihan Village, North Sumatera

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ABSTRACT

One of the challenges for farming sustainability and food security into the future is the aging of farmers. The reluctance of youth to work in farming and their choice to migrate to urban areas has resulted in a scarcity of productive workers in rural areas. As a result, farming production relies on aging farmers. The implications of this condition not only have an impact on decreasing farming productivity but also to the family farming sustainability and threats of food security in the future. Apart from the impact on decreased production, it is important to see how aging farmers overcome their limited capabilities by rely on farming as a source of their daily needs. This research aimed to explain the impact of migration of rural youth for family farming's sustainability and what strategies that aging farmer carried out to maintain their farm when they become the main actors in farming. This research was conducted on rice farmers in the village of Parbotihan, North Sumatra using qualitative methods and data collection techniques through observation and in-depth interviews. The findings in this study are that the reluctance of rural youth to work in farming is influenced by society's negative view of farming. This negative view encourages rural youth migrate to urban areas and leave their family farming for their parents who have limited capabilities yet still fulfil their needs. In the end, farmers made efforts to overcome their limitations in several ways, such as setting a more flexible planting schedule, choosing the type of crop, and maintaining the season once a year.

Keywords: *migration; aging; farmer; adaptation; flexibility; family farming*

INTRODUCTION

One of the problems in agriculture is the younger generation's disinterest to work in family farming. Prawesti, Witjaksono, and Raya (2010) noted that the younger generation's interest working in the agriculture sector is low and they prefer to migrate to urban areas (Jansuwan & Zander, 2021). Factors that make the younger generation's disinterest working in family farming are the low of productivity and welfare of farmers (Nugroho, Waluyati, & Jamhari, 2018; Prawesti et al.,

2010; Rusastra & Suryadi, 2004; Sinuraya & Saptana, 2007). Agriculture is viewed to provide little stability and continuity of income. The younger generation's disinterest in farming is also influenced by the change in the subculture of farming communities (Suyanto, 2016), values held by society (Oktafiani, Sitohang, & Saleh, 2021), changes in perspective (Susilowati, 2016) and level of education (Setiani, Pratiwi, & Fitrianto, 2021), family, agricultural business, financial, individual characteristics, location and the labour market (Pranadji & Hardono, 2015; Tocco, Davidova, & Bailey, 2012). Other factors are limited land ownership, underdeveloped non-agricultural business diversification, low succession in farming maintenance and the absence of agricultural incentive policies. The decrease of farming skills and knowledge of young people, the decrease of living standard in rural society, the government's neglect of small-scale farming, land confiscation, and youth's limited access to land have pushed young people away from farming (White, 2012). These factors have encouraged farmers to prefer another sector than farming as a source of income (Nugroho et al., 2018).

The choice another sector is characterized by a strong desire to leave the village and migrate to urban areas which are considered offer more diverse jobs. Recently, the younger generation tended to prefer migrating to urban areas to work in the industrial sector. The urban area, by most young people, is considered offer wider employment opportunities and guaranteed income with wages paid every month. As stated by (Setiani et al., 2021) in their research, working in urban areas is considered more impressive amidst the limited employment opportunities in rural areas (Gunawan, Setiani, & Saptana, 2016).

The migration of the younger generation to urban areas has implications for the scarcity of productive labour in rural areas, especially in the family farming. According to (Yuniarti & Sukarniati, 2021), youth migration in Indonesia has caused a decline in the number of farming households in rural areas. Another implication of the migration of the rural youth is that the sustainability of agriculture in rural areas depends on older farmers. The migration of young workers to urban areas has left farming to farmers who are getting older. Aging farmer occurs when the number of young farmers decreases and at the same time older farmers increase (Susilowati, 2016).

Aging occurs not only because farmers are getting older but also because farmer regeneration is slow (Wiyono, 2015). According to Sumaryanto, Ariani, Suhartini, Yofa, and Azahari (2015) farmer aging occurs in all types of agroecosystems. He noted that more than 70% of farmers were aged 40 years and over, even those aged over 50 years were more than 40% (Sumaryanto et al., 2015). BPS Data (2019) shows that around 33,4 million farmers, 91% of them are aged 40 years and over, and the most are aged 50-60 years (Alinea Id).

Farmers who are getting older clearly have reduction in physical strength, mobility and motivation to farm which results in reduction in farming productivity (Fried & Tauer, 2016; Rogers, Barr, O'Callaghan, Brumby, & Warburton, 2013; Ruiz Salvago, Phiboon, Faysse, & Nguyen, 2019; Seok, Moon, Kim, & Reed, 2018). Older farmers tend to be less independent. They also get lower income. Unless they adapt their farming processes (Jansuwan & Zander, 2021). The results of research by (Guo, Wen, & Zhu, 2015) in China show that in the context of aging, changes in working-age households have a significant impact on farming output. Farming in the hands of aging farmers causes the expected production results not be optimal. Low farming yields can cause regional food insecurity and this can occur on a larger scale (Ruiz Salvago et al., 2019).

The limitations of older farmers in cultivating their rice fields have caused many farmers to choose outsourcing, namely non-family members carrying out part or all of the farming process (Gillespie, Nehring, Sandretto, & Hallahan, 2010; Sun, Rickaille, & Xu, 2018; Wolf, 2003). Many farmers who own land have changed professions and sold or converted their land because they consider their agricultural land to be less productive (Prawesti et al., 2010). Therefore, it is important to discuss aging farmers' strategies in maintaining the sustainability of their food.

Hayami and Ruttan (1971) noted that utilizing of agricultural technology can trigger agricultural growth and save more labour and land. In the midst of the limited capacity of older farmers, the use of agricultural technology could be an alternative solution. However, it seems that this is not always the right choice to overcome the problem of the scarcity of productive labour and the aging of farmers. Priyanto (1997) notes that a substantial amount of capital is required to utilize agricultural technology, considering factors related to the topography of agricultural land, the risk of unemployment and a lack of expertise in handling agricultural machinery (Aldillah, 2016; Priyanto, 1997). In China, for instance, several studies state that most farmers are not interested in investing in agricultural machinery (Davis & Lopez-Carr, 2014; Ji, Yu, & Zhong, 2012; Yang, Huang, Zhang, & Reardon, 2013).

To date, much research has been conducted on aging farmers. Some of them are research by Seok et al. (2018) looked at the impact of aging and income subsidies on agricultural efficiency in Korea. The research found that aging affects efficiency on farming. Research by Guo et al. (2015) specifically investigated the factors of agricultural workers' work preferences and age on agricultural production. The research found that changes in age have a significant impact on farming yields, especially for farmers who intend to stop farming. Research by Poungchompu et al. (2012) highlighted the link between aging farmer populations and food security in Thailand and Japan. The research shows that food insecurity occurs due to decrease of young worker and at the same time much farmer that getting older. Furthermore, research by Zou et al. (2018), investigated farming land use in China without the absence of successors. That research explains that elderly farmers who do not have successors tend to have choices in the use of agricultural land. Ren et al. (2023), the impact of aging on farming can be solved by labour savings in new large-scale farming models, further contributing to the widespread transformation of small-scale farming towards sustainable farming in China. Griffin et al. (2019) show that farmer exit and investment withdrawal from farming are influenced by economic and demographic factors. The size of land is an important factor for farmers to survive or invest in farming. Jansuwan and Zander (2021) examined how aging affects the agricultural activities of older farmers and how they adapt. This is more acceptable than waiting for risk-prone farming results. Rigg et al. (2020) in their research sees farming as a household activity that is not even one but as part of a complex livelihood. The research shows that farmer aging decreases the average education level of farmers and reduces the area of farming land due to land diversion and abandonment. These various studies focus more on the impacts that occur when farmers age, but do not explain why aging farmers continue to maintain their farms even though they are experiencing physical limitations.

Research by Saputra et al. (2022) analyzed the influence of parental land ownership, education and motorbike ownership, and parental desires on rural youth's interest in becoming farmers. The research found that parents' desires had a positive effect on teenagers' interest in becoming farmers. Research by Adam et al. (2021) shows that older farmers (over 60 years old)

are less likely to use modern technology. Research by Maulida & Wati (2022) in Yogyakarta shows that the choices of the younger generation differ depending on rural and urban spatial areas. Susilowati (2016) research shows that in general the phenomenon of aging farmers and the decline of young farmers in Indonesia is increasing. White (2012) research shows that young farmers are faced with narrowing and closing access to land. In addition, the expansion of education affects the decline in the skills of rural young people because they are neglected and relegated to the status of an occupation. In general, the previous research was carried out on farming in Java. This research will be conducted in Sumatra because it has different characteristics from Java, both in terms of land management practices and land ownership. These studies generally represent small-scale food-oriented farming in Java. Meanwhile, this research focuses on Sumatra, namely in Parbotihan Village, Humbang Hasundutan Regency. The farming activities in this area combine food farming and plantation by using differ land. Farmers in this area divide their farming land into rice fields and moors with their own special crops. Apart from different farming styles, the farm land in the regions is also wider for each family to manage. Currently, farming have been dominated by older farmers, which bring out the fundamental question of what are the reasons and strategies of farmers in Parbotihan Village in dealing with aging farmers and how do they maintain family farming.

This research aims to explain the impact of migration of rural youth for family farming's sustainability and what strategies that aging farmer carried out to maintain their farm when they become the main actors in farming. The migration referred to here is the migration of the younger generation after completing high school (SMA) from rural area to urban areas, both for economic and educational purposes. The younger generation, especially young people who are in high school, are an important and productive labour in farming process. Their migration has resulted in the delegation of farming in rural areas to aging farmers, namely farmers aged 55 years and over. This research also aims to explain the motives of the rural youth for migrating to urban areas and the strategies of older farmers in maintaining their farming land.

METHOD

This research was conducted in rural area of Parbotihan, Onan Ganjang District, North Sumatera. Currently, farming in Parbotihan village is predominantly carried out by older farmers. The term "old farmers" in this context are individuals aged 55 years and above who are actively farming, and still rely on agriculture as their primary source of income. Among the total labour force in Parbotihan Village, approximately 37% fall within the age range of 41 years and older. Notably, around 56% of this group, aged 41 years and older, are in the 57-80 age range. Rural youth, aged 20-26 years, make up approximately 13% of the population. However, it should be noted that young people in this age range or who have graduated from high school may have migrated, even though they are still registered as village resident. This happens because they do not immediately change their population records even though they have migrated out of the rural area.

This paper is based on a qualitative research involving observation and in-depth interviews. Observation was made in the rice fields owned by residents to find out the structure of land tenure and land cultivation processes. Moreover, I also conducted in-depth interviews with farmers to understand their family conditions, especially with regards to which family members had

urbanized, which affected the availability of labour and their ability to cultivate their land. Through these interviews I also gathered information regarding the impact of urbanization on family farming sustainability. The data collection process was conducted at the beginning of planting season, from September to October 2021 and before the harvest in February to May 2022, where the author interviewed several farmers who were still maintaining their rice field and also at once suffering about labour shortage.

FINDINGS AND DISCUSSION

Parbotihan Village is in Humbang Hasundutan District, North Sumatra Province. Based on 2022 Village Monograph data, the population of Parbotihan village is 2,091 people consisting of 1023 males and 1068 females. This number consists of 554 heads of households. Most of those population (52,40%) work as farmers, the rest civil servants/military/police, entrepreneur, traders, craftsmen, retirees, and service workers (Parbotihan Village Monograph, 2022). From the results of observations, farmers in Parbotihan village can be identified as mixed farmers, namely as rice farmers as well as moor farmers. In their daily lives, they cultivate rice in the rice fields, while in the moor they cultivate horticultural crops and plantation crops such as coffee and rubber. Even though they plant local rice with the planting season once a year, cultivation of moorland is carried out only during the fallow period, between the post-rice harvest period and the next planting season and the harvest period.

As rice and moor farmers, farmers in the Parbotihan Village differentiate agricultural land into two types, namely *tano maraek* or wet land (rice fields) and *tano mahiang* or dry land (moor) (Marbun, 2021). *Tano Maraek* is the same as rice fields/land that its cultivation always relies on water availability. The rice fields are only used as an area to plant rice. Even though rice fields are called wetlands, it does not mean they are flooded with water throughout the year, in fact most of them are rain fed. Only a small portion of rice fields have reservoirs with simple irrigation channels. Dry land or moorland is a land that its farming process does not focus of on water availability. However, farmers tend to spend more time cultivating rice fields than moor. Moorland cultivations only carried out during fallow periods in the fields. This shows how important rice fields are for farmers. On moorland, farmers generally plant vegetables, chili, coffee, and rubber.

Most of the rice fields in Parbotihan Village are at the foot of hills with sloping terrain. Because the land is located at the foot of a hill/slope, the land is cultivated using a terracing system. The condition of rice field that are located in this slope make the size of rice field very diverse, from 1x1 meter to 15x15 meters. On sloping land with a gentle slope, rice fields are wider than steep slope areas. The slope also affects the depth of the soil because it is dominated by mountain rocks. Forming new rice fields is called as *mangarimba.* Farming activities carried out by farmers in Parbotihan Village are still traditional. They usually only use simple tools such as hoes, machetes and sickles. Farming activities such as cultivating the soil, selecting seeds, caring for plants, harvesting, and collecting the harvest are carried out by relying on human power. One season's harvest is usually used only to meet food needs for one year. Therefore, the dry grain from the season's harvest will be collected in the farmer's barns at their house.

The labour used to cultivate rice fields is generally dominated by family members consisting of husband, wife, and children. Some parents have even involved their children in farming activities

since they were in elementary school. In general, high school students proven to be productive to cultivate rice fields. Usually after school at 02.00 pm, high school students spend their time in the fields until 06.00 pm. Even though every family member is involved in farming activities, technically work in the fields is dominated by women. It is a common sight during the rice field season, most of the women are seen working in the rice fields. Men's involvement in rice fields generally occurs in the activity of loosening the soil and removing the rice grains from the straw at harvest time. Meanwhile, women are involved in all types of work such as making embankments, loosening the soil, planting rice, cleaning weeds, and all types of harvest activities. However, some farmers who are financially capable will pay for labour to cultivate their land. In addition, the community still practice a cooperation system called *marsirippa* or *marsiadapari*. The cooperation activities are carried out reciprocally.

The people of Parbotihan village recognizes two forms of land ownership, namely land owner and non-land owner. Valid evidence of ownership of land that commonly found is a sale and purchase letter or handover of inheritance. However, most of them do not have proof of ownership. Meanwhile, non-owned land is divided into several types, namely rent, *dondon* or pawn, and *mangula* or cultivating. Rent is a land cultivation right given by the land owner to the tenant at a certain cost determined by both parties. The rental price is a fixed price, it means that even if the harvest changes, it does not affect to the amount of the rental cost that was agreed at the beginning. In the land leasing pattern, the land owner only gives empty land to the tenant, while the tenant is responsible for the entire cultivation process until the land is produced. Dondon or pawn is land given to another person for a certain time as collateral for a loan. The pawn is valid for the agreed loan repayment deadline. If the loan cannot be paid on time according to the agreement, the collateral land will be owned by the lender. Meanwhile, there are two forms of *mangula*/cultivation in Parbotihan Village, namely profit sharing and non-profit sharing. The profit-sharing system is usually implemented for rice fields. Profit sharing is done when the harvest is over. The profit-sharing pattern used is 1:1. In the past, in the profit-sharing pattern, the responsibility between the land owner and the cultivator was same. The land owner provided input for rice cultivation, while the cultivator was responsible for cultivating the land and caring for the plants. However, in recent developments, the responsibility for adding inputs and maintaining plant has all become the responsibility of the cultivator. The land owner only gives the land to be cultivated according to the rental system. The difference between profit sharing and renting is the amount of the price that must be paid. The pattern of cultivating without profit sharing applies to moorland. In this pattern, the land owner does not expect compensation for using of his land.

The labour used to cultivate agricultural land is generally dominated by family members. Most of the farmers in Parbotihan Village have involved their children as workers since they were under 15 years old or when they were still in junior high school (SMP). For children, the average time at work on agricultural land is around four hours, starts from 02.00 pm when they get home from school until 06.00 pm. For some farmers who financially capable, they will pay farm labourers to work in their land. Meanwhile, farmers who are financially incapable and do not have family members as workers will cultivate the land by working together with fellow farmers. This cooperation activity, in local terms is called *marsirippa* or *masiadapari*. *Marsirippa* activities are carried out by two or more farmers who work in turns on each member's land. In this context, labour is paid by labour. Cooperation activities are carried out in a reciprocal manner. Currently,

families actively farming in Parbotihan Village are dominated by parents over 50 years old. In fact, there are still many farmers aged over 60-80 years who actively work on their land. With all the limitations they have, they still rely on farming as their main income.

The productivity of rice fields greatly depends on their fertility. Productivity is also the basis for farmers to determine the level of land fertility. Although there are no exact figures, the measure used by farmers for fertile rice fields is that one litre of seed produces 60-70 litres of dry grain. The harvest obtained by farmers will be stored in the barn. Most of farmers still have a barn in their homes. Farmers who do not have barns will usually allocate one room to serve as a storage shed. It means that the harvest for one season will be stored for food supplies for the whole year.

The rice harvest in Parbotihan village is only meant to meet the need of rice for one year. Although there are some farmers who sell rice at certain times, this is only to meet urgent needs such as covering children's education costs or medical costs when a family member is sick. Others are to meet the need of fertilizer for rice plants which cannot be postponed. Meanwhile, for other needs outside of rice and other urgent needs, farmers will look for other sources such as cultivating dry land, becoming farm labourers, raising livestock, craftsmen, village infrastructure projects and so on.

At the time this research was conducted, several fields of rice fields appeared abandoned and no longer cultivated. These abandoned rice fields are not limited to rice fields that do not receive intense irrigation, but also to fields that are well irrigated. There are some abandoned rice fields that do not receive intensive irrigation, but other parts that are well-watered and considered fertile are also abandoned. Some farmers whose abandoned land even offer their fields to be cultivated by others for free. They only hope that their rice fields will remain productive and well maintained.

Besides the abandoned rice fields, the period for rice field cultivation has also changed. In the past, farmers started cultivating fields in September and planting in December every year. Recently, farmers no longer follow this schedule. Even though farmers still go down to the fields in September, the planting period has a longer range, from December to March on the hereafter year. Thus, from September to March on the hereafter year, there were farmers still working on the rice fields. In fact, in the previous period, between February and March, farmers were already at the stage of weeding the rice.

The implication of the uncertainty cultivation period is that the harvest does not occur simultaneously. Some farmers have harvest period in May, others in June and July. That difference harvest season requires farmers who harvest early must be take care their crops from bird pest attacks. Some farmers even must look after their plants when paddy starts to fill up until harvest period come. Otherwise, they will have crop failure because the birds will focus on their rice. Likewise with other pests such as rats or stink bugs or leafhoppers.

Another interesting thing is the use of short-lived rice seeds. Previously, people tended to use long-lived rice, recently they are more inclined to choose short-lived rice. The short-lived meant is not only being able to harvest four months after planting, it is even faster, which is three months. Even though they use short-lived rice varieties, they don't change the number of growing seasons. They still plant rice once a year.

Migration, Labour Scarcity and Aging Farmers

The people of Parbotihan village is characterised by migration activities driven by efforts to meet economic needs. Conveyed by (Gunawan et al., 2016) that the economy is the dominant factor causing migration. Before the 1980s, people migrated to simply meet their food source as they could not fulfil the household food needs. The inability to fulfil food needs is not because of limited land, but because the lack of agricultural productivity. Even though the peasant cultivated rice fields and moor to produce rice at that time, their daily rice needs could not be met. This condition is exacerbated by the failed harvests due to pest attacks or natural factors.

Low productivity at that time had encouraged rural society to look for work by migrating to other regions that needed workers. Some of the regions as migration destinations are Barus, Manduamas and several other rural areas in Central Tapanuli regency, north Sumatra. These regions need workers for their rubber plantations. Other than rubber, these regions also has another source of income by cutting wood for building materials such as boards and wood beam. At that time, almost every productive male in Parbotihan village migrated circularly, they take advantage of the fallow period between the harvest season and the next planting season and between the planting season and the harvest season. This condition shows that when the environmental carrying capacity is insufficient, migration becomes a way to overcome economic problems.

In the early 1980s, the migration activities of the society began to change. If previously the dominant aim of migration was to fulfil food needs, in the 80s it was intended to improve living standards. The aim of improving living standards is carried out by looking for work beside of traditional agriculture which is usually done. Another way is by increasing their formal education. Migration also no longer involves parents or married man but are limited to rural youth and single men or women who have just completed their education on senior high school. These changes seem to be inseparable from the increase of agricultural production due to changes the agricultural patterns at that time. According to interviews with farmers, there was a significant increase in rice production at that time because the using of inorganic fertilizers. Apart from that, people are starting to learn about secondary crops cultivation which enables them to fulfil their needs other than rice. At that time, the farmers of Parbotihan Village began planting Arabica Coffee, which then change their economy significantly. Increasing agricultural production affects the economic level of society.

A further implication of improving the economy of Parbotihan society is awareness and opportunities to improve the formal education of farmers' children. If previously, most of the people's education only reached elementary school level, since the 1980s, more people sent their children to high school (SMA). Economic improvements give farmers the opportunity to be able to pay the education fees charged by schools. At the same time the government also build junior and senior high schools infrastructure in villages and sub-districts, so that people can access education easily. Apart from economic factors and ease of access to education, the main factor that encourages parents to improve their children's education is the desire to prevent children from working in the agricultural sector. People consider farming to be a hard job so it doesn't need to be inherited. And education is needed to get better jobs outside of agriculture.

Increasing levels of education has changed the orientation of the youth of Parbotihan towards more pragmatic work. The aim of improving their standard of living no longer remains in the agricultural sector but in the non-agricultural sector in urban areas. This is what encourages

the youth of Parbotihan Village to choose to migrate to the urban area than stay in the rural area as farmers after they graduate from high school. According to Noveria (1993), education increases the tendency to migrate to big cities. The younger generation's choice to migrate to urban area is not only their own desire, but also pressure from their parents. As main intention to improve their children's education, parents are also very displeased if their children continue to work as farmers like them. Heavy physical work is a reason not to want their children to work as farmers. There are several reasons for parents to encourage their children to migrate after graduating from high school, namely reducing the burden of the family, so that they can change their fate by getting a better job and their children can be successful. Interestingly, parents in Parbotihan consider the option of migrating after graduating from high school provides better job than staying in the village as a farmer. They also consider that success in the urban area is much easier to achieve than choose to farm in the rural area. According to them, farming in the rural area does not give guarantee for better life.

Migrating to the urban area is still the choice of young people in Parbotihan Village until this day. Every year, around 90% of rural youth who graduate from high school leave the village and migrate to the urban cities such as Medan, Pekanbaru and Jakarta. The purposes of their migration are work outside agriculture to increase their income and continue their education to university. The purpose of their migration is to work outside agriculture and continue their education at university. Those who migrate for work purposes do not have any reference for the type of work they will go for. As young people who had just graduated and had no work experience outside of agriculture, they were looking for any type of work they could do. Most of these young people seek their fortunes in factories, cooperative workers, plantation workers, shopkeepers, and tire repairers. Despite how fierce the competition is for jobs in urban areas, young people clearly prefer to leave the villages for jobs that can earn money quickly. Most of them choose to live in the city, even though their work in the city is limited to informal workers. Meanwhile, young people who migrate for educational purposes are spread across state and private universities in the city. There are several drivers for young people to choose to continue their education, such as children's desires, parents' desires and economic capabilities and prestige. In the last two decades, more and more children are realizing the importance of continuing their education. This awareness is also supported by the desire of parents who do not want their children to inherit their work as farmers. The desire to continue education cannot be separated from the hope for a better standard of living. The aim of their migration is to improve their economy (Bandiyono & Indrawardani, 2016; Ravenstein, 1889). Migration at that time was carried out permanently where the migrants were reluctant to return to their hometowns.

Expectations regarding migration decisions for the purpose of improving the economy do not always match the expectations of young people. Some young people do not always find work as quickly as expected. Others do not get the job they want. Others even got jobs but were no better in terms of income. Although there are not many, there are several young people who have had to migrate just because they were laid off or their work contracts were not renewed. There are others who must survive even if only with odd jobs. However, most migrants prefer to stay in the city rather than return home. Even when they still have land to manage in the village. Returning to the village for most migrants is considered as a failure.

Young people who succeed in finding work and can improve their standard of living overseas

will choose to stay, even until they have a family. Meanwhile, young people who failure reluctant to go home to avoid negative talk about their failures in urban areas. Some young people who are successful will set aside their income for their parents, but it is very rare for young people who migrate to save money specifically to buy land again. Young people who are successful overseas prefer to buy land overseas rather than in their own village. This happens because there is no desire to return to the village, even after retiring. Meanwhile, young people who fail and intend to return home still have family land to manage in the future.

Labour scarcity

The migration of youth after graduating from high school has a significant impact on the scarcity of productive labour on agricultural land. The decreasing number of family members and at the same time the age of old farmers getting older means that their ability to cultivate land decreases over time. Farmers who were previously able to cultivate five plots of land with an area of 1.5 ha with the help of three children, are now only able to cultivate one to two plots of land with a maximum of 0.25 ha due to the migration of the younger generation. Limited productive labour has resulted in agricultural productivity decreasing significantly. Migration of family members has caused difficulties in cultivating land optimally, resulting in many agricultural lands being neglected and not being cultivated properly. From a survey conducted by the author on 30 farmers, all farmers have agricultural land of various sizes. The average land area they own is 10,688m2 consisting of several fields of rice fields and moor. The decrease of ability to cultivate land because children are no longer involved as workers, it is certain that more and more land is not being handled.

> Andi'65 and his wife Dian'62 have five children, four boys and one girl. The age difference between their five children is an average of two years. Since 2002, their eldest child has completed his high school and migrated to Medan to continue his education at university. Four years later, his second child migrated for the same reason.

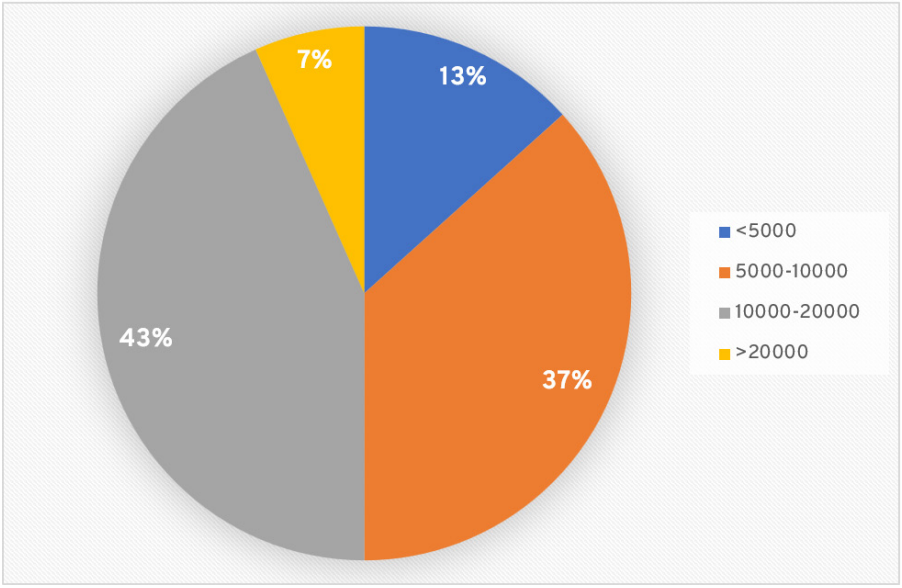

Figure 1: Land Ownership in Parbotihan (m^2)

> Then the third, fourth and fifth children also move to other cities each two years apart. Since 2012, all the children no longer live with them. Andi was left alone with his wife to cultivate all their agricultural land. Even though Andi and his wife are aware that relocating their children to the urban city will affect the cultivation of their agricultural land, they have no intention of having their children continue living in the village. In fact, they encouraged all their children to migrate and seek income in the urban area. By utilizing agricultural products, Andi and his wife are trying hard to educate their eldest child and hope that the eldest child will be successful and ready to help their other children. After the eldest child worked and had a steady income, he also helped his younger siblings cost in the university, and so on, the oldest child contributed to the children under him. Until now, Andi's children have permanent jobs in the city. Some work as civil servants, and some are private employees. Of the five children, one chose to return to the village to help cultivate Andi's land. In the village he grows vegetables and other horticultural crops but is reluctant to get involved in work in the rice fields. His involvement in rice fields was only to help when work could not be postponed, that is during harvest time. (October 2021 Field notes)

When Andi and the children were involved in working on agricultural land, they were able to cultivate nine plots of rice fields and moorland with an area of up to 2 Ha. Since their children migrated to the urban city, the cultivation of the farm only depended on Andi and his wife, who were getting older. Since then, the land that they cultivate has begun to be abandoned one by one. The land they rented was also finally returned to the owner. In the end, Andi and his wife only cultivate four fields of rice fields and one field of dry land with a total area of approximately 0.2 ha. Meanwhile, they abandoned other plots of land.

Andi is just one example of a farmer who has shortage of labour problem and must abandon part of his land. There are still many other farmers who experience a similar situation, like Emar'65 years old, who are willing to abandon around 1 ha of their land and rent out part of it at a very low rental price. Dimar, 67 years old, also no longer cultivates more than half of his land area. He rents some to others at a voluntary price. Dina'75 even offered a plot of his rice field for free and a bonus for rice seeds to plant if there were farmers who were willing to cultivate the land. It's not that they don't have children who can manage it, but they don't want these children to stay in the village just to cultivate their land.

The lack of young farmers as a productive labour means that agricultural cultivation only relies on to the aging farmers. The limited capacity of older farmers causes many productive plots of land becoming neglected. Most land owner in Parbotihan has abandoned their land. To prevent the spread of abandoned land and keep the land productive, land owners are trying to rent out their land to younger farmers. If land owners have difficulty getting tenants, they are willing to give the right to work on it to someone else without expecting anything in return. The rental pattern and granting of cultivation rights do not apply the same between rice fields and moor fields. Usually, the rental pattern applies to rice fields, while the right to cultivate without compensation only applies to dry land. This shows the difference of value of the two lands.

Rental patterns amid scarcity of productive labour are not without risks. The increasing amount of abandoned land and the unbalanced demand for land rental make rent prices decrease. The decrease in rent was also driven by the desire of land owners to maintain land productivity,

while tenants had many choices of land to rent. For that reason, land owners are willing to lower rental prices to find tenants. As happened with Emar, a tenant farmer received a 100% reduction in rental price compared with the previous tenant.

> In 2018, Emar rented rice fields from Ojo with an area of 600 m^2or equivalent of 24 litres of rice seeds. In the first year he cultivated the land, he was required to pay for 14 cans (1 can = 20 litres) of dry grain. In the following years, he tried to ask for a reduction of the rental price to 12 cans of dry grain by using certain tricks. The reduction in rent has been much reduced compared to Andi, the previous tenant who had to pay 30 cans of dry grain for one harvest. Q: "how much is the rent?"; Emar: "it's a little, only 12 cans for one harvest"; Q: " that's cheap, isn't it?"; Emar: "I was offered for 14 cans in the first year, and for the hereafter year, it was 12 cans, 'ah... I can no longer cultivate it ma'am, I'll just return the rice fields. That's just a trick so that the rent cost can be reduced. 'Ah...to whom else, I'll give the rice fields, you just cultivate it, you pay that much, it's okay, that's fine, just give me 12 cans" (Emar'65 years old, farmer)

The accumulation of agricultural land provides tenant farmers with the option and influence to negotiate lower prices. Rice fields characterized by low fertility, limited irrigation, distant locations from tenants' residences, and smaller plots are frequently declined by tenants. Conversely, in the case of fertile rice fields, tenant farmers secure them at considerably lower rental prices. In such circumstances, the landowner lacks the authority to dictate rental prices as the likelihood of non-acceptance by tenants is substantial. The next implication is increasing wages for agricultural workers. Older farmers who have large areas of land require quite a lot of labour to compensate for their limitations. The increasing demand for labour influences the increase in wages for agricultural workers. My findings show that the wages for agricultural workers in Parbotihan Village are IDR 5,000.00 – IDR 10,000.00 higher than in the surrounding villages. This condition is in line with the results of research which found that wage increases were caused by farm labour shortages (Ando & Horiguchi, 2013; Nugroho et al., 2018).

Rising farm worker wages not only has an impact on increasing income but also on the reluctance of farmers to cultivate their own agricultural land. They tend to choose to be labour because as a labour they get definite income, while farming will not.

> "How will I say... now, the labour wages are greater than the harvest... listen, now there are many rice fields that have been abandoned because no one wants them anymore. There are many people, but prefer to be a labour, no longer farming. The number of people who work in the fields has also decreased. I mean, people no longer cultivate their fields. For example, I have a rice field, where I no longer cultivate it because I prefer to be a labour. And if I have a rice field to give to people to cultivate, no one will accept it anymore because the wages for labour are already high." (Umar'80 years old)

> In addition to rejecting offers to cultivate the land, the shortage of labour amidst a considerable amount of land that need to be cultivated results in workers not performing as effectively as necessary. This causes the process of cultivating land takes longer. "In the past, cultivating the rice fields is still profitable because the people we employed were still diligent, the wages were not so expensive, they were still

> profitable. Now *nombok*, no profit. In the past, cultivating one can of rice fields using hired labour, it was all done in 15 days, now if you count, it has not been completed in 30 days, that's what happen with hired labour and how cheating they are now haha…" (Dimar'67 years, farmer)

With longer execution process and the lack of yields, farming is increasingly unprofitable. Besides that, farming in Parbotihan Village is dominantly undertaken by aging farmers. Then why do farmers stick with their rice fields?

Maintaining Rice Fields for What?

The aging of farmers and the scarcity of young workers have not made the Parbotihan farmers stop their rice field activities. They also continue to follow the farming season once a year since September. Their desire to continue farming in their old age with many limitations is driven by several things. First, ensure the availability of food. One of the biggest concerns of farmers is the lack of food availability. Thus, they remain cultivate the rice fields and ignore other agricultural activities is intended to prevent food insecurity. Food insecurity is a measure of people's anxiety about experience of food shortages (Perez-Escamilla et al., 2004; Tucker, 2012).

> Q: "How about just farming in the moor?"; Ipa: "waduhh…waduh, so how about our daily meal?… if you only depend on coffee plants and have to buy rice, well cheers"; Q: "isn't it enough to buy rice from this (coffee result)?".; Ipa: "How can this be enough, for rice, for other dishes and for sugar, right? This coffee doesn't harvest continuously, there is a season. Unless it can be harvested all the time or at least once a fortnight. So how do you try to share it if you use it for rice and other things. So, if you have to buy rice, people laugh at it… well, I don't know…so how can we sleep, we say this (coffee field result) will cover all the daily needs, after a while we're starving" (Ipa'68 years old)

Concern over the availability of food makes them always store harvest for consumption throughout the year. They do not make rice as traded commercial item. The availability of rice at home makes them feel more comfortable doing their activities. Economic benefits and the production of sufficient food for self-consumption are also important (Rigg, Salamanca, Phongsiri, & Sripun, 2018; Ruiz Salvago et al., 2019).

Second, farming is also used to fulfil social responsibility. Rice for the people of Parbotihan Village is not only needed to meet food needs. Rice is also used as a requirement to fulfil responsibility when participating in traditional ceremony such as marriage and death. Everyone who takes part in Batak traditional events such as marriage and death always bring rice to the owner of the celebration. These activities occur throughout the year. If someone does not have a supply of paddy or rice at home for traditional activities, it will be very inconvenient. Even though in recent times many people have replaced 'rice' with money, but rice is still considered the original one has to give to the ceremony owner as a form of responsibility.

Third, farming is an attempt by old farmers to fulfill their responsibilities as parents. Jansuwan and Zander (2021) note that the reason for farming is to enjoy farming and retain well-being, giving them a sense of doing meaningful work and fulfilling a sense of responsibility. The

responsibility of a farmer is not only to fulfil subsistence, but also to the children when they are about to get married. This responsibility relates to fulfill of consumption when the wedding is held. For this reason, parents usually form a "rice" *arisan* which members will take turns receiving when their children are getting married. The purpose of the *arisan* is to provide the need of rice for wedding receptions, which can reach more than 20 cans (400 litters). This condition makes farmers reluctant to leave the fields and rice cultivation. "There are still children who are not married" is a phrase that often comes out from farmers when they are advised not to cultivate rice fields anymore.

Fourth, farming is an important effort to maintain self-esteem. Farmers' decisions to stay in their farming activities are intended to retain self-esteem (Chiswell, 2018; Conway, McDonagh, Farrell, & Kinsella, 2016, 2018). Paddy fields for farmers in Parbotihan Village are intended as a form of independence and not depending on other people, including children. Own needs should be met independently without depending on children abroad. Thus, their efforts to remain active in the rice fields and meet food needs independently will make them feel more valuable.

Fifth, farming is an effort by farmers to ensure the security of their land. Older farmers choose to remain in the rice fields in an effort to secure their land. Besides being able to remain productive, land that is still being cultivated can be protected from other's claims and from damage. Retain rice fields stay productive is also a form of respecting hard work and inheritance as the source of land acquisition. Many farmers are forced managing their rice field because that field is a heritage. Some farmers also feel unwilling if the fields they were initiated themselves become abandoned. "So, whatever we have produced it is very valuable...if the land is not productive anymore... it is impossible for me to throw away the land that I have initiated," said Umar, 80 years old.

Sixth, experience in rice farming. Farmers in Parbotihan Village have traditional rice farming knowledge which has been passed down from generation to generation and has retained to this day. On the other hand, farming skills on moor are not owned at all. Although some farmers have started trying to plant the crops, their success rate is still very small and they often failed. Therefore, the only business that is considered provide more income security is rice farming.

> "On rice fields, we have experience there, there is knowledge that we have learned from the past and we have repeated it. But on moor, I think it's really difficult, because there's no one to teach it. It should plant certain crops here; it should be in special ways for planting and caring of the crops. (Umar'80 years old)

Efforts to retain rice fields for farmers are not always related to profit and loss calculations. Comparison of production results with production cost in rice fields is often unfavourable. Whereas farmers must spend most of their time cultivating the fields.

> "How if the land was cultivated by the labourers?" "Now let's say we have a rice field with one can of seeds. It was not finished for 30 working days, starting from cultivating the land till collecting the crops to the house. In fact, if 30 days x Rp. 70,000.00, it is already Rp. 2,100,000.00. When compared with the yield, it does not profit. The wages are higher than the yields..., it's loss... The maximum average yield of rice production in Parbotihan village for one litter of seeds, can produce 60 litters of dry unhulled rice or 30 litters of rice. So, for 20 litters of seeds that are planted can produce

rice on average 30 litters x 20 litters = 600 litters of rice. If the price of 1 litter of rice is IDR 7,500, then 600 x IDR 7,500 = IDR 4,500,000.00. So, IDR 4,500,000.00 – IDR 2,100,000.00 = IDR 2,400,000.00". (Umar'80 years old)

This acquisition has not been reduced by the costs of purchasing fertilizers and pesticides as well as the work tools needed. That amount is also measured on rice fields that are considered the most fertile among existing rice fields and on ideal situation, there are no damage plants and pest attacks. In fact, the success of rice production is highly dependent on nature conditions. In addition, farmers do not have the power to determine market prices according to the production cost they spend. With these minimal production results, they still retain rice cultivation as their source of income.

Farmers' desire to retain rice fields is not accompanied by efforts to increase productivity through agricultural mechanization. The method of processing the soil is still traditional with simple tools. According to Rusastra and Suryadi (2004), productivity and welfare can be increased by institutional arrangements in agricultural mechanization, development of agribusiness and agro-industry, and creation of non-agricultural jobs. Without utilizing modern production technology, then there is no significant harvest escalation. Even so, rice cultivation in paddy fields is still retained.

Local knowledge about rice is a local wisdom which is inherited from generation to generation, yet it contains flexible and adaptive aspects that enable farmers to overcome unknown difficulties (Takakura, 2018). The importance of paddy fields as the first protection against food insecurity has made farmers retain rice cultivation as their source of income. However, the method used by older farmers in the middle of declining number of young people who involved in agriculture is deal with adapt to this situation. Then what should farmers do to retain their production?

More Flexible Cultivation Process

Farmers will change agricultural processes follow their aging process (Jansuwan & Zander, 2021). Increasing age of the farmers has limited their abilities, both in terms of physical and technological mastery. Decrease of physical strength, mobility and motivation of the farmers can reduce work capacity in attempt to improve farming methods which impact on reduction productivity (Fried & Tauer, 2016; Rogers et al., 2013; Ruiz Salvago et al., 2019; Seok et al., 2018). These limitations reduce their opportunities to intensify land utilization (Halliday, 1989).

Parbotihan Village farmers who are getting old are not trying to intensify land utilization and improve plants maintenance to increase productivity. They also do not utilize of modern agricultural technology to facilitate their work. Reluctant using technology occurs because the latest technology is difficult to access. There are several factors that make farmers in Parbotihan Village not interested in using machine technology to manage their land. First, the land owned by farmers is not large enough to be cultivated at once using a tractor. Even though farmers have an average of 1 ha of land per family, this land is very fragmented. One family with an area of 1 ha can have three to eight plots of land separated by varying distances. If a farmer rents a tractor to cultivate his land in several fields, he must pay quite a lot of money just for the cost of moving the tractor. Often, tractor owners also do not accept orders if the comparison between operating costs and rental prices is unfavourable. Second, the contour of agricultural land in Parbotihan

Village, especially rice fields, is not suitable for managing using tractor machines because it is on a slope, so it has small rice fields. Third, most farmers in Parbotihan Village do not have sufficient capital to buy or even rent a tractor for their farming needs. Apart from the first and two reasons, economic capacity is the reason why farmers in Parbotihan Village do not switch to using machines to cultivate their land.

The adaptation made by the farmers of Parbotihan Village in responding aging is to change the agricultural process flexibly. Farmers no longer follow the standard schedule of rice cultivation processes that have been carried out for generations, such as going to the fields in September, sowing seeds in October, planting in December and harvesting in June on the hereafter year. The current process is adjusted to the readiness of farmers in cultivating the land. Even though they go down to the rice fields in September, the time of sowing and planting is changed according to their ability in completing land cultivation. Farmers choose a longer planting time, starting from December to March. It has never been witnessed before.

> "The *Tabbatua* paddy is rarely planted by farmer. Who wants planting first, he will plant that type. Now there are no more people who plant in December, it's all in January. Anyway, this type is fuller than shorter rice. Then, like in Dolokdolok, if you plant short rice there you have to plant it faster because it takes time for rainwater. Try planting a short one there, it's already harvested now (March). Even though birds, stink bugs and rats need to be worried about" (Dian'62 years old, farmer)

Even though the cultivation process is carried out flexibly, they also arrange the harvest period fall in the same month, namely June. That choice is rational because they have to avoid pest attack. When they harvest ahead of each other, it will open up the possibility of getting attacked by pests such as birds, rats and stink bugs. Such risks are avoided by farmers. This made farmers delay going to the fields because they saw that other farmers had not finished cultivating their fields at all. Increasing age makes farmers try to avoid the risk (Dillon & Scandizzo, 1978; Gómez-Limón, Arriaza, & Riesgo, 2003; Tanaka, Camerer, & Nguyen, 2010).

The flexibility of the cultivation process is driven by two conditions, first, the limitation of time and ability of farmers to cultivate land because of aging. Second, the accumulation of land that has to be cultivated by a small number of young farmers. These two conditions make both young and old farmers need more time to cultivate the land. Flexibility in using time allows farmers have more time to cultivate the land. The shortage of young workers can be overcome by extending the cultivation time.

Flexibility of cultivation process is supported by the presence of various types of rice, especially the 'short-lived' type of rice**.** Basically, the farmers of Parbotihan Village know two types of local rice based on the age of the plants, namely long-lived rice or *Sibendet* and short-lived rice or *Sigirgir*. Both types of rice have been cultivated for a long time. The difference between the two is not only in the age of the plant but also in the height of the plant. *Sibendet* lived longer with taller stems. Meanwhile, *Sigirgir* has a shorter life and shorter stems**.** From the production side, according to them, *Sibendet* type is bigger than *Sigirgir* type. So that some farmers prefer to cultivate *Sibendet* rice.

The difference age between two types of the rice is actually only one month apart. Even so, this difference is enough for farmers to adjust the planting time so they would get the harvest

optimally and avoid of pest attacks. They also regulate the distances of sowing time and planting time to ensure the harvests time both of them do not coincide, only two weeks apart. This is important to reduce the risk of pest attack such as wild boar, rats and birds. Another advantage is that it allows farmers to have time to harvest before long-lived rice is ready to be harvested. This time lag can lighten the farmer's work as well as ensure that the rice does not collapse because it is too ripe to be harvested, so that the grains of rice are well preserved**.** Farmers' knowledge in using rice types of different ages is influenced by production safety.

The diversity of rice types, especially the short-aged rice variants, has changed the agricultural pattern in Parbotihan Village to follow the aging farmers. Interaction between farmers both inside and outside the village allows for the exchange of seeds between them. This exchange makes the types of rice more diverse and allows farmers to have many choices of plant ages from three to five months. This diversity of rice types makes farmers more flexible in choosing the time to plant and still harvest in July.

Diversity of short-lived rice make farmers prefer it over long-lived rice. The longer-lived rice then is only used for rain-fed rice fields, which take advantage of December rainy season for planting. This is different like before which the farmer was more dominant planting long-lived rice for productivity reasons. It is realized that farmers' choice of short-lived rice species will reduce harvest, but from a time perspective it is very helpful. By using shorter-lived rice varieties, aging farmers can allocate more time to cultivate the land, have longer planting time plant and still being able to pursue the harvest at the same time as other farmers who planting earlier.

Even though farmers have many choices of short-lived rice seeds, they have no wish to add seasons more than once a year. They still retain the season farming from September to July. In fact, planting rice that are ready to be harvested in three months, farmers will harvest at least twice a year. Farmers admit that adding seasons will be very difficult for those who are getting older. On the other hand, adding seasons will affect the paddy productivity which is cultivated traditionally because it just has less fallow period. In this context, farmers only using seeds according to the planting time target. If the farmer wants planting early, he will plant long-lived rice varieties. If they need more time in cultivating land, they will plant short-lived rice varieties. They are using rice seeds according to when the cultivation of the land is finished.

CONCLUSION

The younger generation is an important labour in the rural area to maintain a sustainable family farming. However, the facts show that there has been a stable rural youth migration to urban areas to find job opportunities and higher education. For the Parbotihan Village society, migration is influenced by parents who do not want their children to be farmer. The experience of bitter and less favourable in farming makes parents not interested in encouraging their children to be farmer, especially rice farmers. In the end, migration causes a significant scarcity of productive labour in family farming, especially among old farmers who are left to cultivate land without the support of younger family members. Patterns of migration, scarcity of labour, and aging farmer in the village of Parbotihan have significantly re-established farming landscapes and socio-economic dynamics for years. The scarcity of productive labour has resulted in a decrease in farming productivity and the neglect of many fields of land, the increase in wages for wage labour, the rental price

of paddy fields and moor is getting lower, the inefficiency of the wage labour, which leads to a longer cultivation process and reduced profitability. In the end the condition will threaten farming sustainability and food security.

Amid the scarcity of labour and aging farmer, farmers in Parbotihan Village still maintain their rice fields remain productive. The decision to maintain the rice fields driven by various considerations such as the reasons for food security, cultural interests, family responsibilities, and preservation of land ownership. Rice storage that is harvested throughout the year reduces anxiety about lack of food and provides a sense of comfort. In addition, rice farming is an integral part of maintaining self -esteem and independence of farmers. Efforts to maintain farming are also intended to secure land ownership and maintain family heritage.

Farmers who are increasingly aging adapt to their limitations in farming. Factors such as physical limitations, fragmented land ownership, and limited access to modern farming technology require farmers to adjust farming practices. Knowledge and experience that rooted in farming from generation to generation contribute to the adaptation ability of farmers. They have a strategy to remain active and productive to ensure food availability. Adaptation to aging includes a flexible cultivation process. Flexibility in the process of cultivation manifests in several ways, namely farmers shifting time to indicate and plant from a rigid traditional schedule to be in harmony with the readiness and ability of old farmers. The adjustment allows them to manage land effectively despite reduced physical ability and fragmented plots. Farmers strategically choose between long -lived rice variants and short -lived based on planting and harvesting time, effectively managing risks associated with pests and ensuring optimal harvests. The shift towards a more flexible cultivation process in Parbotihan Village reflects a pragmatic response to the aging farmer population and the obstacles they face. By adjusting the time of planting, using various types of rice, and maintaining traditional farming practices, farmers can maintain farming productivity while accommodating changes in their needs and abilities.

It is hoped that this research can enrich references regarding the sustainability of family farming at a time when farmers are getting older and young people prefer to work as a farmer. This research does not fully describe the contribution of migrating youth to efforts to maintain family farming. This could be an opportunity for further research in the future.

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