Article

Challenge of Agriculture Development in Indonesia: Rural Youth Mobility and Aging Workers in Agriculture Sector

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Abstract: The agricultural sector in Indonesia plays a strategic role in both economic development and employment. However, this sector has problems, especially concerning its declining workforce and aging workers. This is largely associated with the low attractiveness of the agricultural sector in absorbing labor. The younger age group prefers to seek non-agricultural employment by migrating to urban areas. This paper aims to analyze the youth mobility, job choice and the implications for agricultural workers. The data for analysis are data from the Indonesian National Labor Force Survey, 2019, by the Central Bureau of Statistics. The result of the descriptive and inferential analysis shows that the probability of youth migrating is higher than for older age groups. On the other hand, the probability of youth finding work in manufacturing and services is greater than in the agriculture sector. This carries implications for an increase in the workforce aged 60 and over, which has escalated from 7.6% in 1971 to 21.2% in 2020. Therefore, it is necessary to develop the agricultural sector so that it is attractive to the younger generation in Indonesia, especially to increase productivity and the use of digital technology for agriculture.

Keywords: youth mobility; job choice; agriculture sector; aging workers; Indonesia

1. Introduction

The aging of workers in the agricultural sector is one of the real challenges for countries in the world, including Indonesia, to realize an end to hunger, achieve food security, and improve nutrition, along with promoting sustainable agriculture as one of the Sustainable Development Goals [1–3]. Statistics show that of the 38.22 million agricultural workers in Indonesia in August 2020, around 21.2% were 60 years old and over, an increase compared to 2005 (12.6%). In addition, the number of workers in the agricultural sector decreased from 41.3 million in 2005 to 38.22 million in 2020 [4,5].

The proportion of older-age workers in the agricultural sector in Indonesia is predicted to increase, making it necessary to formulate appropriate policies that are appropriate to the available resources [6]. In addition, efforts to develop the agricultural sector so that it attracts younger workers must continue to be encouraged, especially since the agricultural sector is a key sector in providing food for the Indonesian population, which in 2021 will amount to 275 million, or the fourth largest in the world after China, India, and the United States [7]. The agricultural sector also plays an important role to reduce poverty while at the same time transforming the rural economy. Therefore, conducive policies that can help develop innovation, as well as adaptive institutional engineering in agricultural development, are important factors for the success of the economic transformation in Indonesia [8].
Several factors are associated with aging in the agricultural sector; among others, the agricultural sector has become less attractive to the larger proportion of the young workforce in Indonesia [9,10]. Young people find farming or the rural future less appealing. Working in the agricultural sector is not the main choice due to its lack of competitiveness. Agriculture is the last choice, with the assumption of having no other choice of work [11]. Various factors have a direct impact on youths’ motivation and intention to migrate. These factors include the influence of the family, the socio-cultural conditions or norms of the community in which they live, and the location of the village as the center of activity [12]. At the same time, different studies have found that work in the agricultural sector is considered a menial job that has low wages, is full of uncertainty, and carries great risks [13].

This paper aims to analyze the mobility of the youth workforce in Indonesia, along with their job choices, as well as the aging of the workforce in the agricultural sector. The analysis of the aging workers in the agricultural sector is based on the time-series data on the age structure of the agricultural sector workforce in the period of 1971–2020. The number of aging workers is calculated based on the proportion of the population aged 60 and over who work in the agricultural sector. The aging of the workforce has implications on patterns of agricultural production, land tenure, the social organization within rural communities, as well as socioeconomic development in general [1]. In China, changes in working-age households have a significant impact on agricultural output [3]. In the United States, farmer productivity generally increases and then decreases with age. On average, productivity increases about 5 to 10 percent every 10 years to middle age (35 to 44 years), and then decreases at the same rate [14].

There is a concern that the aging of the workforce in the agricultural sector will result in a decline in productivity in the agricultural sector, thereby disrupting food security altogether, which, in and of itself, is currently insufficient. In 2019, Indonesia’s rice production was 54.6 million tons, placing Indonesia as the third-largest rice producer in Asia after China and India [13]. Interestingly enough, the need for rice was not fulfilled, so in the 2015–2019 period, on average, Indonesia imported 1.03 million tons of rice per year [15]. In the meantime, food needs in Indonesia are predicted to continue to increase in line with the increase in population which is estimated to reach 318.96 million in 2045. The COVID-19 pandemic has also reduced food safety in Indonesia; 31 percent of households reported food shortages. The same data show that 38 percent reported eating less than usual, compared with 3 percent and 5 percent, respectively, in the previous year [16].

Migration is often seen as an adaptive human response to adverse social and environmental conditions, and individual characteristics are seen to be more important as the determinants of migration than household or village characteristics [17]. Young people prefer to migrate from rural areas to cities. Despite employment in the home village, the attractiveness of the city is still greater for the younger generation to work. The out-migration of young people who leave the village then leave older villagers to continue being farmers although they have reached a certain age.

The wage level is connected to the type of work that the youth choose in Indonesia. High salaries, many choices of employment, opening of job vacancies, and working more than one job cause young people to look for work in the cities [18]. In addition, the education level of the young population and the access to land also influence the choice of staying to work in agriculture or off-farm. Higher levels of education tend to benefit the younger population off-farm. On the other hand, the increase in the amount of agricultural land owned by parents usually reduces the number of young people working outside of agriculture [19].
2. Data and Methods

2.1. Research Data

The data used for inferential analysis in this article are raw data from the National Labor Force Survey (NLFS) conducted in 2019 by the Indonesian Central Statistics Agency (BPS). The National Labor Force Survey aims to meet three main objectives. These objectives are designed to obtain the characteristics of (i) employment; (ii) unemployment and underemployment; and (iii) the working-age population not in the labor force who are in schools, doing housekeeping or other activities, excluding personal activity. The number of samples in the NLFS is 300,000 households.

In addition to that, this article also uses data published by the NLFS in 2014 and 2016, and the population census and the National Socio-Economic Survey (Susenas) are also utilized. The population census is conducted every ten years, while Susenas is collected twice a year. Susenas is one of the surveys conducted by the Central Statistics Agency (BPS) to produce various indicators in the social and economic fields such as education, health, and household expenditure.

2.2. Data Analysis

Analysis of the data was performed by descriptive and inferential analysis. Descriptive analysis was carried out in the form of tables and figures. While inferential analysis is carried out by logistic regression. Two logistic regression models used for analysis are: (a) logistic regression to determine the determinants of a person’s decision to migrate, and (b) multinomial logistic regression to find out the determinants of the choice of work and its relationship with migration.

(i) Determinant of migration

A person’s decision to migrate or move from one area to another is influenced by many factors. The determinants of the decision to migrate classify into three, namely, individual human capital attributes, household characteristics, and resources and community characteristics [20]. In this study, the variables used as determinants of the decision to migrate are age, gender, marital status, education, and place of residence in urban/rural areas. We define youth in this research as people between the ages of 15 and 29 years [21]. The logistic regression equation for the decision to migrate is

\[ \ln \left( \frac{p}{1-p} \right) = \beta_0 + \beta_1 \text{Age} + \beta_2 \text{Sex} + \beta_3 \text{Marital Status} + \beta_4 \text{Education} + \beta_5 \text{Urban} \]

where:
- \( p = \) proportion to migrate
- \( \text{Age} = \) age group (1. 15–29, 2. 30–59, 3. 60+)
- \( \text{Sex} = (1 \text{ man, 0 woman}) \)
- \( \text{Marital Status} = (1 \text{ married, 0 others}) \)
- \( \text{Education} = (1 \text{ junior high school and lower, 2. senior high school, 3. tertiary education}) \)
- \( \text{Urban} = (1 \text{ urban, 0 rural}) \)

(ii) Job Choice

Five themes, internal factors, external factors, interpersonal factors, institutional factors, and socio-demographic factors, can be considered critical for career choice decision [22]. The choice of job sector of the migrants is also dependent on their socio-demographic characteristics [23]. This article examines the determinant of job choice of migrants and non-migrant based on their socio-demographic characteristics, such as age, sex, marital status, education attainment, and migration status. This study uses multinomial logistic regression to determine the determinant of job choice as the equation below:

\[ g_1(x) = \log \frac{P(Y = 2|x)}{P(Y = 1|x)} \]
\[
= \log \frac{\pi_3(x)}{\pi_1(x)} = \beta_{10} + \beta_{11}x_1 + \beta_{12}x_2 + \beta_{13}x_3 + \beta_{14}x_4 + \beta_{15}x_5 + \beta_{16}x_6
\]

\[
g_2(x) = \log \frac{P(Y = 3|x)}{P(Y = 1|x)}
\]

\[
= \log \frac{\pi_3(x)}{\pi_1(x)} = \beta_{20} + \beta_{21}x_1 + \beta_{22}x_2 + \beta_{23}x_3 + \beta_{24}x_4 + \beta_{25}x_5 + \beta_{26}x_6
\]

where:

\(Y = \) job sector (1 = agriculture, 2 = manufacturing, 3 = services)
\(x_1 = \) age group (15–29, 30–59, 60+)
\(x_2 = \) sex (1 man, 2 woman)
\(x_3 = \) marital Status (1 married, 2 others)
\(x_4 = \) education (1 = junior high school and lower, 2 = senior high school, 3 = tertiary education)
\(x_5 = \) urban (1 urban, 2 rural)
\(x_6 = \) migrant (1 migrant, 2 non-migrant)

3. Results and Discussion

3.1. Rural Youth Mobility in Indonesia

Migration during the transition to adulthood can present special opportunities and challenges that affect the lives of young people. There is a consensus that youth migrants are an important part of the migrant community, especially in developing countries, with the young being the largest group to join the migrating population. In 2019, there were an estimated 1.8 billion people aged 15–29 in the world’s population. The reasons they migrate include studying, working, doing business, joining family members, and escaping poverty or violence. As these people mature, while entering social and economic independence along the way, they have the potential to reshape the economics, politics, and social relations around the world. International initiatives have also placed the importance of youth at the center of attention for future sustainable development [24].

Logistic regression results show that age, sex, marital status, and education significantly determine the decision to migrate (Table 1). The result shows that the more mature the person is, the lower their probability to migrate. This indicates that young people in Indonesia tend to migrate from their origin. This is in accordance with the results of previous research that young people (aged 20–24 years) have the highest mobility rate among all age groups, and that one out of ten people aged 20–24 years moved between districts in 2015 [25]. Several studies also reveal that migration decisions tend to be made by young migrants around the age of 20–24 years old [26–28]. This is in line with the 2018 Susenas data, which records that recent migrants are dominated by the population aged 20–29 (Figure 1).

Table 1. Determinant of Decision to Move.

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Exp(B)</th>
<th>B</th>
</tr>
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<tbody>
<tr>
<td>Age group (15–29)</td>
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<tr>
<td>Age_group1 (15–29)</td>
<td>-1.755***</td>
<td>0.003</td>
<td>825,001.798</td>
<td>2</td>
<td>0.173</td>
<td>-1.755</td>
</tr>
<tr>
<td>Age_group2 (30–59)</td>
<td>-0.929***</td>
<td>0.003</td>
<td>416,278.368</td>
<td>1</td>
<td>0.0395</td>
<td>-0.929</td>
</tr>
<tr>
<td>Sex2 (women)</td>
<td>-0.150***</td>
<td>0.001</td>
<td>123,207.638</td>
<td>1</td>
<td>0.861</td>
<td>-0.150</td>
</tr>
<tr>
<td>Married</td>
<td>-0.343***</td>
<td>0.001</td>
<td>27,062.428</td>
<td>1</td>
<td>0.710</td>
<td>-0.343</td>
</tr>
<tr>
<td>Education</td>
<td></td>
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<tr>
<td>Educ (junior high school and lower)</td>
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</tr>
<tr>
<td>Educ1 (Senior high school)</td>
<td>0.725***</td>
<td>0.001</td>
<td>356,241.335</td>
<td>1</td>
<td>2.064</td>
<td>0.725</td>
</tr>
<tr>
<td>Educ2 (Tertiary education)</td>
<td>0.376***</td>
<td>0.001</td>
<td>99,806.851</td>
<td>1</td>
<td>1.457</td>
<td>0.376</td>
</tr>
<tr>
<td>Urban</td>
<td>-0.463***</td>
<td>0.001</td>
<td>232,686.272</td>
<td>1</td>
<td>0.629</td>
<td>-0.463</td>
</tr>
<tr>
<td>Constant</td>
<td>4.361***</td>
<td>0.003</td>
<td>2,030,782.433</td>
<td>1</td>
<td>78.318</td>
<td>4.361</td>
</tr>
</tbody>
</table>
The decision to migrate is seen as an individual investment decision, so if they migrate at a young age, the investment they will get in the future can be even greater [29]. The older a person is, the less likely they are to migrate due to the increasing social ties that they develop within their environment [30]. With regard to the motivation of youth in the rural group to migrate to the cities, the writings of Pranadji explain that the desire or the impetus for migrating is also due to the increasingly limited availability of agricultural land [31]. This creates a perception among the rural youth of the need to look for work outside of their villages. Another research reveals that the youth's decision to move depends on the agricultural land owned; the larger the agriculture land holding of their parents, the lower the tendency of youth to choose a livelihood outside of agricultural work [19].

The logistic regression shows that the probability of people in an urban area migrating is lower than people in a rural area. This is related to the declining interest of the young workforce in working in the agricultural sector in Indonesia. Youth in rural areas tend to migrate to cities to find work in factories rather than living in villages to cultivate agricultural land [30]. Working in the non-agricultural sector is more promising to young people because wages earned from working as operators in factories are relatively higher than those of farms. The trend of migration from villages to cities and abroad has become the focus of attention of many parties. It has also received serious attention from the World Food and Agriculture Agency (FAO), which knows the absence of farmers’ regeneration is a serious threat to food sustainability. The BPS has data that show the group of farmers aged 45-54 years is larger in number than the younger generation of farmers. The agricultural sector is considered less able to provide adequate income to live properly [32]. When it comes to the agricultural sector, young people are more interested in an agricultural model that is managed as a business scheme which doesn’t stop after harvest, but continues with the process of trading a commodity that is ready to be marketed.

Modernization has constructed the perception of the rural youth regarding four conditions, namely, family, school, rice fields, and non-agricultural activities [33]. Modernization in the village has led to a change in views on social, economic, and cultural capital assets. On the one hand, modernization encourages changes in the direction of the renewal of perceptions, while at the same time modernization is also perceived as a factor that keeps village youth away from life in rural areas. The urbanization of rural youth in the city has created a crisis for farmers in the village, and agricultural activities in the village are mostly carried out by farmers who are classified as old-age [32]. It is small-scale agricultural products that indeed support the food needs of most people in Indonesia. The regeneration of farmers is a priority since agricultural productivity is largely supported by farmers who have entered older age and have become less productive.
The migration of rural youth leaving the agricultural sector to find work in the city can be said to have been the trend since the very beginning. This is reviewed through an examination of the reasons for out migration from the village in Gunung Kidul Regency. Limited land ownership in rural areas has been an important factor that contributes to the perception of rural communities that working in agriculture was not feasible and also does not reflect a more dignified social status. This condition was seen as the reason for young rural workers to leave the agricultural sector and migrate out to look for work in the city. It is seen that around 80% of young people desire to work in the city. Agricultural work is not only considered to be less promising when it comes to having a decent life but psychologically it is also considered less attractive. Even the option of being idle or relaxing is preferable to taking up work on the farm.

The logistic regression shows that the probability of women migrating is lower than for men. This finding is in line with the trend of recent migration of all ages in Indonesia, where male migration is higher than female [35]. However, in a society that demands women focus more on family matters, the tendency is for women with higher education to decide to migrate. Meanwhile, concerning the migration pattern according to gender, men migrate mostly at the age of 25–29 years, while women migrate at the age of 20–24 years. As women get older, the tendency to migrate decreases. This possibility is related to women’s duties as housewives. In contrast, at the same age, men tend to still migrate before reaching their peak age in the 25–29 year of age group [36,37]. However, there is a propensity for young females to migrate at a younger age than their male peers. The youth decide to migrate to pursue their life course pathways, such as entering the labor force, pursuing higher education, and getting married [25,38].

The logistic regression shows that level of education has a significant impact on migration. The probability of people with a low level of education migrating is lower than those with higher education; the higher the level of education, the higher the desire to increase income. This is in line with another analysis using IFLS data from 2000 and 2007, showing that the more educated, males, and young people tend to migrate. The role of education is significantly the largest among the young [39]. A higher level of education is often considered as a determinant factor to migration. Some studies have also shown the relationship between education and migration in the country [40,41]. Another study highlights the increasing migration flows of the highly educated from rural areas [25].

3.2. Job Choice

Logistic regression results show that age group, education, sex, rural–urban, and migration status have a significant impact on the decision to migrate (Table 2). The result shows that the opportunity for young people to work in the manufacturing and service sectors is greater than for older workers. The opportunity for workers 15–29 years old to
work in manufacturing is 4.321 times that of workers 60+ years old. While the opportunity for workers 15–29 years old to work in services is 2.711 times that of workers 60+ years old. That is proof that young workers tend to choose to work outside the agricultural sector. Study in UE found that younger individuals are more likely to leave farming activities [42].

Earning potential or wage levels and welfare are the main concerns for young people in finding work [43]. However, other factors must also be taken into account, such as job availability. Still, the labor market conditions also affect how much an individual’s aspirations for work are attainable. Holland’s career choice theory assumed individuals’ occupational choices are influenced by the following variables: individuals’ personality, job environment, members of a similar group, behavioral styles, and personality types [44].

The low and uncertain wages in the agricultural sector are also caused by unsustainable prices of agricultural commodities [45,46]. When commodity prices are low, they directly harm workers in the agricultural sector. This results in the reluctance of the young population, especially in rural areas, to enter the agriculture sector. To make things worse, agriculture also faces other threats in the form of low agricultural productivity, and vulnerability to crop failure due to natural factors such as floods or droughts [47]. This condition also causes unpredictable wages. On the contrary, employment in the industry and construction sectors has better sustainability in wages. For example, in those sectors, wages are paid weekly or monthly.

The low wages in the agricultural sector make this sector even more unattractive to young workers in rural areas. This situation causes the agricultural sector to be less desirable among the job preference of the younger generation (15–29 years). In 2014, the agricultural sector was still the choice for 25.5% of young workers, and then decreased to 18.8% in 2019. The decline in young workers in the agricultural sector in Indonesia was then followed by an increase in the proportion of workers in the services sector (55.2%), while manufacturing tends to remain the same. Low levels of wages, as well as lack of sustainability and less predictable employment, affect welfare levels. The study found that the level of welfare perceived by the head of young households from the agricultural sector is low if compared to non-agricultural sectors since the income from selling raw agricultural products in rural areas is less than the value added to agricultural products usually in urban areas. This makes the youth in rural areas feel poorer than their urban counterparts [44].

Wages in the agricultural sector that are lower than in the service and manufacturing sectors is one factor for the aging of the agricultural sector workforce in Indonesia. The reason for the low wages in the agricultural sector is erratic working hours [48]. Fluctuations in working hours occur, for example, because during planting and harvesting working hours are long, but during the waiting period it’s the opposite, and working hours are significantly low. This condition causes workers in the agricultural sector to be more vulnerable to work discontinuity. The vulnerability of working hours and wages along with the absence of guaranteed career security and social protection increases the accumulation of potential young workers in rural areas to leave the agricultural sector [42,45,48]. This causes the agricultural sector to lose the potential of its young workers, thus raising the question of how the agricultural sector will thrive in rural areas. Thus, the decision that the younger generation makes to leave the rural areas to explore options in other sectors can be seen as quite rational due to more promising wages in other sectors.

### Table 2. Determinant of Job Choice.

<table>
<thead>
<tr>
<th>AMS</th>
<th>B</th>
<th>Std. Error</th>
<th>Wald</th>
<th>df</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacture</td>
<td>Intercept</td>
<td>-1.030 ***</td>
<td>0.002</td>
<td>268,791.473</td>
<td>1</td>
</tr>
<tr>
<td>Age_group [15–29 yrs]</td>
<td>1.463 ***</td>
<td>0.001</td>
<td>1,762,743.651</td>
<td>1</td>
<td>4.321</td>
</tr>
<tr>
<td>Age_group [30–59 yrs]</td>
<td>1.120 ***</td>
<td>0.001</td>
<td>1,391,922.302</td>
<td>1</td>
<td>3.063</td>
</tr>
<tr>
<td>Age_group [60+ yrs]</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
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</tbody>
</table>
The result of the multinomial logistic analysis shows that education has a significant impact on the job choice. The differences in the educational level of the workers affect the probability of workers working in the manufacturing and services sectors. The lower the education, the lower the probability of workers working in the manufacturing and services sectors. The probability of a worker in junior high school and below working in manufacturing is 0.293 times that of a diploma and above. This is proof that workers with low-level education are more absorbed in agriculture. Figure 2 shows that at the low level of education (secondary and below), the proportion of workers in the agricultural sector is still high—higher than in the manufacturing sector. In 2019 the proportion of secondary school educated workers and below working in the agricultural sector was 32.9% larger than the proportion of workers in the manufacturing sector (29.7%). In the same year, for the senior school educated, the proportion of workers in the agricultural sector was 12.0%—less than half of the young workers in the manufacturing sector (27.3%). For those with a diploma-level education and above, the proportion of workers in the agricultural sector is declining (3.1%) while workers in the services sector are dominant (Figure 2). This condition shows that higher education keeps workers away from the agricultural sector, who instead choose to work in non-agricultural jobs.

Figure 2. Distribution of Youth Employment (15–29 years) according to main industry and education, 2019. Source: [49].

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<tbody>
<tr>
<td>Services</td>
<td>1.667</td>
<td>-2.909***</td>
<td>-0.558***</td>
<td>-0.128***</td>
<td>2.081***</td>
<td>0.474***</td>
<td>0.997***</td>
<td>0.825***</td>
<td>0.150***</td>
<td>-1.228***</td>
<td>-0.476***</td>
<td>0.361***</td>
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<td></td>
<td>0.002</td>
<td>0.001</td>
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<td>0.001</td>
<td>0.002</td>
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<tr>
<td></td>
<td>0.293</td>
<td>0.621</td>
<td>0.002</td>
<td>0.992</td>
<td>6.176</td>
<td>1.435</td>
<td>0.055</td>
<td>0.199</td>
<td>1.055</td>
<td>0.199</td>
<td>1.606</td>
<td>2.711</td>
</tr>
</tbody>
</table>

Note: *** p < 0.01; * = reference; AMS = Agriculture, Manufacture, Services.
However, there was a decline in the proportion of workers with low education in the agricultural sector during the 2014–2019 period, which was greater than the decline in workers with a secondary education (senior school) or diploma and higher. In 2014 the proportion of agricultural workers with secondary and below education was 40.1% and then went down to 32.9% in 2019. This situation shows that even at a low level of education, the workforce leaving the agricultural sector is increasing as well. The agricultural sector is no longer desirable work. This trend can be seen in almost all developing countries, including Indonesia where agriculture is still the dominant sector of the population’s livelihood. However, young people in rural areas are not interested in farming. Agriculture work is seen as low status. Being a farmer is considered to carry a low level of social status since the work is dirty and the income is low [10].

At the same time, the development of jobs in the service sector which are relatively easier to enter, with fewer requirements for higher education, encourages agricultural workers to switch to non-agricultural jobs. In Figure 3 it can be seen that during 2016–2019, there was a decrease in the agricultural workforce from 37.7% to 32.9%, while the service sector increased from 32.8% to 37.4%. This is because service sector activities such as small trades, motorcycle repair shops, and other kinds of businesses, are growing in rural areas. The development of non-agricultural business opportunities affects the exit of young people from the agricultural sector, including entrepreneurship in micro-scale businesses, small trades, and transportation businesses [43].

The result of the multinomial logistic analysis shows the probability of women working in manufacturing is 1.161 times that of men. This condition corresponds to the fact that the manufacturing industry is highly dependent on women. The need for female workers in the manufacturing sector is high because women demonstrate high performance with regard to productivity. Although female workers often earn lower wages than men, the trend for women to work in the manufacturing industry is driven by economic motives to meet their own family and individual needs [50]. In the meantime, the proportion of female workers in the agricultural sector in the period of 2014–2019 remained smaller than that of men. In 2019, 13.0% of the total female workforce was in the agricultural sector, a decrease compared to 2014 (20.6%). Most of the workers who left the agricultural sector joined the services sector, while the manufacturing sector tended to remain steady. On the other hand, of the total male workforce, 22.5% were employed in the agricultural sector which was a decrease compared to 2014 (Figure 3).

The probability of workers in urban areas working in manufacturing and services is 6.161 and 8.009 times that of workers in rural areas, respectively. This caused the rural
workforce to move to the urban area to work in the manufacturing and services sector. A big city is arguably highly attractive to young migrants due to the provision of job opportunities, and lifestyle amenities. For example, the city of Batam has become a migration destination for internal migrant workers who come from various regions in Indonesia. Under the coordination of the Batam Authority, Batam City has been developed as an industrial and trading area, ship transfer, logistics and tourism base. It has become the “sugar” for job seekers. The workforce in Batam is dominated by the Javanese at 29%, followed by the Batak at 22%, the Minang at 17%, and the Malay at 10%. Based on the 2010 Population Census data, the workforce in Batam City is mostly in the main productive age (20–34 years), which reaches 62.9 percent of the total workforce in this city, or 282,560 people. Among them, the largest percentage is in the youth group, namely, 20–24 years (22.1 percent) and 25–29 years (22.4 percent). The same thing was found in Batam City where the workforce was dominated by the age group of 20–24 years. Almost half (49.8 percent) of the female workers are in the 20–24 year of age group [38].

The choice of employment in the agricultural sector for young people in rural areas is influenced by land ownership. Young workers who own agricultural land are more likely to remain in the agriculture sector than those who do not own agricultural land [44]. Owning their land encourages youth to freely use the land to earn income. Meanwhile, White found that limited land ownership was one of the factors that led to the retreat of young workers from agriculture. More than half of the farmers do not own agricultural land in the village. The inequality in the ownership of agricultural land means that most young people do not have realistic prospects of becoming farmers, especially since most young people who come from small farmers with limited land ownership use the existing family land as a source of family income [51].

The other reason why the agriculture sector is less developed is that the government’s policies have not fully sided with farmers. An example of this statement relates to the rice commodity. The intention to increase the price of rice is faced with socio-political problems in the form of access for the poor to buy rice, especially in big cities [52]. The low price of rice commodities is certainly not wanted by farmers. Should the government implement the right policy of buying rice from farmers at prices above the market while at the same time reducing rice imports, it would certainly increase the wages received by farmers.

3.3. Aging Workers in Agriculture Sector

The United Nations predicts that in 2030 one in six of the world’s population will be aged 60 and over, and the population of 60 years and over will reach 1.4 billion, or 16 percent of the world’s total population [53]. Indonesia is one of the developing countries that has entered the third phase of the demographic transition, which is marked by the increasing number of elderly people. In the period 1971–2020, the proportion of the elderly population continued to increase from year to year twice as much, namely, 9.92%, or 26.82 million people in 2020 [5]. By 2045, it is estimated that the elderly population will reach one-fifth of the total population of Indonesia [14]. This fact indicates that the aging process has occurred and therefore cannot be avoided.

As an agricultural country, Indonesia makes agriculture the main sector that absorbs the largest workforce in all age groups. At the same time, the rapid economic development opens up wider job opportunities as well. Industrialization in the 1980s provided considerable job opportunities for young workers. On the other hand, the increasing economic growth is followed by a process of urbanization. This causes a lack of interest in young workers in the agriculture sector, which in turn puts Indonesia in danger of experiencing a farmer regeneration crisis. The results showed that of 60.4% of parents had farmer as their main occupation, while only 7.1% of the children continued to work as farmers [33]. This fact shows that the interest of young workers in the agricultural sector is increasingly lacking, which then affects the demographics of the workforce in the agricultural sector as a whole.
An important indicator that shows the aging of the labor force in the agricultural sector can be seen in the average age of the farmers. The data from the 2018 Inter-Census Agricultural Survey (SUTAS) shows that one in four Indonesian farmers is at the age of 45 to 54 years old. The proportion of farmers aged 45 years and over has reached 64.20% [49]. The trend of agricultural labor in Indonesia shows a decline from year to year. During the period from 1971 to 2020, there was a decline in the proportion of youth workers (15–29 years) in the agricultural sector. Meanwhile, the number of elderly increased from 7.6% in 1971 to 21.2% in 2020 (Figure 4). The decline in agricultural labor is also related to the increasing level of education in the younger age group. They tend to choose jobs in the manufacturing or service sectors. The agricultural sector is becoming less attractive to young people. Based on the job choice model, it can be seen that the probability of young workers in the manufacturing sector is four times the probability of workers in the agricultural sector. The increase in age will increase the probability of workers working in the agricultural sector (Table 2). These facts indicate a slowdown in the regeneration process of farmers which resulted in the aging of the agricultural workforce in Indonesia.

Aging of the workforce in agriculture can also be seen in other countries in the world. The average age of farmers everywhere has reached 60 years and over. Note, the aging of farmers does not only occur in developed countries but also in developing countries [59]. Japan is a country that has experienced this phase since the 1990s. In recent decades in Japan, there has been a significant decline in the population employed in agriculture, with a decline of 61% in 2010 [60]. The regeneration crisis has hit many Japanese farmers who do not have successors to continue their agricultural business [61]. Farmers’ aging and regeneration crises have also occurred in several other Asian countries, such as China, Korea, and Thailand [3,62,63].

Aging in the agricultural sector will directly affect agricultural productivity [64]. On the other hand, the individual needs of the elderly themselves tend to escalate. Old farmers still have to protect themselves from poverty [65–67]. There is an immediate connection between aging farmers with health problems, and work accidents [68]. The elderly who work in agriculture tend to have a higher accident rate than other sectors [62]. Some of these findings indicate that the elderly working in agriculture are not only more physically vulnerable, but at the same time, also threaten agricultural productivity itself.

Since the aging of the workforce in agriculture is unavoidable due to the slow regeneration process, agricultural modernization has become strategically important to continue the guarantee of agricultural production during the whole aging period of farmers [69]. The use of agricultural tools such as tractors and harvesters, for example, relieves the physical burden and work time for the older farmers. Utilizing technology
and information to be able to monitor and maintain prices, and stabilize income as a form of innovation in agriculture is a must in this era [5]. The low quality of old farmers requires policies that support the improvement of the quality of farmers while at the same time also encouraging the presence of young workers to participate in building sustainable agriculture [11,63,69].

4. Conclusions

The result of the analysis shows that age group is a significant determinant for migration. The probability of youth to migrate from their origin is greater than for older age groups. On other hand, age group was also a significant determinant for job choice. The probability of youth working in manufacturing and services is greater than that in the agriculture sector, causing the aging of the workforce in the agricultural sector. Data shows that there has been an increase in the proportion of workers in the agricultural sector aged 60 years and over from 7.6% in 1971 to 21.2% in 2020. At different times the NLFS data also shows an increase in the proportion of old age workers in the agricultural sector from 15.2% in 2012 to 19.3% in 2019. The aging of the agricultural sector workforce brings direct implications for the productivity of the agricultural sector, including the choice of technology. Various factors are associated with the aging of the agricultural sector workforce, including the younger age group who are no longer eager to work in the agricultural sector and instead choose to migrate to cities to work in the non-agricultural sector.

Incentives and greater attention to farmer regeneration must be taken seriously to improve the interest of young workers in working in the agricultural sector. The support needed is not only from the government but also from the private sector to contribute to farmer empowerment programs. This can be achieved, for example, by supporting farmer entrepreneurship programs in the wake of the start-up trend. This can help the young groups to be interested in participating in the agricultural businesses that are in line with or directed to business schemes. What must be impressed upon the younger generation is the knowledge that agriculture is a strategic sector that through professional and modern management can improve the welfare of farmers as well. At the same time, support from the government to attract young groups to enter the world of agriculture, among others, can be given through providing incentives and business facilities, such as providing capital for agricultural businesses through village funds. The younger generation will then be able to see that “farming” is a decent source of livelihood to be engaged in, and in turn reduce the flow of migration to cities.

Empirically, wages in the agricultural sector in 2019 were only 26.16% of the national average wage. This condition causes young people in rural areas to look for employment in cities with the promise of better wages. As a result, the agricultural sector is dominated by an old, less productive workforce. For wages in the agriculture sector to improve compared to other sectors, several policies need to be carried out, including firstly, improving the institutional framework and capacity to integrate workers in the agricultural sector and informal enterprises [70]. This institutional integration can occur with the diversification of agricultural products. The results of agricultural products are processed and packaged so that there is an economic turnaround. In addition, to support the diversification of agricultural products, technology adoption is needed. This is necessary because low wages are also caused by the unhurried adoption of technology in agriculture. Quoting from the statement in [71], the slow transfer of technology in agriculture can result in productivity being sluggish and wages stagnant. However, the problem of technology adoption not being achieved is usually related to the high cost of technology in agriculture.

The main focus that must be to educated the younger generation that agriculture is a strategic sector due to its ability to drive the national economy as well as produce food crops consumed by the majority of the Indonesian population daily. A study shows that the number of youths who have an interest in entrepreneurship is quite high, namely 73%
(based on the SMERU online survey 2020) or 81% (based on U-Report 2019) [72]. By developing the potential for entrepreneurship, agricultural activities with start-up business schemes that are preferred by the younger generation due to their technology-base can be simultaneously developed. The added value of carrying out agricultural activities via this start-up business is that farmers have access to information on market prices for food crops. The most important thing about this is that through agricultural applications, farmers can easily learn to grow crops while at the same time finding solutions to their agricultural problems. With the development of digital start-up agribusiness, farmers’ welfare levels can be achieved especially since farmers can then market their agricultural commodities with maximum profit [73]. This hopefully will inspire the younger generation to pursue agriculture.


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**References**


44. Ochieng, N.A.; Ochieng, N.A. Are Youth Moving towards or away from Agriculture? Analysis of farm and Non-Farm Occupational Choices Occupational Choices among Youth in Rural Tanzania among Youth in Rural Tanzania; South African Institute of International Affairs (SALIA): Johannesburg, South Africa, 2020.

45. FAO. *Youth and Agriculture*; FAO: Rome, Italy, 2014.


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