Determinants analysis of farm succession in Indonesian agriculture

インドネシア農業における農場継承の決定要因分析

Rosalia Natalia Seleky

The United Graduate School of Agricultural Sciences

Iwate University

Regional Environment Creation

(YAMAGATA UNIVERSITY)

博　士　論　文

Determinants analysis of farm succession in Indonesian agriculture

インドネシア農業における農場継承の決定要因分析

Rosalia Natalia Seleky

岩手大学大学院連合農学研究科

地域環境創生学専攻

（山形大学）

December 2021

Abstract

Indonesia, a large and well-populated archipelago, has an abundance of the agricultural, fishery, and marine resources. Indonesia is a middle-income country with a GDP of USD 4,293 per capita. Agriculture is still a key strategic sector identified by the government. The Indonesian agricultural sector depends on family farms. However, recently the aging of these farmers is advancing. Yet, the number of successors remains low. Young people in the agricultural sector are decreasing by 3.2% per year. The aging phenomenon of farmers not only has implications for food security in the future but also correlated with conservative decision-making towards the sustainability of agriculture.

The distribution of farm size also varies across sub-sectors. Small farms are associated mostly with food crops, with an average farm size of 0.3 ha on Java Island and 1.4 ha on other islands. The small size of farmland may generate less income and be less attractive to potential successors. As a result, nowadays people of younger generations are interested in non-agricultural occupations. This trend obstructs the regeneration of farming expertise. Therefore, this study is necessary to identify characteristics of farmers with a successor, clarify patterns of farm succession, and examine successful strategies for farm succession through the determinant analysis. This study is expected to yield valuable insights into the development and sustainability of agriculture in Indonesia.

The data of farm households were collected at the Seyegan sub-district, Sleman District, Yogyakarta Province. This agriculture area has typical production activity for Central Java. Agriculture and irrigation have been developed in this region over many centuries. However, the study area is located near Yogyakarta City. The village residents can readily access non-agricultural job opportunities there. Therefore, the village faces a great challenge in farm succession because well-educated young people from farm households tend to pursue non-agricultural occupations. A total of 155 samples of farm households from two villages were interviewed via a semi-structured questionnaire. Quantitative and qualitative analyses were used to analyze the data.

The first study was conducted to identify characteristics of farmers with and without a successor, to clarify patterns of farm succession and farmer retirement, and to examine strategies for successful farm succession. Results clarified that 56.2% of farmers have identified a potential successor to continue farming in the future. However, only 1.8% of successors worked full-time in farming while 44.5% of potential successors worked part-time

in farming. For the study area, results clarified succession patterns of two types, with potential successors chosen directly and indirectly.

Furthermore, results also revealed that the type of farm households without a potential successor indicates farmers have remained unmarried and because potential successors might be too young. However, farmers believe that they will find and identify such a successor. Some farmers apparently hold out hope that they might identify a successor among their grandsons, relatives, or sons-in-law. The future's plan of these farmers indicates that the land tenancy system of sharecropping will be increasingly common as a fate of farmland in the future. Sharecropping systems, if well managed, represent a good alternative strategy to improve farm succession. Evidence also suggests that the parental role in the primary socialization process is the key factor affecting farm household succession. Training usually takes place within the family. Therefore, farm succession planning is necessary for farmers. Planning benefits smooth succession immensely.

The second study was conducted to elucidate factors influencing farm household succession in agricultural occupations. Binary logistic regression analysis revealed that four variables significantly influence farm household succession in agricultural occupations: farmer age, farmer children with non-agricultural jobs, farmland area, and the number of family laborers in farm households. Older farmers show a stronger tendency to have a successor. Non-agricultural jobs of a farmer's children decrease the probability of the farmer having a successor. Furthermore, farmers with small landholdings have a higher probability of having a successor. The inheritance system might affect farm succession processes in the study area. Results also suggest that greater numbers of family laborers in farm households are associated with higher chances of having a successor.

The third study was conducted to elucidate the motivations of farmers to continue rice farming including factors related to motivation. Based on local customs, most farmland is bestowed by parents to children equally. It makes the future farmland size smaller. Farmers are also unable to support themselves if they must do solely based on agricultural income. However, results clarified that, overall, the rice farmers' motivation to continue farming is categorized as moderate. In detail, the relatedness needs have the highest score of farmers' motivations, although this item is categorized as a moderate level. It indicates that farmers want to share good relationships and work with other farmers. In addition, the factors that have a significant and positive relationship with the farmers' motivation to continue farming are farmers' education, number of children, side jobs, and encouragement by parents to be a farmer. Inheritance land status is negatively influenced the farmers' motivation to continue farming.

From this study, it can be concluded that although recently farm succession has become an issue in Indonesian farm households, farm households could have a potential successor. Farmers mentioned having one or more than one successor. However, the main reason for farm successors to continue farming is the lack of other job opportunities, possibly perceived by the overall low education level. Aspirations of educated and productive farmers for their children pursuing non-agricultural jobs may indicate a pending turning point leading to higher education levels and potentially lower succession rates among the next generations. Yet, farmers with higher education can think more forward and solve farming problems.

Moreover, the investigation of the farm succession process in the study area showed strong traditional components of farm management in rural areas. Due to the overall tradition that farmland must be bestowed equally between all children during inheritance, average farm sizes all over Java Island are declining dramatically. Although this decline is not perceived as a problem by most local farmers, it has several negative consequences – farming practices need to be constantly adapted and optimized, fragmentation of plots complicates efficient cultivation, and likelihoods are endangered by insufficient incomes.

Attracting younger people and inspiring high motivation for farming is better for successful farm succession. Farmers must also be supported to avoid fragmenting the farmland or organize a community farming to consolidate the farmland. Supporting farmers to encourage them not to fragment their landholdings during the succession process might help to secure the future successor. Further research must be conducted to ascertain inheritance system effects by bestowing the farmland equally during farm succession.

This study is conducted in only one region, therefore, the generalizability of the results of the present analysis is constrained. Furthermore, the questionnaire used for this study is based mainly on socioeconomic statements. The farm household survey only reflects the perspective of current farm managers (farmers). Further research must be conducted in other regions or other provinces for a comparative case study of farm succession. It is expected that the variables of other types (e.g., successor characteristics, labor market, government support, family support, the motivation of young generation, the participation of young generation in agriculture, local custom, religion) might affect farm household succession. Therefore, it is necessary to conduct further research for clarifying the actual successor of Indonesian agriculture that seems to be suitable in the future. It might also be necessary to conclude more detailed policy suggestions for farm succession issues in Indonesia.

要旨

インドネシアは人口の多い大きな群島で、農業、漁業、海洋資源が豊富にある。一人当たりの GDP は 4,293 ドルの中所得国であり、 現在も農業は政府が指定する重要な戦略分野である。インドネシアの農業部門は、家族経営の農場に依存し、近年は農業従事者の高齢化が進み、若者は年に 3.2%ずつ減少し、後継者が減少傾向である。農家の高齢化現象は、将来の食糧安全保障に影響を与えるだけでなく、農業の持続可能性に対する保守的な意思決定をも引き起こしている。

ジャワ島の平均農場面積は 0.3 ha であり、その他の島では 1.4 ha と、農場規模の分布は地域によって異なる。小規模な農場は主に食用作物を栽培し、収入が少なく、後継者にとって魅力的でない可能性がある。その結果、近年、若い世代は農業以外の職業に興味を持つようになっている。この傾向は、農業の専門知識の継承を妨げる。そこで、本研究では後継者の有無による農家の特徴と継承要因を明らかにし、農業後継者の成功戦略を検討する。なお、本研究はインドネシアの農業の発展と持続可能性について、貴重な洞察をもたらすことが期待される。

ジョグジャカルタ県スレマン郡セイガン地区で農家のデータを収集した。この地域は、中央ジャワの典型的な生産活動を行っている。この地域では何世紀にもわたって農業と灌漑が発達してきた。また、大都市ジョグジャカルタ市に近く、住民は農業以外の仕事の機会を容易に得ることができる。そのため、高学歴の若者は農業以外の職業に就く傾向があり、農家の後継者問題に直面している。本研究では、2つの村の農家 155 世帯を対象に、半構造化質問票を用いてインタビューを行った。

初めに、後継者の有無による農家の特徴を分析し、農家の継承と退職のパターンを明らかにし、農家の継承を成功させるための戦略を検討した。調査対象のうち 56.2%の農家が農業後継者候補を特定しているものの、フルタイムで農業に従事している後継者は 1.8%に過ぎず、44.5%はパートタイムで農業に従事していた。また、後継者候補がいない農家は未婚や後継者候補が若すぎる場合であり、これらの農家は後継者を見つけることができると思っており、孫や親戚、義理の息子などの中から後継者を見つけられるかもしれないという希望を持っている。このような農家の将来計画を見ると、今後、農地の貸借が普及しそうである。適切な管理がされていれば、農地貸借は後継者を増やすための良い戦略となりうる。加えて、親の役割が

後継者に影響を与える重要な要因であることも明らかとなった。農業のトレーニングは通常、家族内で行われるため、農家では後継者計画が必要不可欠であり、これがスムーズな後継者育成に多大なメリットになる。

次に、農家の後継者に影響を与える要因を明らかにした。二値ロジスティック回帰分析の結果、後継者の有無には 4 つの変数が有意に影響し、それは農家の年齢が高いほど後継者を持つ傾向が強く、農家の子どもが非農業系に就業していると後継者を持つ確率が低下し、土地が小さい農家ほど後継者がいる確率が高く、家族労働者数が多いほど後継者がいる確率が高いことが示唆された。

最後に、農家が稲作を継続する動機を解明した。地域の慣習から、ほとんどの農地は親から子へ平等に贈与されるため、将来的に農地面積が小さくなり、農業収入だけでは生活できなくなる。しかし、稲作農家の農業継続のモチベーションは「関係性の欲求」が影響しており、農家は他の農家と良い関係を維持し、仕事をしたいと考えていることを示している。また、農業継続の動機づけには学歴、子供の数、副業、親からの励ましが有意に正の関係を持つ要因であり、相続地の状況が負の関係を持っている。

インドネシア農業では、近年、後継者が問題になっているが、まだ潜在的な後継者がいる。しかし、多くの後継者は他の仕事の機会がないことを要因としており、それは教育水準が低いことが要因と考えられる。教育を受けた生産性の高い農家は自分の子供が農業以外の仕事に就くことを望んでいるため、教育レベルが上がることで、次の世代の後継者率が低下する可能性があると考えられる。一方で、高等教育を受けた農家はより前向きに考え、農業問題を解決することができるとも考えられる。さらに、調査地域における農場継承プロセスの調査から、依然として農地はすべての子供たちに平等に与えられなければならないという伝統のために、ジャワ島全体で平均的な農場の規模は劇的に減少している。この減少は、ほとんどの農家で問題として認識されておらず、区画の断片化が効率的な栽培を困難にし、十分な収入を得られなくしている。

若い人たちを惹きつけ、農業に対する高いモチベーションを持たせることが、農場の継承を成功させるためには必要であり、農家が農地を細分化しないように支援し、農地を集約するための営農の組織化や農地を平等に与える相続システムの効果についても今後研究が必要である。

Table of Contents

Abstract iii

要旨 vi

Table of Contents viii

List of Figures xi

List of Tables xii

List of Abbreviations xiii

Chapter 1 General Introduction 1

1.1. Background of the Study 1

1.1.1. Structural changes and current situation of farm succession in Indonesia 2

1.1.2. Agricultural land policy in Indonesia 7

1.2. Literature Review 11

1.2.1. The influence of sociodemographic, economic, and social factors on family farm succession 11

1.2.2. The transfer of farm management 15

1.2.3. Retirement decision and the ageing of rural communities 17

1.2.4. Motivational factors in farming 19

1.3. Objectives of the Study 23

1.4. Study area 23

1.5. Research Framework 28

1.6. Research Limitations 30

Chapter 2 Characteristics of Farms with and without Successors: A Case Study of Margumulyo Village, Sleman District, Yogyakarta Province, Indonesia 31

2.1. Introduction 31

2.2. Material and Methods 32

2.2.1. Sample size and data collection 32

2.2.2. Data analysis 32
2.3. Results and Discussion 33
2.3.1. Characteristics farms with and without successors 33
2.3.2. Farmers' possible successors in farm households 35
2.3.3. Actual situations of farm household successors 36
2.3.4. Farm succession and farmer retirement 38
2.4. Conclusion 43
Chapter 3 Factors Influencing Farm Household Succession in Agricultural Occupations ... 44
3.1. Introduction 44
3.2. Material and Methods 46
3.2.1. Sample size and data collection 46
3.2.2. Statistical analysis 46
3.3. Results and Discussion 49
3.3.1. Characteristics of farm households 49
3.3.2. Factors influencing farm households in agricultural occupation 53
3.3.3. Case study of a farmer with a potential successor 59
3.4. Conclusion 62
Chapter 4 Farmers' Motivation to Continue Farming 63
4.1. Introduction 63
4.2. Material and Methods 64
4.2.1. Sample size and data collection 64
4.2.2. Data analysis 64
4.3. Results and Discussion 66
4.3.1. Characteristics of farmers in the study area 66
4.3.2. Rice farmers' motivation to continue farming 68
4.3.3. Factors affecting farmers' motivation to continue farming 70
4.4. Conclusion 73

Chapter 5 General Discussions and Conclusion 74
5.1. General discussions 74
5.1.1. Farm succession process 75
5.1.2. Influences of farm households' succession in agricultural occupation 77
5.1.3. Relationship between farm succession and farmers' motivation in rice farming 79
5.2. Conclusions and recommendations 80
ACKNOWLEDGEMENTS 84
REFERENCES 86
APPENDICES 1 95
APPENDICES 2 116

List of Figures

Figure 1.1 The world's top five rice producers in 2017-2018 1
Figure 1.2 The percentage of agricultural labor by age group 3
Figure 1.3 Composition of farmers according to age group, 2003-2013 3
Figure 1.4 Defining the potential successor: a conceptual framework 5
Figure 1.5 The succession ladder 16
Figure 1.6 Comparison of Maslow and ERG needs theory 20
Figure 1.7 Indonesian provinces where most rice is produced (2017) 24
Figure 1.8 Physical map of Yogyakarta Province 25
Figure 1.9 Rice field in Margokaton village. 26
Figure 1.10 Livestock farming in Margokaton village. 26
Figure 1.11 Research framework 28
Figure 5.1 Outline of study 74
Figure 5.2 General conclusions of this study 83

List of Tables

Table 1.1 Number of farm households by farm size 4
Table 1.2 Distribution of farm households based on land ownership (%) 6
Table 1.3 Average of agricultural land in Indonesia (ha) 27
Table 2.1 Characteristics of the farm household sample (*n*=73) 34
Table 2.2 Possible successors in farm households 35
Table 2.3 Fate of farmland by farm households 36
Table 2.4 Farm household child characteristics 37
Table 2.5 Profiles of selected farmers with full-time successors in the study area 38
Table 2.6 Net profit of selected farmers with full-time successors in the study area 40
Table 2.7 Profiles of full-time successors and opinions about farming as an occupation 41
Table 2.8 Successors' opinions about farming as an occupation 42
Table 3.1 Independent variables used for data analysis 48
Table 3.2 Characteristics of farm households (*n*=82) 50
Table 3.3 Characteristics of farmers' children 51
Table 3.4 Farm household income (*n*=82) 52
Table 3.5 Statistical test of the model (*n*=82) 53
Table 3.6 Correlation matrix of independent variables 54
Table 3.7 Results of analysis of the factors influencing farm household succession (*n*=82) 55
Table 3.8 Profile of selected farm households (*n*=1) 60
Table 3.9 Reasons for identifying a successor based on farmers' opinions (*n*=82) 61
Table 4.1 Categories for motivation levels of farmers 65
Table 4.2 Independent variables used in analysis 66
Table 4.3 Characteristics of farm households' samples (*n*=82) 67
Table 4.4 Motivation rate of farmers to continue farming (*n*=82) 69
Table 4.5 Farmers' motivation to continue farming 70
Table 4.6 Factors affecting farmers' motivation to continue farming 70

List of Abbreviations

CBS : Central Statistical Bureau

FAO : Food and Agriculture Organization of the United Nations

GDP : Gross Domestic Product

IDR : Indonesian Rupiah

OECD : Organization for Economic Cooperation and Development

USD : United States dollar

Chapter 1 General Introduction

1.1. Background of the Study

Indonesia is one of the developing countries in Southeast Asia and Oceania between the Indian and Pacific oceans. It has an abundance of agricultural, fishery, and marine resources. Therefore, Indonesia is regarded as an agricultural country: agriculture has long served as the backbone of its economy. Based on Figure 1.1, Indonesia has also become the third-greatest rice producer in the world (FAO, 2017). However, Indonesian rice farming systems are classified as small farm holdings with little capital and traditional (non-mechanized) management, raising subsistence crops. In fact, agriculture plays a pivotal role in food production, although its contribution to Indonesia's GDP is decreasing continually. OECD (2012) indicated agriculture as a key strategic sector identified by government to raise GDP per-capita in Indonesia beyond the level of USD 4,293 at purchasing power parity (PPP). Based on data for Indonesia in 2020, that sector alone accounted for 13.7% of Indonesia's GDP and 29.7% of its employment.

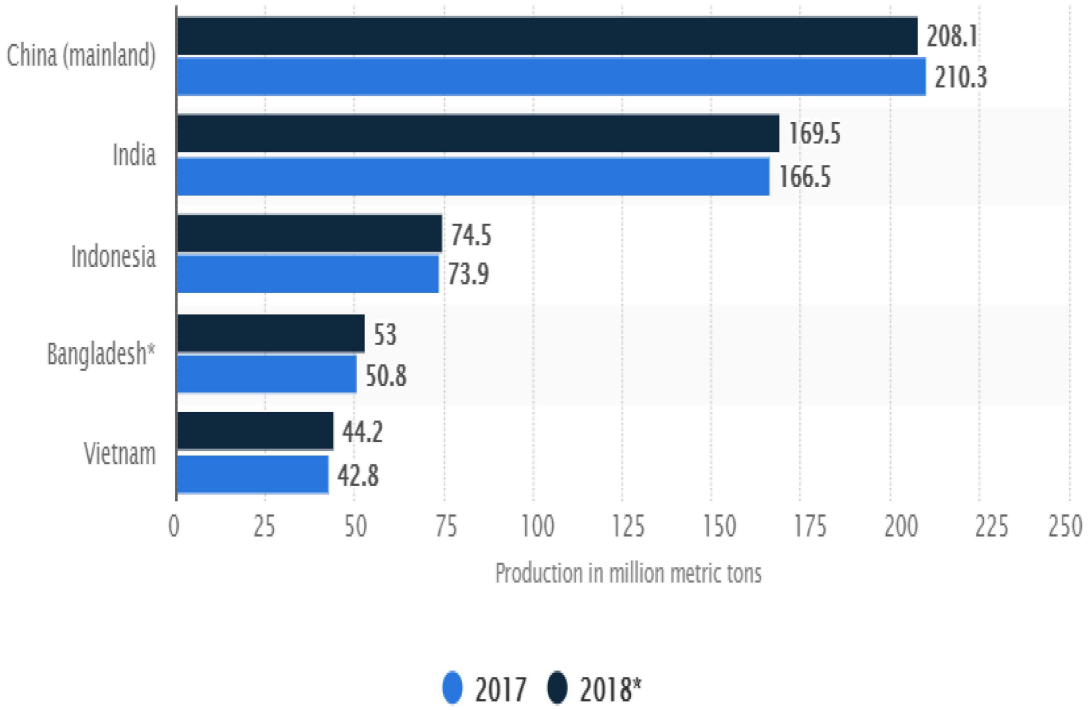

Figure 1.1 The world's top five rice producers in 2017-2018

Source: https://www.statista.com; FAO, 2017.

Furthermore, Indonesia has human resource potential by virtue of its population, which was ca. 273.5 million in 2020. Qualified human resources with good commitment to agricultural development constitute a key factor supporting sustainable agricultural development. Agriculture has therefore become exceedingly important to feed Indonesia's growing population. Yet, the sector faces a daunting challenge posed by aging of the farming population with the ratio of young farmers have declined rapidly. The need for farm succession is unavoidable. These phenomena are also apparent in Australia and in other countries of Asia, Europe, and North America (Susilowati, 2016).

Farm succession and inheritance of agricultural enterprises are increasingly regarded as complex phenomena affecting the farm family lifecycle and sustainability of the agricultural sector (Anwarudin et al., 2018). According to Inwood and Sharp (2009), farm succession represents a crucially important issue of rural-urban relations. Succession plays a critical role in enterprise adaptation and persistence. Succession is also a key influence on how farm households manage risk and expand their farms. However, rapid industrialization and urbanization, rather than the stagnant pace of agricultural growth, have induced rural people to leave their farms and to find non-agricultural or urban sector jobs (Syuaib, 2016). Therefore, extensive research is needed to find out a sustainable strategy for farm succession, particularly in Indonesia.

1.1.1. Structural changes and current situation of farm succession in Indonesia

Recent years, Indonesia and many countries deal with the decreasing number of young farmers. A survey of the national labor force during 2007–2011 (Figure 1.2) revealed that the percentage of young people involved in agriculture declined by an average of 3.18% per year, whereas the labor force of older generations decreased by 0.38% (Syahyuti, 2015).

This situation is like that prevailing in economically developed countries. Young people are more interested in working in the non-agricultural sector than in the agricultural sector. Based on the agriculture census of 2013, the number of farm households in Indonesia declined from 31.3 million in 2003 to 26.1 million in 2013 (CBS, 2013). The reluctance of young people to work in the agricultural sector is a significant problem in terms of maintaining an adequate agricultural labor force. Young people leave their villages because few good incentives exist for working in agriculture, despite important difficulties: unpredictable climate and agricultural production, long durations of production, low commodity prices, and low job prestige (Firman et al., 2018).

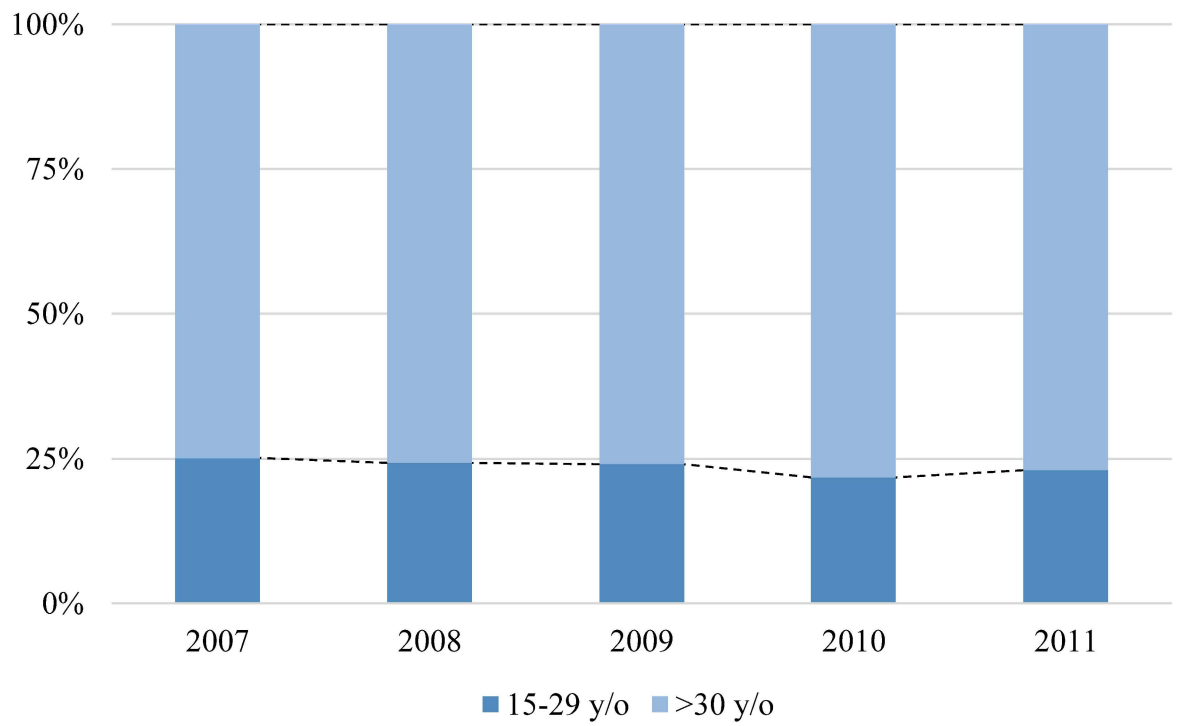

Figure 1.2 The percentage of agricultural labor by age group

Source: Indonesian national labor force survey, 2007-2011.

Those hardships and benefits also compel many older farmers to remain in the villages. Data of the Indonesian Agricultural Census in 2013 show that 62% of farmers are at the categorized age of 35-54 years old (Figure 1.3). In Indonesia, according to the Law No. 40 of 2009 Article 1, the youth are those who enter an important period of growth and development from the ages of 16 to 30. Therefore, farm succession represents an important difficulty in Indonesia, especially for rice farming.

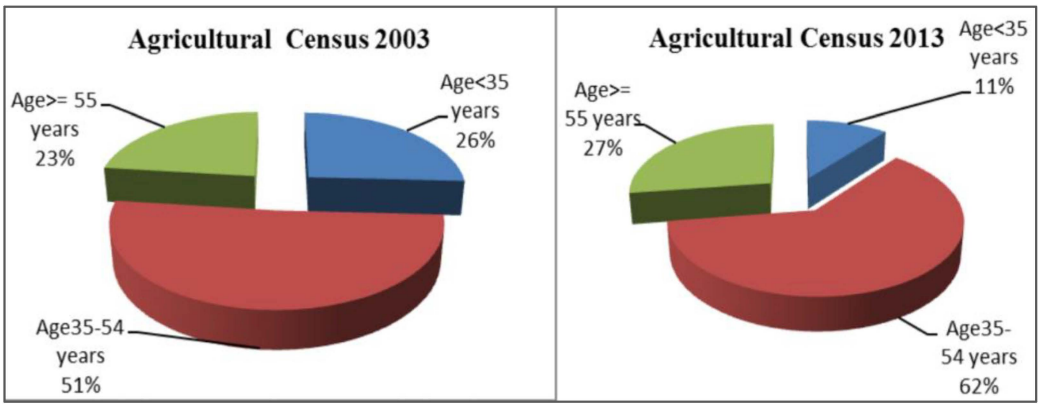

Figure 1.3 Composition of farmers according to age group, 2003-2013

Source: CBS, 2013.

The challenge of agricultural sector in Indonesia nowadays is also about land ownership which affected the farmer's welfare. Farm households in aggregates are decreasing year by year, followed by the decreasing of agricultural land because of the land reform. Indonesia's land reform is the government program that typically involves the redistribution of land and/or regulatory changes which increase land access and/or tenure security. According to (Syahyuti, 2011), from Indonesia's independence until the reform era, land reform is acknowledged but it has not been effectively implemented. As a result, farmers selling their farmland, land fragmentation, and uncontrollable land conversion cannot be avoided. Disaggregation of farm households by farm size reveals interesting phenomena (Table 1.1).

Table 1.1 Number of farm households by farm size

Farm size (ha)	2003		2013	
	Farm household (million)	%	Farm household (million)	%
<0.50	19.8	63.4	14.6	46.8
0.50-0.99	4.8	15.3	4.6	17.4
1.00-1.99	3.7	11.7	3.7	14.3
>2.00	3.0	9.8	3.2	12.4
Total	31.3	100	26.1	100

Source: CBS, 2013.

Based on Table 1.1, the share of small farms (operating <0.50 ha) declined during 2003–2013, whereas the percentage of larger farms (operating ≥0.50 ha) increased. However, most of the farmland is used by developers to build real estate. The lack of education and technology, high agricultural cost management and an increase of their needs forced farmers to sell their land. The low level of farmers income in Indonesia also makes them have no choice other than to work in the non-agricultural sector, while for those who do not own the land become tenant farmers. The possible non-farm activities that small farmers usually engaged in are wage laborers, artisans, household industries, and traders (Iwamoto and Hartono, 2009).

The succession of agricultural actors in Indonesia can be characterized as slow and infrequent (Anwarudin et al., 2019). Younger generation family members, as successors, have little interest in becoming involved in agricultural activities. Susilowati (2016) found that various factors such as less prestige, high risk, and unstable income affect the willingness of the younger generation to be involved in the agricultural sector. Based on Figure 1.4, Chiswell (2014) defined a successor as someone who has succeeded and who is now in managerial control of the farm. In contrast, a potential successor is someone who might gain future

managerial control of the farm. A potential successor can assume one of two distinct 'positions': 1) The possible successor is presumably the future successor, typically by virtue of a kin relationship to the farmer. 2) The prospective successor is someone moving actively to gain managerial control of the farm.

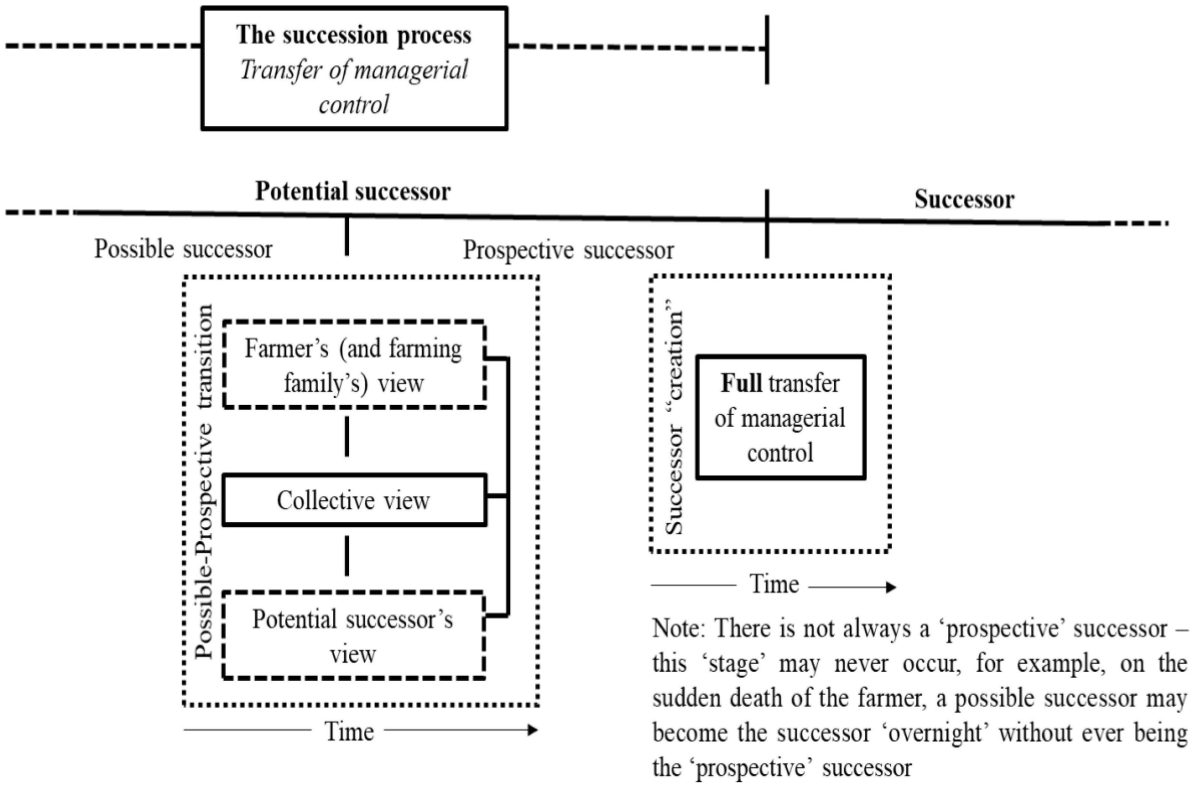

Figure 1.4 Defining the potential successor: a conceptual framework

Source: Chiswell, 2014

Chiswell (2014) also stated that the progression from a possible successor to a prospective successor is described as the possible-prospective transition. It denotes any kind of collective recognition and agreement between the farmer, the farming family, and the potential successor(s) which the potential successor(s) will in time, succeed to the farm. This can be the result of an informal conversation or more formal succession plan and can occur at a specific time or can be a protracted transition. Figure 1.4 also demarcates the point at which the potential successor gains full managerial control of the farm.

According to Aldanondo Ochoa et al. (2007) farm size, farmers' children's educational level, and agricultural policy heavily influence the outcome of succession. Wider farmer ownership of land would increase cultivation, whereas landless people would strive to gain access to land. Pamungkaslara and Rijanta (2017) found that land tenure in Indonesia has affected farm

succession processes in urban areas. Alternative tenure systems for landless farmers include fixed-rent contract, sharecropping, and mortgage. Fixed-rent contract usually involves an advanced cash payment to the landowner. In sharecropping, the tenant farmer provides a share of the harvest to the landowner. Share tenancy is a labor contract that yields higher utility to the principal compared with wage or rental contracts. In mortgage, the land is awarded to the tenant farmer in exchange for a lump sum loan, and the land is returned to the landowner upon loan repayment (Jamal and Dewi, 2009; World Bank, 2003).

By contrast, rural areas have been affected more by farming experience, capital, new farm management costs, and revenues than other occupations. Jamal and Dewi (2009) reported that choices of land tenure contracts for farmland are becoming increasingly important. Those choices might result from land fragmentation, which in turn, is a result of population pressure and the equal inheritance system, particularly those of Java Island (Iwamoto and Hartono, 2009). Certainly, most farmers in Indonesia usually get access to the land through inheritance land and land purchase. In Java Island, 30% of farmers access the land through land purchase while outside of Java Island was about 40% (Table 1.2). It indicates that the land market in rural areas outside of Java Island is more active than in Java Island (Pasaribu et al., 2011).

Suryantini (2002) states that land fragmentation and land conversion have led to smaller farm size. As a result, rural household incomes are decreasing, and the following step is affecting farm activity and household welfare. The participation of young farmers plays an important role in small-scale farms because the use of family labor is intended to reduce production costs (Firman et al., 2019). The family member is the main source of the farming labor force. Recently however, full-time farming involves one person and one part-time worker (Suryantini, 2002).

Table 1.2 Distribution of farm households based on land ownership (%)

Land acquisition	Java Island	Outside Java Island
Inheritance	66.49	45.75
Purchase	29.79	43.11
Given land	0.93	4.47
Government land (transmigration program/local migration)	-	4.02
Others*)	2.78	2.64

Source: Pasaribu et al., 2011.

*) In Java Island, most farmers purchase the land at a low price (related to inheritance land), whereas outside of Java Island farmers will expand the farmland by open forestland.

Available research related to Indonesian farm succession and retirement remains extremely limited (Syahyuti, 2015). Results of a recent relevant study indicate that agricultural policy in Indonesia still supports farmers. As described in the Strategic Plan of Agriculture for 2009–2014, primary goals of agricultural development during the period are achieving and maintaining self-sufficiency of the five strategic commodities (rice, maize, soybean, sugar, and beef), and particularly of rice (Ministry of Agriculture, 2011). However, the policy is intended to raise farmer wealth. As described by Syahyuti (2015), no specific policy has been undertaken to encourage young people to adopt farming as an occupation. Moreover, in fact, the existing farmers have not been assured that they will get access to the land.

1.1.2. Agricultural land policy in Indonesia

Agricultural land has always been a policy of concern, since Indonesia gained independence in 1945. The main policy is the Constitution Republic of Indonesia 1945 and the national Basic Agrarian Law No. 5/1960. Syahyuti (2015) mentioned that both policies provide reassurance to the public and farmers to hold land for agricultural activities and ensure their welfare. The Basic Agrarian Law of 1960 is a first effort to reconcile *adat* (traditional or customary) law with western law and to give small farmers or tenant farmers more equitable access to the land. According to (Soemardjan, 1962), the Basic Agrarian Law is also related on planned land use and registered sharecropping agreements constitute the basis of the present land reform in Indonesia.

The Sharecropping Law No. 2/1960 was passed to control the popular institution of sharecropping on both irrigated and dry land. Landowners who for some reason are not in a position themselves to work on their land used to enter into a working agreement with farmers, most of whom were landless, to till the land under traditionally determined conditions for sharing the product. The differential economic position of the landowner and the landless farmer frequently gives rise to what government considers an unbalanced sharecropping agreement. For this reason, the government has deemed it necessary to issue the Sharecropping Law, which includes the following principles: (1) to establish justice in the relationship between landowner and sharecropper; (2) to protect the usually weak position of the sharecropper against the economically stronger landowner; (3) to instill in the sharecropper a stronger incentive for increased production.

To prevent the sharecropper from falling into a position that would be worse than his/her present situation, the Minister of Agricultural Affairs has issued an instruction that no shares

for the sharecropper may be fixed below the minimum of half the product of irrigated land and two-thirds of the yield of dry land. For purposes of public control, it is determined in the Sharecropping Law that the landowner is required to register each sharecropping agreement on his/her land with the village administration. It is further ruled that only private farmers and village or farmer cooperatives are lawfully allowed to enter into sharecropping agreements as sharecroppers. A maximum of 3-hectares is set for each sharecropper for a period of not less than three years for irrigated land and five years for dry land.

According to (Utrecht, 1969), three activities marked the execution of the land reform regulations from the beginning of 1961 to the end of 1965: registration of the land, determination of surplus and its distribution to as many landless peasants as possible, and implementation of the 1960 Law on Sharecropping Agreements. Land registration was provided for in Government Regulation No 10/1961 under Article 19 of the Basic Agrarian Law. Although registration is an indispensable factor in any efficient execution of land reform, it also often introduces an obstructive element of bureaucracy and may easily become a means for falsification and fraud. A report by the Agrarian Minister issued on 14 January 1965 gave the following resumé of the difficulties met by the executors of the land reform regulations up to the end of 1964:

a. Deficiencies in the registration of land hampered investigations of the land surplus, and opened the way to abuses.
b. Lack of understanding of the necessity and significance of land reform as an instrument of social change among wide sections of the people made it easier for landlords to obstruct the reforms.
c. There was insufficient cooperation among the members of the committees, partly because other duties kept some of them from devoting their full attention to the tasks of the committees, and partly because many of the committee members themselves were interested in the failure of land reform; in many cases land surplus were even officially kept outside the land reform regulations.
d. The peasants' organizations, which would have lent the strongest support, were prevented from playing a significant part on the committees.
e. The peasants were still subject to strong psychological and economic pressure from the landowners which kept them from pushing for an efficient execution of land reform.
f. It proved difficult to establish an order of priority in redistributing land either because many fields had no regular laborers or because through changes in registration, the workers concerned had been listed as absentees.

After 1965, the Indonesian government did not have the political and ideological interest in land reform of its predecessors. However, it is arguable that its efforts to raise food production, especially the production of rice will fail unless the foundations for social justice are laid in the Indonesian countryside through further land reforms. If this foundation, a just distribution of land, is not laid, all other efforts to gain economic stability and progress will remain ineffective (Utrecht, 1969).

The present Indonesian government intends to redistribute control over 21.7 million hectares of land, equivalent to about 12% of the entire nation's land area (Resosudarmo et al., 2019). The Indonesian government mentioned that 16.8 million hectares are forest land. The current, 'reinvigorated' reforms aim to provide legal recognition of land rights through two distinct means, namely land subject to agrarian reform (*Tanah Objek Reformasi Agraria,* TORA) and social forestry (SF). SF involves the distribution and formalization of community access to state forest lands through permits or partnership arrangements. TORA or Agrarian Reform concerns the formalization of land ownership through land certification and redistribution to small-scale or landless farmers.

With formal ownership, the TORA program provides the most extensive form of land rights that include alienation rights or more freedom in the use of the land. The TORA program targets nine million hectares of land. It aims to certify 4.5 million hectares of land informally controlled by individual farmers, as well as to redistribute an additional 4.1 million hectares of state forest lands and 0.4 million hectares of idle or abandoned lands under use rights. Use rights granted on state lands of 5-hectare areas or above that can only be used for agriculture, animal husbandry, or fishery. However, according to (Suryana and Hermanto, 2016), the capacity of the Government to invest in land expansion, particularly in the off-Java regions has been limited to around 40 thousand hectares per year. Ministry of Agriculture in 2015 mentioned that this rate has been much lower than the rate of land conversion to other uses of about 100 thousand hectares per year.

In addition to land size, land tenure is another element that hinders smallholder farmers to implement productive investments such as technology adoption and build physical infrastructures. The government has been registering an average of 1 million holdings per year, but even at this pace, it will take around 60 years to register all farms in Indonesia. Farmers with unregistered land are not legally secure and inheritance of unregistered land can also be questioned. Moreover, rules on government expropriation are ambiguous, which creates a certain degree of legal insecurity about land tenure (Suryana and Hermanto, 2016). According to (Aditya et al., 2020), from the data of the complete systematic land registration in 2018, it

was shown that of the 7.7 million land parcels covered, 62.1% in total could be followed up with formal registration, whilst 24.6% could not be certified due to uncertain landowners' legal status. Therefore, the data about farmland ownership in Indonesia remains unclear.

Responding to the challenge of limited farmland in Indonesia, the government has launched Law No. 41/2009 on Protection of Sustainable Food Crops Farmland. The major elements of this law are: (a) local government determines the protected zone dedicated to food crop production and cannot be converted for other purposes; (b) any party willing to do land conversion in the protected zone must prepare replacement of the land with similar quality in other regions; (c) local government oversees monitoring the implementation of the law in their respected regions. In practice, the implementation of the law is not strictly enforced which indicates that an economic incentive to change agricultural land for other purposes is more important.

This was then enforced by Regulation Government No. 1 of 2011, on the Classification and Transition of Sustainable Food Agricultural Land. During this process, two things are achieved in this law. Firstly, the conversion of agricultural land was prohibited, by developing the Sustainable Food Agricultural Land (SFAL). SFAL is a statute-covered paddy field, which is not to be used for other purposes except agriculture, for 20 years. Secondly, provision of incentives for farmers, to continue their farming activities. Specifically, incentives have also been developed, to reduce land taxes, improve infrastructures, finance research, develop high-yield varieties, encourage access to agricultural information and technology, provide farm inputs, secure site tenure, and increase farmers' achievements. The main goal of this regulation is to increase agricultural products' economic value, which in turn helps to decrease farmers' interest in changing land functions, or selling their sites for other purposes (Rondhi et al., 2018).

Unfortunately, farmers in Indonesia are unable to protect their farmland, due to social and economic pressures, making farmland conversion unavoidable. Data from CBS in 2019 showed a decrease from 7.75 to 7.40 million hectares of crude rice field within 2013-2019, respectively, in Indonesia. This indicates a drastic shortfall, as a result of the conversion of agricultural land. CBS of Indonesia inevitably recommends that the conversion of agricultural land should be stopped immediately, by a strict policy. Besides that, incentives should be offered to farmers, in a bid to help them preserve their farmland for their future farm successors. The Ministry of Agriculture then began administering Law No. 19/2013, Article No. 58 (3a), whereby the government has intended to give 2-hectare areas for farmers who do not own land and who have worked on the land for at least five years. Indeed, this law lends great hope to

young farmers for obtaining sufficient farmland. However, the policy is intended to raise farmer wealth only. It is not specifically for young farmers yet to gain the liquidation of farmland.

1.2. Literature Review

The last decades have seen great changes in the agricultural landscape, which has affected family farms in several ways, particularly in their access to resources. Many countries also face a lack of young people willing to engage in farming, leading to fast rural depopulation and over-aged farmer communities. Some previous studies revealed the process and its factors influence on family farm succession. It will be described as follows.

1.2.1. The influence of sociodemographic, economic, and social factors on family farm succession

The farm household has long held an important place both in policy and society (Lobley et al., 2016). The high importance of farm household succession in the context of agricultural socioeconomics is agreed on (Bohak et al., 2010), as it has clear implications for production and price policy, for land use policy, and for the pace of structural change in agriculture (Fennell, 1981). Farm household succession is a process of transferring the farm from one generation to the next. This transfer involves not just the physical assets of lands, buildings, machinery, and livestock, but also the transfer of knowledge, skills, labor, management, and control of the business (Olson, 2011). Succession on a farm household is therefore the basis for a farm's existence and development (Kerbler, 2012). However, there is widespread evidence that small farm households are less likely to attract a successor (Lobley et al., 2010; Uchiyama et al., 2008).

Many studies on family farm succession have been conducted in a European, North-American, and Australian. Yet, the possibilities of comparing them to other cultures and nations are very limited as farm succession is influenced by local policies, economy, and customs (Glauben et al., 2004a). The identification of factors influencing farm household succession issues has been subject of intense research in many developed countries. Factors of distinct nature such as economic, sociodemographic, and social, have been shown to have a positive or negative influence on farm succession (Bohak et al., 2010; Suess-Reyes and Fuetsch, 2016). Factors comprising farm size and income, structure of farm, age, family situation, education, aspirations as well as emotional attachment to the farm were found to be influential and will be described in detail as the following paragraphs.

a. Economic factors

Several important economic factors can affect farm succession. One of these variables is the farm size, where higher size of farmland increases the likelihood of succession, while smaller farms may generate less income and are therefore less attractive to potential successors (Bohak et al., 2010; Mishra and El-Osta, 2008). Farm size is one of the important factors to determine the effects on the state of farm succession than the farm income. In addition, farmers with larger farm size are more likely to secure their future competitiveness by making higher investments (Suess-Reyes and Fuetsch, 2016). The same applies for farm profit–farms generating a higher income are more likely to be passed on to a successor as they offer better economic prospects (Glauben et al., 2004a; Mishra and El-Osta, 2008). Only two recent studies found a negative impact of very high farm incomes on farm succession in specialized horticulture farms, possibly due to the specific characteristics of horticultural businesses or the type of economic measurement employed (Bertoni and Cavicchioli, 2016; Cavicchioli et al., 2019).

The structure of the farm itself, such as the degree of specialization, can affect the succession process as well. Specialized farms were generally found to favor farm household succession due to their overall high efficiency. However, other researchers raise the point of diverse agricultural activities increasing the likelihood of succession as risks and uncertainties can be counterbalanced (Suess-Reyes and Fuetsch, 2016). Therefore, the effect of the degree of specialization on farm household succession is not completely explained yet. Some studies reveal that farms run as side-business are less likely to find a successor than full-time farmers (Mishra and El-Osta, 2008; Suess-Reyes and Fuetsch, 2016).

b. Sociodemographic factors

Among the demographic factors, the age of the current farm manager has been shown to increase the likelihood of having a future successor (Glauben et al., 2004a; Kimhi and Nachlieli, 2001). Likewise, higher age of the oldest child increases the chances of the farm manager to have a successor (Mishra and El-Osta, 2008). A study on farm succession in Italy has shown that the birth order of children can also play an important role. First-born children were found to be more likely to become a successor than last-born children (Cavicchioli et al., 2018), which may relate to primogeniture tradition in many cultures.

The marital status of the farmers also has a strong influence on succession, even though farmers are less likely to have a spouse in comparison to other population groups (Fennel, 1981; Mishra and El-Osta, 2008). In connection with the age of the farm manager and the timing of the transfer, Glauben et al. (2004a) spoke about the phenomenon of a time path for

farm transfers. Their study reveals that an extended planning time for the farm handover also lengthens the actual time of transfer. The older the farmer becomes, the more difficult it is to transfer a farm to a successor.

In addition, a high number of children, especially every additional male child, favors farm household succession (Cavicchioli et al., 2018). However, the existence of siblings can also decrease the child's willingness to take over the farm due to social conflict (Suess-Reyes and Fuetsch, 2016). Moreover, the existence of many children in the farm household can lead to multiple eventual successors, which often results in a division of the farmland (Ram et al., 1999; Suess-Reyes and Fuetsch, 2016). Taken together, the amount of progeny of farm households can have both, a beneficial or detrimental effect on the likelihood of succession.

Several researchers have described gender bias in succession decisions (Cassidy et al., 2019) as male children are more likely to take over the parent's farm than female (Bohak et al., 2010). The number of male children in the farm household is a factor that clearly reflects tradition. Parents are generally more likely to expect a male child to continue the farm household than a female (Fennel, 1981; Kimhi and Nachlieli, 2001), as the latter are often only perceived as a successor in the absence of the former (Cassidy et al., 2019). Although these patterns seem to be changing slowly and are dependent on the cultural context, gender bias within farm succession must be acknowledged (Lehberger and Hirschauer, 2016; Otomo and Oedl-Wieser, 2009).

Differences between genders were also revealed among the generation of current farm managers. While one study has shown a positive correlation between the farm holder being of male gender and family farm succession (Bertoni and Cavicchioli, 2016), others observed female farm managers to have a positive influence on future succession (Glauben et al., 2004a; Stiglbauer and Weiss, 2000). However, the reasons behind the influence of farmer's gender are still unidentified.

In conclusion, the number of children influences farm succession in many ways. While the existence of children in the farm household is indispensable for farm household succession and the likelihood of succession process increases with every additional child, multiple potential successors can have non-beneficial effects on the succession process such as rivalry. While traditionally, mostly male children are expected to take over the family farm, studies showed a positive influence of female farm managers on farm household succession.

The education level of farmers and potential successors was also found to influence succession decisions and outcomes in different ways. Glauben et al., (2004a) described two possible effects a higher educated potential successor may have on farm succession – either the

farm benefits from the advanced knowledge of the successor, or the potential heir decides to leave the farm in order to choose a non-agricultural profession. A higher education level of potential successors generally influences their choice to take over the farm negatively (Aldanondo Ochoa et al., 2007; Bertoni and Cavicchioli, 2016; Bjarnason and Thorlindsson, 2006; Hennessy and Rehman, 2007; Mishra and El-Osta, 2008).

Higher education of the parents was found to favor farm household succession in some studies (Mishra and El-Osta, 2008; Suess-Reyes and Fuetsch, 2016), while it influenced succession negatively in others (Aldanondo Ochoa et al., 2007; Bertoni and Cavicchioli, 2016). There is clear evidence that many farmers do not want any of their children become a farmer. It is because they do not want their children to have some struggle as themselves on small marginal farms where the standard living is falling behind that of the rest of society (Fennel, 1981). Education of the successor can also influence the farm management. While successors with higher education are more likely to farm part-time, full-time farmers tend to have formal education in agriculture (Glauben et al., 2004b; Hennessy and Rehman, 2007).

c. Social factors

Along with factors of economic and sociodemographic, social factors such as the aspirations of potential successors have been shown to influence farm succession. While not all young people who are expected to take over a farm are interested, others who want to follow that career path are often not even considered as successors (Cassidy et al., 2019). Farmland, diversified livelihoods, and market access are essential for potential successors to choose farming over another profession (Cassidy et al., 2019; Leibert, 2016). In addition, spatial effects, income gaps and the labor market surrounding the farm are very important when valuing options besides taking over the farm household (Aldanondo Ochoa et al., 2007; Cavicchioli et al., 2018). The farmers also can have an important influence on their potential successors' decisions to take over the farm and to continue farming through the positive perception, support, satisfaction, and happiness with work and life on the farm, and a good opinion of the farm (Kerbler, 2012).

While many farmers have problems finding a qualified and interested successor, some parents do not wish for their child to take over the family farm. One common reason is the perceived existence of better economic prospects in non-farming professions (Cassidy et al., 2019; Fennel, 1981). National policies and administrative processes were found to influence decision-making of parents and children in the succession process as well (Kimhi and Bollman, 1999; Mishra and El-Osta, 2008). Because educating a potential successor as a future farmer

takes place entirely on the farm within the family, a very important role for the sustainability of farm succession is played by the parental orientation. The behavior and thought patterns that the potential successor receives during the socialization process from the farmer (who is a model for the potential successor in his/her future profession) are very well preserved in the intergenerational transfer of farming (Kerbler, 2012).

Rural traditions of passing on the farm to the next generation are considered highly important in many cultures and countries (Bertoni and Cavicchioli, 2016; Blanc and Perrier-Cornet, 1993; Glauben et al., 2004a). Farmers often feel emotionally attached to their farm and want to keep it in family ownership (Bohak et al., 2010; Cassidy et al., 2019). For many farmers, their farms are still a way of life and a reason to live, a lifelong project, and not just capital that must continually be enriched (Kerbler, 2003).

Successors often have the same emotional attachment to the family farm as their parents, as they are mostly brought up and socialized with the thought of eventually inheriting the family business, as well as knowledge is passed on to them since early childhood. Therefore, children of farmers often feel the urge to continue the legacy of their parents (Suess-Reyes and Fuetsch, 2016). An empirical study showed a positive correlation between the years of existence of a farm and its likelihood of succession, which supports the argument that a tradition of farming in the farm household increases the likelihood of succession (Bertoni and Cavicchioli, 2016; Cavicchioli et al., 2019).

1.2.2. The transfer of farm management

The process of farm succession varies in duration and contains among other components the handing-over of management decisions and responsibility. The succession process generally takes several years, and follows different patterns. This part of the process is often referred to as the succession ladder (Bohak et al., 2010; Errington, 1998). Specifically, as successors grow older, more tasks and decisions are delegated. Gasson and Errington (1993) stated that different successors of the same age will be on different rungs at any given point in their career. It is possible to consider the situation of the ‘average’ successor by taking an arbitrary point on the responsibility scale. Figure 1.5 takes the point at which responsibility is shared equally between the farmer and successor, and identifies the average age at which the successor reaches this point. Responsibility for deciding when to pay bills appears at the top. It is beyond the top rung to which the successor can aspire during his father’s lifetime.

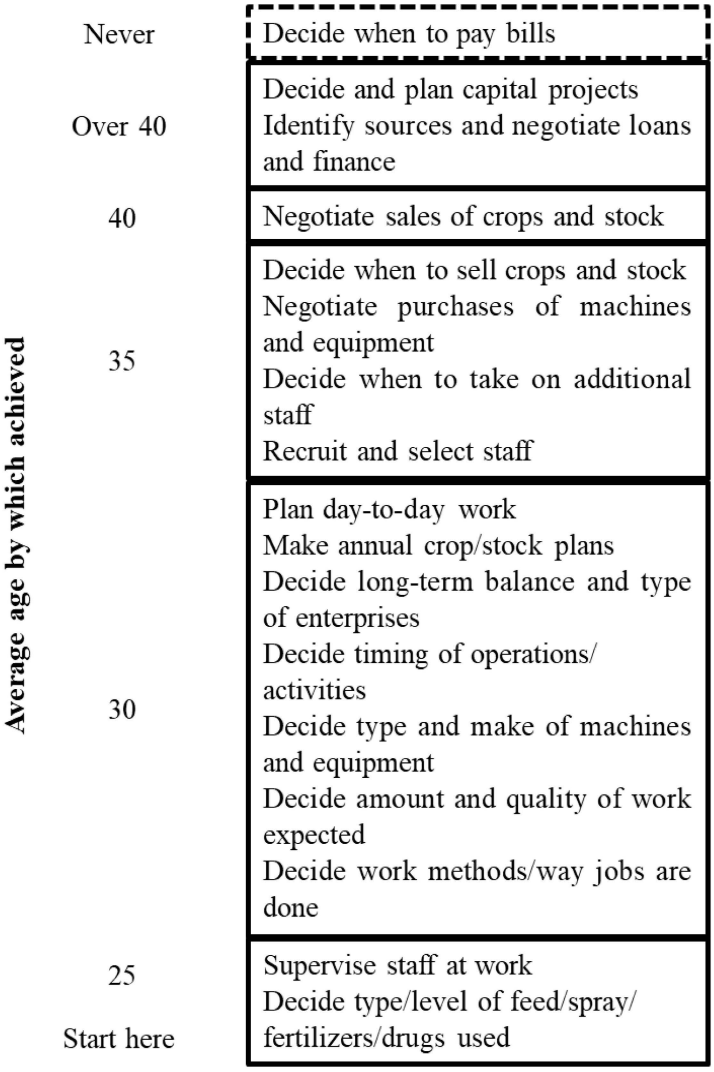

Figure 1.5 The succession ladder

Source: Errington and Tranter, cited in Gasson and Errington (1993).

While the delegation of tasks can look different in each family and culture, the young farmer typically takes care of technical decisions in an earlier stage of the succession ladder (Errington, 1998; Lobley et al., 2010). A strong parental dominance during the succession process accompanied by a lack of management transfer to the successor can hinder an efficient succession process, as the successor can be unprepared for future responsibilities (Errington, 1998). During the transfer of management, the successor gets assigned more responsibility in the farming process and decision making and is socialized into ideas of 'how to farm' (Joosse and Grubbström, 2017). The socialization often starts much earlier as the successor of the family farm is (consciously or not) identified at an early age (Potter and Lobley, 1996). This socialization is important for the continuation of farming practices and secures continuity of farm household succession.

Management transfer and its timing are influenced by the education level of the successor– according to Kimhi (1994) an heir with higher education is likely to receive the farm earlier. Educated and experienced farmers on the other hand transfer their land later to their successors. The number of family members and the current farm productivity influence the timing of succession as well. Farmers will usually only transfer their land once the productivity starts to decline. Another phenomenon described by several studies is the so-called successor effect (Bohak et al., 2010; Kerbler, 2012), which refers to a positive effect on investment decisions and prospects of a farm triggered by the presence or existence of a successor. When a designated or anticipated successor has already taken over part of the management on the farm, it is possible to speak about the successor effect or the new blood effect.

The successor effect can occur up to a decade before the actual farm transfer (Zagata and Sutherland, 2015). For young successors, it is characteristic that they are very innovative at the beginning of their personal careers and they are the driving force in modernizing agricultural structures (Blanc and Perrier-Cornet, 1993; Kerbler, 2012). However, the absence of a successor can lead to running-down and disinvestment of the farm (Joosse and Grubbström, 2017; Potter and Lobley, 1992). Farms without successor record an overall lower income and smaller land growth than farms with the prospect of succession. These are more likely to be successful and make more future-oriented and environmentally considerate decisions (Lobley et al., 2010). It must be noted though, that cause effect are hard to separate here – the existence of a successor might be due to the success of a farm, while the absence of one could be explained by bad economic prospects (Potter and Lobley, 1992).

1.2.3. Retirement decision and the ageing of rural communities

Retirement of the predecessor is a process happening simultaneously to farm succession; therefore, timing of retirement and involved decision-making are closely linked to succession (Bohak et al., 2010). Retirement is recognized as a series of transitions between different states (Gasson and Errington, 1993):

a. Full-time working in farming – many paths will start with the farmer fully involved in both the manual and managerial aspects of farm work on a full-time basis.
b. Semi-retirement in farming – farmers still maintain some regular involvement in farming activity and the land continues to be farmed by their successors.
c. Retirement in farming – farmers have ceased all farming activity, except on a very occasional basis, but the land continues to be farmed by their successors.

d. Retirement from the farming industry – farmers have ceased all farming activity and the land is not formed by their successors. It has been sold, or surrendered to the landlord or to creditors.

Retirement in agricultural family businesses can be seen as a sensitive issue by the farmers. Different surveys have shown that a non-neglectable number of farmers does not plan to ever retire. Many elderly farmers only adjust the workload to their reduced physical capabilities instead (Fennel, 1981). A study in Austria and Germany showed that up to 80% of the interviewed farmers planned to occasionally work on the farm after their official retirement (Glauben, et al., 2004b). This unwillingness to retire is often accompanied by concerns and difficulties of the farmers handing over their land; a behavior that can hinder efficient farm succession (Errington, 1998; Lobley et al., 2010). Retirement has different meanings for everyone. It is not always an easy decision to reach if much of an individual's and family's social, cultural, and economic history and identity are conjoined. It is important for the older generation to consider their vision of retirement (Lobley et al., 2016).

Retirement age and plans are influenced by the existence of a successor – if no successor is present, farmers do not usually have retirement plans (Potter and Lobley, 1992). Most farm exits occur around the time of retirement in case no successor can be found (Kimhi and Bollman, 1999). Passing on the farmland to the next generation and retiring can go along with several difficulties and internal conflicts – many farmers fear losing authority and an unstable financial situation (Errington, 1998). Additionally, the retiring farmers want to uphold their farm and usually wish to transfer the land in one intact piece (Cassidy et al., 2019).

Retirement decisions are influenced by the financial situation of the family, retirement plans of a spouse, and social or political security systems (Väre, 2006). In some cultures, not only governmental but also informal security systems for the retiring farmers exist (Cassidy et al., 2019; Glauben et al., 2004b; Kimhi and Nachlieli, 2001). It is tradition for successors in Israel to care for their parent's future well-being in exchange for the inherited farmland (Kimhi and Nachlieli, 2001). In some regions of Austria and Germany it is common until today to form civil contracts between predecessor and successor which bind the successor to guarantee housing, food, and other necessities to the older generation (Cassidy et al., 2019). The retirement plans and expectations of the older generation need to be discussed as part of the transfer.

A well-known problem linked to farm succession is the worldwide aging of farmer communities (Bertoni and Cavicchioli, 2016; Boehlje and Eisgruber, 1972; Morais et al., 2018; Zou et al., 2018). The average age of farmers in Europe is evidently rising rapidly (Aldanondo

Ochoa et al., 2007). This aging is most likely connected to the unattractiveness of farming professions for younger generations and rural depopulation (Aldanondo Ochoa et al., 2007; Cavvichioli et al., 2019; Hennessy and Rehman, 2007). The aging of farmer societies is closely linked to problems in finding a successor (Cassidy et al., 2019). Unwillingness of young adults to become farmers and especially the trend of potential successors choosing a career besides farming is likely to ascend even more, leading to increased aging of rural communities and farm exits (Zagata and Sutherland, 2015).

The future use of farmland in case no successor can be found is scarcely researched so far (Joose and Grubbström, 2017). Zou et al. (2018) report from a study in China that most affected farmers either planned to lease the spare farmland or did not know what to do with it yet. A second confirmed that elderly farmers without successors lease out land in order to lighten their workload (Suess-Reyes and Fuetsch, 2016). While based on Kerbler (2012) research, on farms without successors most often the retirement is followed by a gradual reduction of working hours, a reduction in the area of the farmland being used and the volume of agricultural production, and there is an increasingly less maintenance of equipment and machinery as well as structures, which are often empty.

1.2.4. Motivational factors in farming

Conceptually, factors which personally motivate the farmer and the farm family can be separated from the goals the farm operation is pursuing. For example, companionship may be a strong motivational factor for the farmer, but this need would not necessarily become a goal of the farm business. However, for farm household, it can be expected that the farmer's personal motivations to be influential in directing the resources of the farm business (Kliebenstein et al., 1981). The aim of farm business management can be taken beyond the restraints set by the belief that motivations have their foundation only in economic grain, and workers can take account of the effects of individual farmers' different managerial skills, managerial objectives, and resources (Maican et al., 2021).

A previous study described three factors relating to motivation and one relating to the ability that is mirrored in the performance of a farm. The motivation factors are 'interest', 'need', and 'ambition or will', while 'knowledge' represents the factor for ability. Some research has indicated the importance of variations in the interest factor. When the reasons for undertaking farm work were classified based on the degree of interest in or liking for the vocation, a positive relationship with earnings was apparent. There was also a positive relationship between the

size and efficiency of the different farm enterprises and the operator's interest in or liking for the enterprise. The motive considered for explaining why an individual undertakes economic enterprises is their desire for personal gain or the betterment of their economic position. The word 'need' may be thought of as describing the relation of the individual's economic accumulations to their probable personal and family requirements (Wilcox, 1932).

In terms of needs theories in Human Resource Management, none rings more than the ERG needs theory that is so-called the ERG motivation theory. Referring to the ERG motivation theory, in farming, farmers usually have three needs. Based on Figure 1.6, Clayton P. Alderfer's ERG theory from 1969 condenses Maslow's five human needs into three categories as follows (Schneider and Alderfer, 1973):

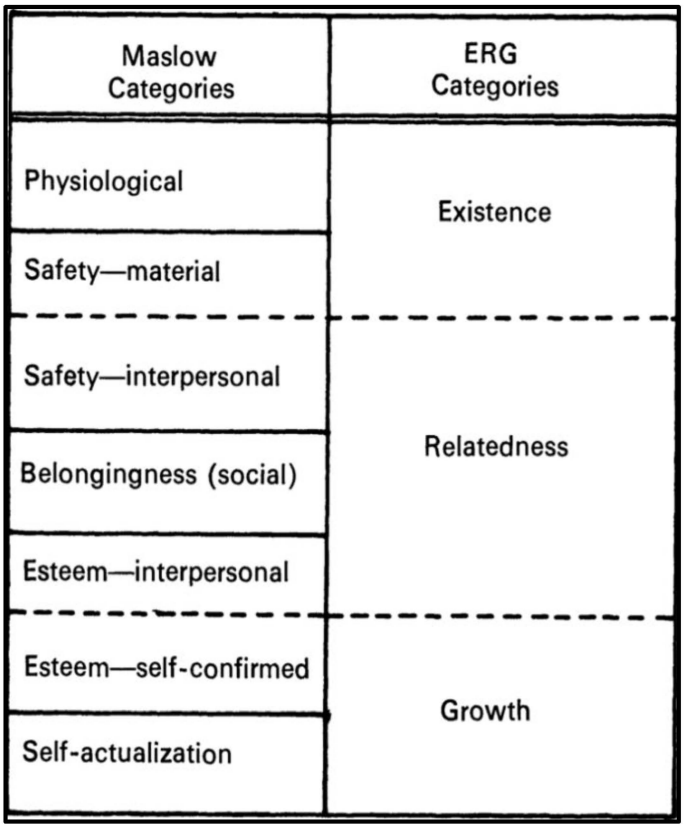

Figure 1.6 Comparison of Maslow and ERG needs theory

Source: Schneider and Alderfer, 1973.

a. Existence needs

Include all material and physiological desires (e.g., food, water, air, clothing, safety, and shelter). It comprises of the first two levels of Maslow's theory i.e., the physiological and the safety needs. Existence needs are characterized first by the goal of obtaining a material

substance, and second, by a person's satisfaction tending to be correlated with another person's frustration, when resources are limited.

b. Relatedness needs

Encompass social and external esteem; relationships with significant others like family, friends, co-workers, and employers. This also means to be recognized and feel secure as part of a group or family. The stage condenses the third and fourth levels of Maslow's theory i.e., the need for belongingness and the need for self-esteem. Relatedness needs concern the desires people have for relationships with significant others can be characterized by a mutual sharing of thoughts and feelings. The basic quality of relatedness needs is different from existence needs because relatedness needs cannot be satisfied without mutuality. For all the parties in a relationship, their satisfaction (and frustration) tends to be correlated.

c. Growth needs

Internal esteem and self-actualization; these impel a person to make creative or productive effects on himself and the environment (e.g., to progress toward one's ideal self). The stage comprises of the fourth and fifth levels of Maslow's theory. Satisfaction of growth needs occurs when a person engages problems which call upon him to utilize his capacities fully and to develop new capabilities. This includes desires to be creative and productive, and to complete meaningful tasks.

Although the priority of those needs differs from person to person, Alderfer's ERG theory prioritizes in terms of the categories' concreteness. Existence needs are the most concrete, and easiest to verify. Relatedness needs are less concrete than existence needs, which depend on a relationship between two or more people. Finally, growth needs are the least concrete in that their specific objectives depend on the uniqueness of each person. There are three relationships among the different categories in Alderfer's ERG theory:

a. Satisfaction-progression

Moving up to higher-level needs based on satisfied needs. With Maslow, satisfaction-progression plays important part. Individuals move up the need hierarchy as a result of satisfying lower order needs. In Alderfer's ERG theory, this is not necessarily so. The progression upward from relatedness satisfaction to growth desires does not presume the satisfaction of a person's existence needs. In other words, once lower order needs are fulfilled,

an individual will tend to progress toward higher order needs, thus intensifying the desire for higher order needs (Yang et al., 2011).

b. Frustration-regression

If a higher-level need remains unfulfilled, a person may regress to lower-level needs that appear easier to satisfy. Frustration-regression suggests that an already satisfied need can become active when a higher need cannot be satisfied. Thus, if a person is continually frustrated in his/her attempts to satisfy growth, relatedness needs can resurface as key motivators.

c. Satisfaction-strengthening

Iteratively strengthening a current level of satisfied needs. Satisfaction-strengthening indicates that an already satisfied need can maintain satisfaction or strengthen lower-level needs iteratively when it fails to gratify high-level needs.

Guither (1963) described research in which farmers were questioned about their real motives for farming as a business or as an occupation. The respondents mentioned several different reasons that they liked farming activity: (1) they can have a sense of accomplishment; (2) a farm is a better place to raise children; (3) it is a challenging occupation; (4) farming gives more opportunity to work outside in the open air; (5) a farmer runs his own business; (6) a farmer likes to operate machinery; (7) a farmer can spend more time with his family; and (8) living in the countryside is more enjoyable than living in town. Another research refers to the fact that farm families struggle to obtain the most that they can out of the resources they have. Usually, it is not only net income that matters to this kind of family, but rather a combination of things, including survival, net income over time, increasing the number of resources controlled by the family, and increased prestige within the local system. In most cases, family resources seem to consist mostly of the family workforce and entrepreneurship, there being not so much capital or land to use (Stanton, 1978).

According to Rahayu et al., (2018), using Alderfer's ERG theory, factors that influenced the motivation of Indonesian farmers in choosing cabbage farming were divided into two factors, namely internal and external factors. The internal factors were age, formal education, non-formal education, income, farming experience, land area, and land status. Whereas, external factors were measured by the availability of capital, marketing and farm risk, suitability of land potential, and suitability of local culture. Formal education, training, counseling, income, and capital availability positively influenced farmers' motivation. While, age and farming experience negatively influenced farmers' motivation in farming.

Work motivation also implies factors that push employees to work harder and more efficiently. Based on Maican et al.'s (2021) findings, the influence of farmers' motivation factors in farm economic performance is stronger than the influence of job satisfaction in the case of Romanian farmers on small farms. This might explain why, although work in agriculture is worse than an office job and the people that work in agriculture are sometimes stigmatized and receive lower incomes, there are still very strong motivators for Romanian farmers to continue their work in agriculture.

1.3. Objectives of the Study

This study aims to explore the current state of family farm succession in Yogyakarta Province, Indonesia. In order to do so, the process of farm household succession will be investigated to describe the farm succession practices (Chapter 2). In addition, sociodemographic, economic, and social influences on the likelihood of farm household succession will be identified (Chapter 3). The factors affecting the farm succession and farmers' motivation to continue farming will be determined to assess the future farm succession (Chapter 4).

To address these objectives, the study aims to answer the following research questions:

1. Research question 1 – How does the process of farm household succession work and what are the major challenges?
2. Research question 2 – What sociodemographic, economic, and social factors influence farm household succession?
3. Research question 3 – What factors affecting farmers' motivation to keep continue farming?

1.4. Study Area

This study is conducted at Margomulyo and Margokaton village, Seyegan sub-district, Sleman District, Yogyakarta Province. This area located in Java Island. Java villages are characterized by small land holdings caused by fragmentation, which in return, is a result of population pressure and the equal inheritance system (Iwamoto and Hartono, 2009). However, the agriculture area at the research site has typical production activity for Central Java. In addition, the Central Java, West Java, and East Java provinces also have a contribution to the total national rice production of around 60% (Figure 1.7). Agriculture and irrigation have been developed in this region over many centuries.

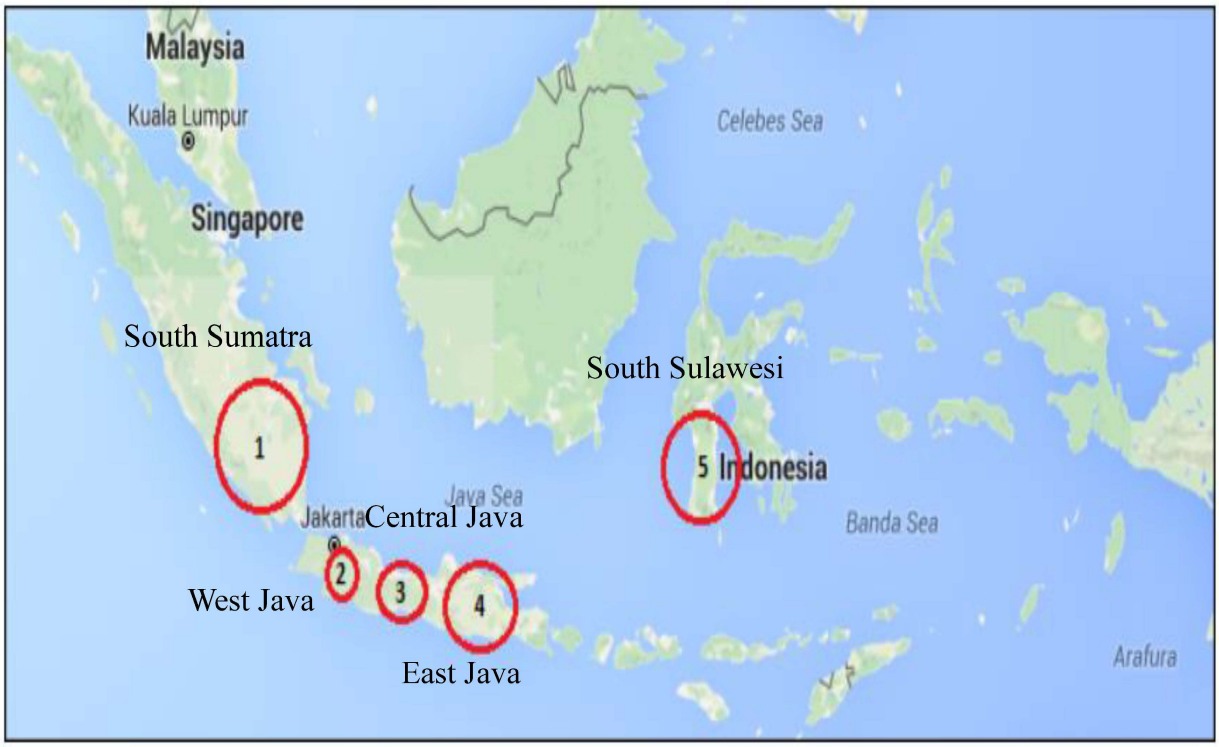

Figure 1.7 Indonesian provinces where most rice is produced (2017)

Source: https://www.indonesia-investments.com

In Yogyakarta Province, the best agricultural land for growing rice is located on the gentle slopes of Sleman District (Figure 1.8). Rice is grown extensively in this zone with yields of more than 5 tons/hectare (Rotgé, 2018). Nevertheless, Iwamoto and Hartono (2009) remark that urbanization has progressed considerably in the southern part of the Sleman border with Yogyakarta City. The village residents can readily access non-agricultural job opportunities there such as wage laborers, artisans, household industries, traders, construction workers, factory workers, civil servants, and so on. Therefore, the village is facing a great challenge in terms of farm succession because well-educated young people from farm households tend to pursue non-agricultural occupations.

In agreement with a report of work by Suryantini (2002), under economic and natural constraints, farmers must decide what crop they should plant to gain a higher income. Farming commonly takes place in lowland (flat) areas because development and business activity are expanding rapidly in Yogyakarta City. The topography is more than 90% flat or small and wavy. Therefore, this research mainly explores lowland (flat) areas. In the district, the northern part is an upland crop area; the southwestern part is a rice farming area. Urbanization effects have extended to a great degree, even to the Seyegan sub-district.

Based on the geographic area, Margomulyo village, with a paddy field area of 254 ha, located in the urban area of Seyegan sub-district, especially in the southwestern part of Sleman District. While Margokaton village covers an area of 317 hectares for paddy fields. It is also located in a lowland area that is well irrigated by the main canal: Mataram canal. Some farmers can cultivate rice in this area three times a year (Figure 1.9), whereas maize and other secondary crops are cropped in the dry season. In addition to these crops, horticulture has become extremely popular. In areas with sufficient irrigation water, cultivation can be done during the transitional season between rainy and dry seasons. Some farmers also doing a livestock and fish farming (Figure 1.10).

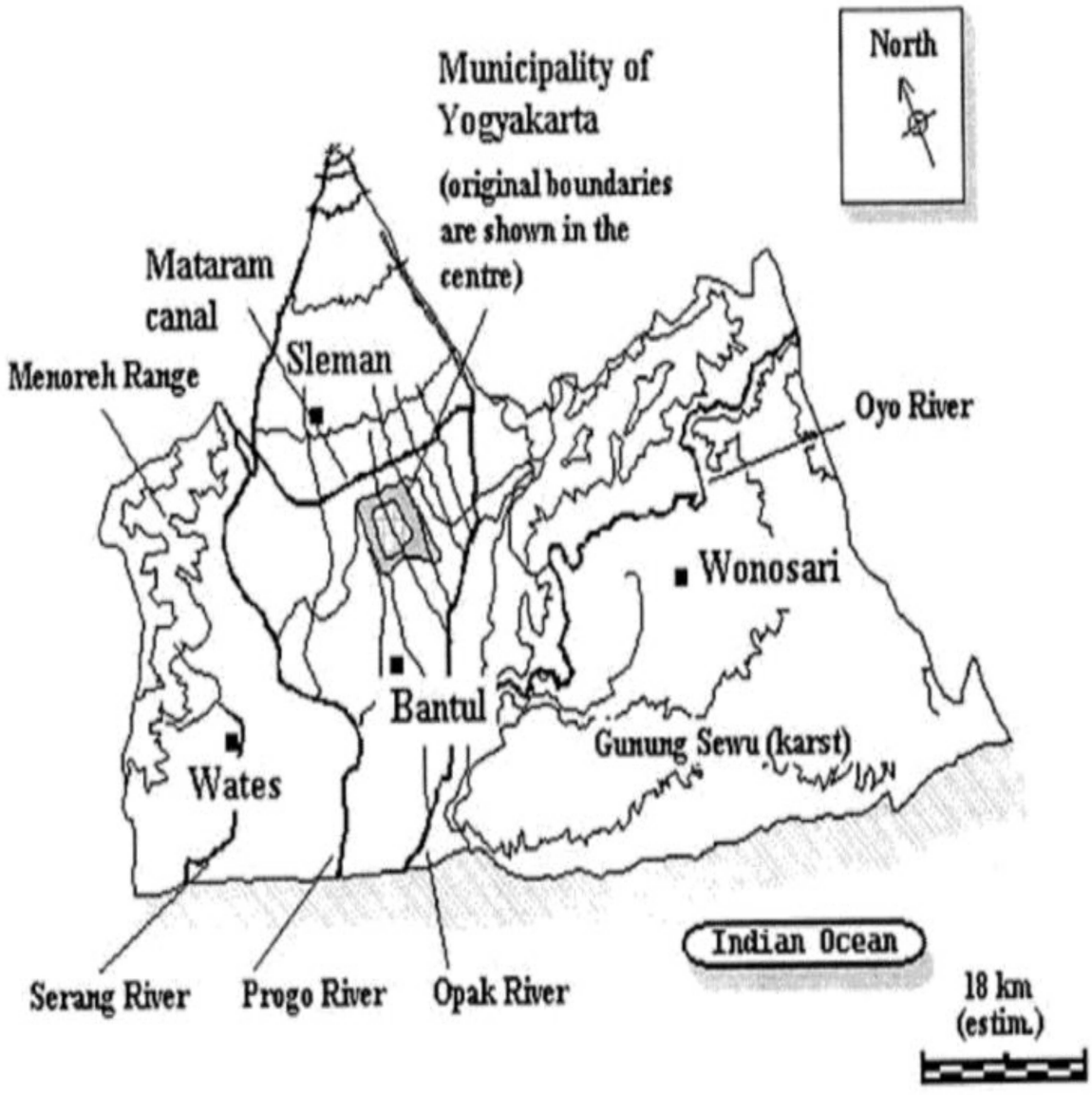

Figure 1.8 Physical map of Yogyakarta Province

Source: Rotgé, 2018.

Figure 1.9 Rice field in Margokaton village.

Source: Field survey, 2020.

Figure 1.10 Livestock farming in Margokaton village.

Source: Field survey, 2020.

Although some farmers can cultivate rice in this study area three times a year, the average agricultural land is still less than 1 ha. Based on Table 1.3 the total average of agricultural land (paddy field and non-paddy field) in Yogyakarta Province for the last ten years is increasing, however, it is still less than 0.50 ha. Therefore, some farmers also need a source of non-farm income for their farm households.

Table 1.3 Average of agricultural land in Indonesia (ha)

No	Province	Agricultural Land					
		Paddy field		Non-paddy field		Total	
		2003	2013	2003	2013	2003	2013
1	Aceh	0.40	0.21	0.85	0.78	1.25	0.99
2	North Sumatra	0.10	0.15	0.31	0.90	0.41	1.05
3	West Sumatra	0.15	0.24	0.28	0.70	0.43	0.94
4	Riau	0.05	0.07	0.93	2.51	0.98	2.58
5	Jambi	0.10	0.10	1.01	2.32	1.11	2.42
6	South Sumatra	0.21	0.32	0.70	1.57	0.91	1.89
7	Bengkulu	0.16	0.15	0.83	1.58	1.00	1.72
8	Lampung	0.14	0.20	0.51	0.85	0.65	1.05
9	Bangka Belitung Islands	0.01	0.03	0.46	1.69	0.47	1.72
10	The Riau Islands	0.01	0.01	0.17	0.83	0.18	0.84
11	Jakarta	0.00	0.05	0.00	0.10	0.00	0.15
12	West Java	0.07	0.24	0.06	0.18	0.13	0.42
13	Central Java	0.09	0.18	0.09	0.17	0.19	0.35
14	Yogyakarta	0.04	0.07	0.10	0.17	0.14	0.24
15	East Java	0.09	0.19	0.10	0.18	0.19	0.37
16	Banten	0.08	0.26	0.10	0.26	0.18	0.52
17	Bali	0.06	0.13	0.19	0.34	0.25	0.47
18	West Nusa Tenggara	0.16	0.30	0.17	0.34	0.33	0.64
19	East Nusa Tenggara	0.10	0.12	0.62	0.76	0.72	0.88
20	West Kalimantan	0.21	0.27	1.07	2.33	1.29	2.60
21	Central Kalimantan	0.21	0.25	0.84	2.77	1.05	3.02
22	South Kalimantan	0.22	0.43	0.23	0.82	0.45	1.24
23	East Kalimantan	0.07	0.19	0.36	2.26	0.44	2.45
24	North Kalimantan	0.12	0.22	0.74	2.56	0.86	2.79
25	North Sulawesi	0.06	0.12	0.45	1.19	0.51	1.31
26	Central Sulawesi	0.14	0.19	0.79	1.45	0.92	1.64
27	South Sulawesi	0.22	0.42	0.41	0.68	0.62	1.09
28	Southeast Sulawesi	0.10	0.16	0.76	1.40	0.85	1.56
29	Gorontalo	0.08	0.15	0.37	0.91	0.45	1.06
30	West Sulawesi	0.11	0.14	0.81	1.25	0.92	1.39
31	Maluku	0.02	0.04	0.67	0.82	0.69	0.86
32	North Maluku	0.02	0.03	1.12	1.68	1.14	1.71
33	West Papua	0.03	0.04	0.30	0.64	0.33	0.68
34	Papua	0.03	0.04	0.25	0.39	0.28	0.43
	Indonesia	**0.10**	**0.20**	**0.25**	**0.66**	**0.35**	**0.86**

Source: CBS, 2013.

1.5. Research Framework

Taken together, the succession process of farm households is a topic of high importance since it is connected to many current issues of agriculture, such as aging and the decreasing number of farms. The process of farm succession is often characterized by a succession ladder and a positive successor effect. An unwillingness to retire and to hand over the farm of the parent to the successor can challenge an efficient succession process – even though, many elderly farmers are reluctant to give up their life's work.

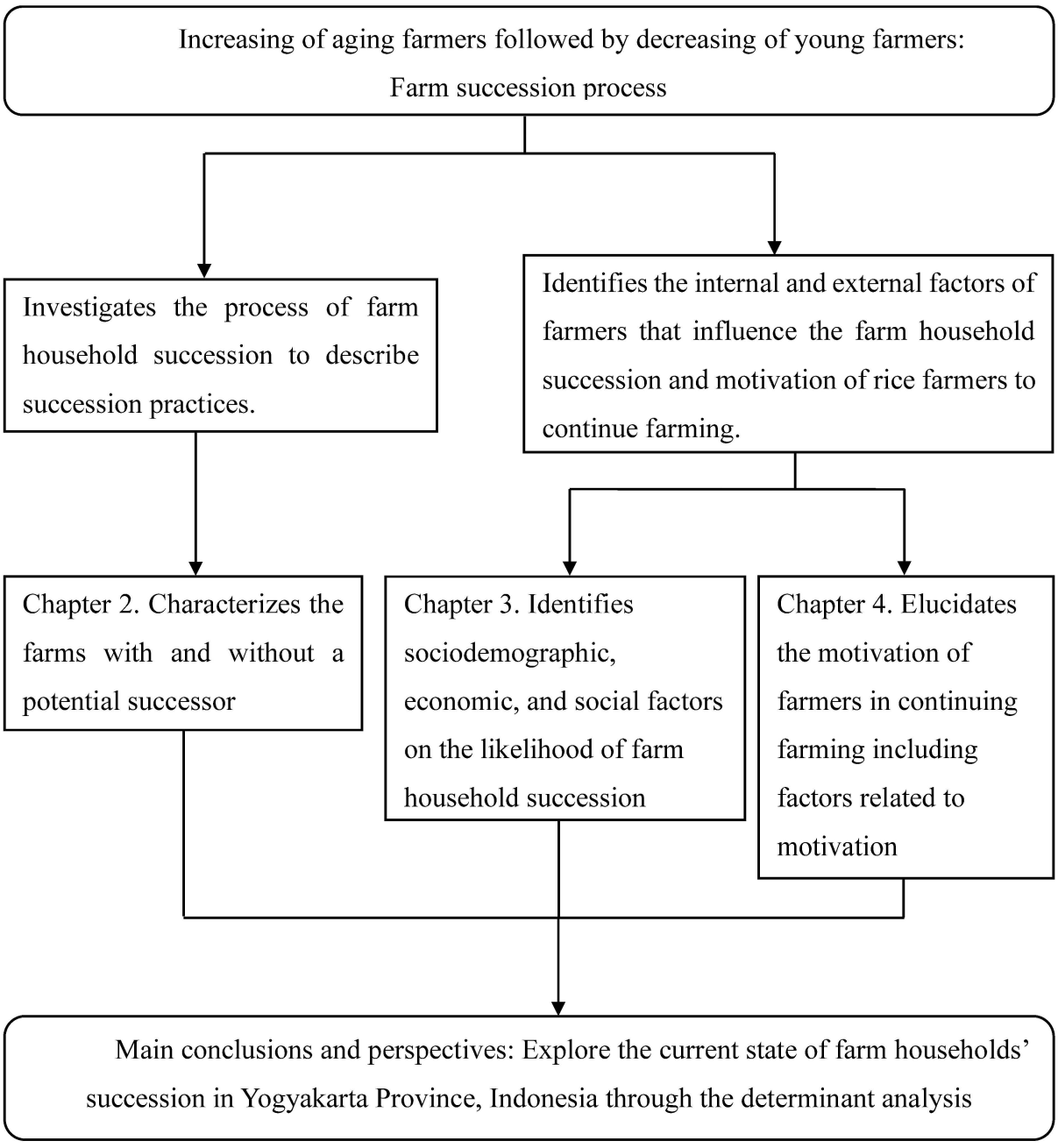

Figure 1.11 Research framework

Farm succession is known to be influenced by many factors, such as internal and external factors of farmers. In addition, a systematic analysis of these factors on the likelihood of farm succession and how these factors interact with each other is still largely lacking, providing ample opportunity for the research of farm succession and factors influencing it. Therefore, to gain further understanding of this study, a research framework is developed which is shown in Figure 1.11 above.

The farmer and farm succession are affected by internal factors, such as the age of farmers, level of education, income of crops farming, farmers' experience in farming, main occupation of farmers' children, farmers' personal reason to be a farmer (farmers interested in agriculture, being a farmer by own will, farmers wanted to keep the farmland as it is, farmers' children think of farming as a side job, and farmers only have daughters), farmland size, land ownership (inheritance land status, purchased land, rent land, and sharecropping land), productivity of crops farming, the number of family labor, and the number of hired labor (Aldanondo Ochoa et al., 2007; Cavicchioli et al., 2018; Foguesatto et al., 2020; Glauben et al., 2004a; Kwanmuang, 2011; Kerbler, 2012; Rayasawath, 2018).

The agricultural sector in Indonesia also faced several problems such as land ownership and the availability of land. According to Anandita and Patria (2016), the land in Indonesia is mostly owned by landlords, they accumulate the number of the land by buying and pledging. A decision in the sustainability of the land depends on the landlords which lead on the decline in land productivity. The decline in land productivity will affect declining farmers and land reform. In addition, the farmer and farm succession are also affected by external factors, such as the encouragement of farmers' parents, farmers' conditions and situations, and farmers' environment. Farmers' conditions and situations are usually related to the farmers' decision to be a farmer, for instance, because there are no other jobs so they will do farming for a living.

Moreover, the personal history and plan of the farmers are important to determine the process of farm succession. Farmers' opinions about the successor in agriculture can also determine whether they need the successor or not to continue their profession as a farmer. As mentioned above the main occupation of all farmers' children influences the farm succession. An identified successor's main occupation will also affect the process of farm succession. It will determine the decision of a potential successor to continue farming or not.

The process of farm succession could affect the sustainability of agricultural development in the future because the Indonesian agricultural sector depends on the farm household. This is proved by their willingness to keep the agricultural products available and to keep the livelihood of farm household. If every year the number of farmers keeps decreasing and the

young generation does not want to be farmers, then the farmer will become extinct. In fact, farmers are the first actor of the producer in agriculture, so without farmers, there is no potential to produce basic foods and the sustainability of agricultural development can be hampered. Therefore, to increase the farmers' motivation in farming is also important for future farm succession by determining the factors affecting farmer's motivation through both internal and external factors of farmers.

1.6. Research Limitations

The scope of this study is limited in time and space. The number of farm households covers the period between 2003 and 2013 only. Furthermore, this research was conducted on the farmers' condition from 2018 to 2020. While it is limited in space because the survey is limited to Sleman District, in the Special Region of Yogyakarta. The samples are the food crops farmers and horticultural crops farmers. The study also had some limitations on the farm succession approach in farming management practices in the country as compared to other countries which have rich knowledge and wide experience of farm succession. Some of the constraints that were met during the research study included a lack of funds and time, and delays by some farmers to allow the researcher to have access for some information related to the study. In this aspect, the scope of the study had limitations to research findings and studies concerning farm succession in the country.

Chapter 2 Characteristics of Farms with and without Successors: A Case Study of Margumulyo Village, Sleman District, Yogyakarta Province, Indonesia

2.1. Introduction

Farm succession, an important social issue in many countries, is particularly so in economically developed countries. In Japan, for instance, the continuing growth and internationalization of the Japanese economy in recent years has brought about many and various changes in Japanese agriculture, especially with respect to family farms (Sato, 1991). The number of farm households in Japan decreased by 58%; their share among the population also declined to 5.4% (Uchiyama, 2014). Succession of family farm ownership to sustain and develop the agricultural sector became the emphasis of several studies (Kerbler, 2012; Joosse and Grubbström, 2017).

Iwamoto (2006) defines a family farm with reference to the "family as the main unit of farm succession and inheritance." Farm succession is a strategic key for farm households to manage risk and achieve business expansion. Lobley and Baker (2012), as cited in Anwarudin et al. (2018), define farm succession as a process involving active planning for the transfer of agricultural assets, and involving the socialization of potential substitute actors. Gasson and Errington (1993) emphasize that ownership and managerial control are combined and that both must be transferred eventually to the next generation if continuity is to be achieved. However, finding a successor within a family is difficult in many economically developed countries (Joosse and Grubbström, 2017). One study revealed that most farm owners in Slovenia are over 55 years old (Kerbler, 2012).

Numerous studies have examined farm succession throughout the world as described above. In Indonesia, for instance, some studies have examined farm succession (Anandita and Patria, 2016; Anwarudin et al., 2018; Firman et al., 2018; Pamungkaslara and Rijanta, 2017; Susilowati, 2016; Syahyuti, 2015). However, those studies provide no information related to the real circumstances faced by farm households, such as which farms have a successor. Young farmer numbers are dwindling because few elderly people are leaving their agricultural businesses. That might be a reason for the delay in managed farm succession.

The farm size distribution in Indonesia also varies across sub-sectors. Small farms are associated mostly with food crops, with average farm size of 0.3 ha on Java Island and 1.4 ha on other islands (OECD, 2012). Difficulties are exacerbated by conversion of agricultural land to non-agricultural use, which is occurring at the rate of 110,000 ha/year (Lanya et al., 2017). As the ratio rises, landless farmers' access to land acquisition can be achieved through the land tenure system. However, land tenure is a crucially important issue in Indonesia, particularly on Java Island, where land fragmentation is increasing and where the land marketing system is underdeveloped (Jamal and Dewi, 2009). Moreover, people of younger generations are interested in non-agricultural occupations. This trend obstructs the regeneration of farming expertise. Consequently, land owners prefer to sell their land to gain capital and prepare for work in the non-agricultural sector (Anandita and Patria, 2016).

This chapter is to clarify farm succession and retirement in Indonesia. This study strives to identify characteristics of farmers with and without a successor, to clarify patterns of farm succession and farmer retirement, and to examine successful strategies for farm succession.

2.2. Material and Methods

2.2.1. Sample size and data collection

This study was conducted using a survey administered via a semi-structured questionnaire. The data of farm households were collected during June–July in 2018. Currently, about 1,145 heads of households and 374 farm households reside in this study area. Through the assistance of the Agricultural Extension Office Center in the Seyegan sub-district, 73 farm households were selected, representing 5 of 32 farmer groups. They were interviewed to discern differences between farms with and without successors according to their farm characteristics and to clarify farm succession pattern characteristics in this study area. Questionnaires elicited information related to farm household characteristics, farm practices, the farmer future's plans, and particularly farm succession processes.

2.2.2. Data analysis

Based on primary data obtained from the 73 farm households, the average values and component ratios were calculated to clarify general conditions and farm household characteristics of farm succession practices. Cost-benefit analysis was conducted to estimate the economic values related to rice farming activity at the farmer level. Lastly, through a case

study of selected farmers, descriptive analysis was used to assess the actual conditions of farm succession patterns and retirement of farmers.

2.3. Results and Discussion

2.3.1. Characteristics farms with and without successors

Of 73 farm households, 41 household respondents reported designation of a potential successor. Others (32 farm households) reported no potential successor or reported that they were still uncertain. In our study area, based on the local culture, the farmlands are bestowed by the parents to the children. Land ownership is divided equally among the family children. The average farm size is 0.20–0.45 ha. Data related to the farm household sample characteristics are presented in Table 2.1. It shows that 56.2% of farmers had identified a potential successor. Also, 30.1% of the farmers had no identified successor, whereas 13.7% remained uncertain about it.

Results reveal farmers of three types in our study area: 1) principal farmers who have their own farmland; 2) tenant farmers who have no farmland; and 3) principal–tenant farmers who not only have their own farmland, but who also lease the farmland. Most landless farmers lease farmland from landowners. Results indicate that land tenure arrangements provide land access to landless farmers. Based on Table 2.1, farm households with a potential successor were predominantly principal farmers and principal–tenant farmers. Farm households without a potential successor were found to be predominantly tenant farmers. Farm households with an uncertain successor were predominantly principal–tenant farmers.

Results presented in Table 2.1 also suggest that the numbers of children were the highest for farms with a potential successor. Some farmers of farm households without a potential successor still have not married. As one might expect, farm households with a potential successor had more family members to help them with farming. However, farmers with neither a potential successor nor any certain successor had completed higher levels of education, managed larger areas of land, more frequently held other non-agricultural jobs, and had fewer family laborers to help them with farming, than farm households with a potential successor. That result might be attributable to the fact that farmers with a potential successor were considerably older than those without a successor and those with no certain successor.

In addition, the farm households in our study area acquired agricultural land through the inheritance system, purchase, fixed-rent contracts, and sharecropping (Table 2.1). Sharecropping was the dominant tenure arrangement in this study area. Under this contract

system, the landowner and tenant share a harvest 50:50. Fixed-rent contracts involve an advanced cash payment to the landowner. Very few farm households with and without successors had acquired farmland through the purchase; moreover, the farms were small.

Table 2.1 Characteristics of the farm household sample (*n*=73)

Characteristic	Farm household (FH)		
	With potential successor (*n*=41)	Without potential successor (*n*=22)	Successor still uncertain (*n*=10)
Successor identified by the farmer	41 (56.2%)	22 (30.1%)	10 (13.7%)
Farmer type			
Principal farmer	19 (46.3%)	4 (18.2%)	3 (30.0%)
Tenant farmer	5 (12.2%)	11 (50.0%)	1 (10.0%)
Principal–tenant farmer	17 (41.5%)	7 (31.8%)	6 (60.0%)
Mean age of household head	62.8	56.9	47.6
Non-agricultural job	24 (58.5%)	14 (63.6%)	7 (70.0%)
Years of education/ FH	7.6	9.3	12.4
Average no. of children per FH	2.9	2.2	1.2
Average no. of family members helping farming	1.7	0.9	0.5
Acquisition of farmland (ha/FH)	0.29	0.42	0.41
Inheritance	0.08	0.07	0.14
Purchase	0.01	0.02	0.00
Fixed-rent	0.06	0.16	0.11
Sharecropping	0.14	0.16	0.16
Paddy yield (ton/FH)	3.87	3.51	5.88
Other crops (ton/FH)	3.86	2.88	3.92
Household income (thousands of IDR/FH)	21,092.1	20,519.8	49,640.9
Ratio of agricultural income (%)	50%	55%	73%
Per-capita household income (thousands of IDR)	4,061.6	5,628.9	25,092.1
(Rice kg/capita)[1]	451.3	625.4	2,788.0

Source: Field survey, 2018. [1]Rice kg/capita is per-capita income in terms of rice. This amount was estimated by setting the average rice price as IDR 9,000/kg at the study area. In the table, FH stands for farm household.

The average yield of rice per crop in a normal year amount to five or six tons per hectare. Although the farmland is irrigated and although farmers can practice double or triple cropping, farmers are unable to support themselves on the agricultural income from rice and other crops alone because the farms are extremely small. However, based on Table 2.1, the average income

of farm households in terms of rice production is only slightly above the poverty line (347 kg) set by the Indonesian government (Yokoyama (1998) cited in Iwamoto and Hartono (2009), p. 207).

2.3.2. Farmers' possible successors in farm households

Children growing up on farms are tested early on regarding their potential as suitable farm successors. The interest demonstrated by the child in agriculture is taken by the parents as an important incentive to encourage him or her (Lobley et al., 2016). The potential successor is assumed to have a position as a possible successor. Results presented in Table 2.2 shows that the probability of a son being a successor was found to be 65.9%. That of a daughter was 17.1%. That of a son in law was 9.8%. That of other relatives was 4.9%. A daughter is likely to be a successor in cases where those farmers have daughters but no son. Apparently, they will bestow the farmland to a daughter to keep their farmland ownership among family members.

Table 2.2 Possible successors in farm households

Possible successor in FH (*n*=41)	Number and Percentage
Son	27 (65.9%)
Daughter	7 (17.1%)
Son-in-law	4 (9.8%)
Relatives	2 (4.9%)
Others	1 (2.4%)

Source: Field survey, 2018. FH stands for farm household.

In line with results of a study by Kerbler (2012), results show that farmers usually select a daughter to take ownership of the farm because the farmer has no immediate male descendant. Also 2.4% of respondents also reported that all children would inherit the family farmland equally, indicating that the future landholding would be smaller. Table 2.3 shows the farmland fate by farmers without a successor and farmers with an uncertain successor.

For farm households without a successor, 50% of them reported that the farmland will be returned to the landlord or to the government. They include farmers who acquired land use rights in return for a salary equal to that of a hamlet head or mosque caretaker. Farmers with an uncertain successor reported that they follow a sharecropping system (40.0%). Those results indicate a future increase in the land tenancy system of sharecropping. Other farmers described that they will rent out the farmland and bestow the farmland equally to children or non-family members, or use it for residence.

Table 2.3 Fate of farmland by farm households

Fate of farmland	FH without potential successor (*n*=22)	FH with uncertain successor (*n*=10)
Return the farmland to the landlord	11 (50.0%)	1 (10.0%)
Sharecropping	6 (27.3%)	4 (40.0%)
Others	5 (22.7%)	5 (50.0%)

Source: Field survey, 2018. FH stands for farm household.

The average age of children in farm households without a successor is 25.6 years old (Table 4). Moreover, they have activities outside the family, such as school, working outside of agricultural fields, and associating with the community. These might affect the successor's decision to continue their parents' job as a farmer or not. None might be identified because the farmers have remained unmarried and because potential successors might be too young. Table 4 shows that the average age of children for farm households with uncertain successors is still 7.5 years old. However, farmers believe that they will find and identify such a successor. Some farmers apparently hold out hope that they might identify a successor among their grandsons, relatives, or sons-in-law.

2.3.3. Actual situations of farm household successors

Table 2.4 shows that 170 farmers' children resided in 73 farm households. The number of children and the average number of children who lived together with farmers in farm households with a potential successor were found to be higher than in other farm households. They are predominantly male children. Children in a farm household with or without a potential successor were of the average age categorized as a productive age. Most were found to be already employed.

The percentages of farmers' children who had a permanent non-agricultural job in farm households with and without a potential successor were found to be, respectively, 73.6% and 56.3% (Table 2.4). Permanent non-agricultural jobs include factory worker (laborer), entrepreneur, trader, company employee, or civil servant, although most children in farm households with uncertain successors were mainly students (83.3%). Others included a housewife, children who are still seeking work (recent graduates), and children younger than five years old.

Based on the field survey, among farm households with a potential successor, from 110 farmers' children, only 1.8% were working full-time alongside farmers on the farmland (Table

2.4). In general, they worked on the farmland for about 4–6 hours per day. Nevertheless, 44.5% of children were working part-time on the farmland, whereas 53.6% of them were not working on the farmland at all. That result reflects the farmers' intentions for semi-retirement by the successor's present occupation in the study area. Semi-retirement signifies that the farmers become less involved in manual work on the farm, although they might continue to be engaged in other farm work. It is likely that farmers' intentions about semi-retirement are reinforced by the presence of a successor (Uchiyama et al., 2008).

Table 2.4 Farm household child characteristics

Characteristic	FH with potential successor (*n*=41)	FH without potential successor (*n*=22)	FH with uncertain successor (*n*=10)
Number of children	110	48	12
Average of children who reside with farmers	1.7	1.4	1.1
Mean age (years old)	33.0	25.6	7.5
Years of education (years/FH)	11.9	11.2	3.7
Gender			
Male	60 (54.5%)	23 (47.9%)	6 (50.0%)
Female	50 (45.5%)	25 (52.1%)	6 (50.0%)
% of children employed	83 (75.5%)	27 (56.3%)	0 (0.0%)
Main occupation			
Non-agricultural jobs	81 (73.6%)	27 (56.3%)	0 (0.0%)
Student	9 (8.2%)	14 (29.2%)	10 (83.3%)
Others	18 (16.4%)	7 (14.6%)	2 (16.7%)
Farmer			
Working full time on the farmland	2 (1.8%)	0 (0.0%)	0 (0.0%)
Working part-time on the farmland	49 (44.5%)	6 (18.2%)	0 (0.0%)
Not working on the farmland at all	59 (53.6%)	27 (81.8%)	0 (0.0%)

Source: Field survey, 2018. FH stands for farm household.

In farm households without a potential successor, among the 48 farmers' children, only 18.2% were working part-time on the farmland, whereas 81.8% were not working at all on the farmland (Table 2.4). Children working part-time in farming usually help their parents on weekends or after the working day. Although the student-successor can become involved in farming on a full-time basis after leaving education, no guarantee exists that they will engage

in farming in the future. That is true because it is extremely difficult to expand the farm size in rural Java. Furthermore, as described earlier, urbanization effects have extended widely, even to the study area, so that the farmers generally motivate their children to work outside of agricultural production.

2.3.4. Farm succession and farmer retirement

Farm transfer is a process that usually takes several years. It does not always coincide with reaching retirement age (Lobley et al., 2016). To clarify farm succession and farmer retirement patterns and to examine farm succession strategies, Table 2.5 presents profiles of farm succession of three farmers in the study area. They were selected from 73 farmers in the study area based on the successor occupation. Their potential successors are likely working full-time on the farmland.

Table 2.5 Profiles of selected farmers with full-time successors in the study area

Farmer age (years)	A (70)	B (68)	C (50)
No. of family members residing together (persons)	5	3	4
Gender	Male	Female	Male
Years of education	6	9	6
Acquisition of agricultural land (ha)	0.51	0.40	0.14
Inheritance	0.01	0.30	0.09
Purchase	0.00	0.10	0.00
Fixed-rent	0.30	0.00	0.05
Sharecropping	0.20	0.00	0.00
Targeted buyers of agricultural production	Middleman	Local market	Middleman
Profession before farming	Trader	-	Construction worker

Source: Field survey, 2018.

Farmers B and C live in the same village with farmer A, but in a different hamlet. All farmers were male except farmer B, a mother. Her husband had retired from farming at 81 years old, after which she continued to manage the farm. Most farmers had inherited the farmland: farmer A had a larger farm than others. In addition, farmer A and C expanded their farmland through the rented land from the landowner in the village. For farmer A, agricultural production had become an important source of household income. Farmer A had no other non-agricultural income source to support his life. In contrast to farmers B and C, they had no non-agricultural

jobs, but their household members were able to earn non-agricultural income. Consequently, they were not 100% dependent on agricultural income. Before becoming farmers, farmers A and C had some experience with non-agricultural work.

Generally, the three farmers (farmland managers) in our study area learned basic farm skills at an early age: before age 22 (school leaving age). At this stage, farmers start to assist their parents' farm work and learn various applicable skills. Training usually takes place within the family. The results are consistent with the findings of Firman et al. (2018), who reported that the role of parents in the primary socialization process is the key factor for family dairy farm succession. The succession process which occurs from farmers to children cannot be separated from the socialization process. In the context of family farm succession, he described that socialization is the process of transferring value, norm, philosophy, belief, knowledge and skill, and behavior: it constitutes a direct or indirect transfer from parents to the successor. A potential successor can receive the pattern used by parents for the management of rice farming.

At the middle stage of each farmer's lifetime, the farmer worked outside of agriculture work, except for farmer B. She undertook on-farm training with her father after leaving school. Farmers marry at an average age of 20-30 years old. Usually, the first child is born one year later. At the same time, especially for farmers A and C, they started farming after work or in their leisure time as "a part-time farmer" and joined the farmer group. All the farmers were encouraged and were sometimes commanded by their parents to continue farming in the family.

Cost and profit calculations in Table 2.6 clarified that farmers earn considerable incomes from agricultural production including livestock sales. Larger cultivated farmlands can support higher incomes. However, farmer A and C can be categorized as a high-producing farmer who achieved higher yields of paddy rice and other crops per hectare. After harvesting season ends, the farmers usually sell their agricultural products to a middleman or local market (Table 2.5). The net profits of farmer A (10,835 thousand IDR/year) and farmer C (10,812 thousand IDR/year) were not markedly different. Differences might be attributable to management practices.

Table 2.7 presents profiles of full-time successors in selected farm households. All successors were male. Successor D is a son of farmer A. Successor E is a son of farmer B. Successor D expects to inherit the farmland in the future from farmer A. Successor E will inherit the farmland from farmer B. By this succession pattern, they can directly become farm successors in the farm household. They will inherit their parents' farmland including the leased land that their parents managed at the present. Successor F, a son-in-law of farmer C, expects to inherit the farmland of his wife indirectly. He also had a larger farm than others.

Table 2.6 Net profit of selected farmers with full-time successors in the study area

Farm households	A	B	C
Production of paddy in rice **(P_1)** (ton)	3.42	1.24	1.0
Yield per hectare (ton/ha)	6.71	3.10	7.14
Sharecropping **(S_1)** (ton)	0.74	0	0
Rice production **(P_1-S_1)**	2.68	0	0
% of Sales	50%	50%	69%
Sales of rice (thousands of IDR/year)	12,060	5,580	6,138
Production of chili peppers (ton)	0	0.75	0.75
Harvested land area (ha)	0.30	0.40	0.14
Yield per hectare (ton/ha)	0	1.88	5.36
% of Sales	0	93%	100%
Sales of chili peppers (thousands of IDR/year)	0	7,000	8,000
Production of corn **(P_2)** (ton)	1.30	0	0
Harvested land area (ha)	0.21	0	0
Yield per hectare (ton/ha)	6.19	0	0
Sharecropping **(S_2)** (ton)	0.60	0	0
Corn production **(P_2-S_2)**	0.70	0	0
% of Sales	100%	0	0
Sales of corn (thousands of IDR/year)	2,590	0	0
Head of livestock	1 (cow)	10 (poultry)	9 (poultry)
Sales of livestock (thousands of IDR/year)	16,000	300	510
a. Total agricultural income (thousands of IDR/year)	30,650	13,090	14,438
Hired labor cost (thousands IDR/year)	4,660	3,940	1,200
Total labor-days	40	66	3
Tools and machinery (thousands of IDR/year)	4,350	1,300	1,420
Cash rent or lease payments (thousands of IDR/year)	5,000	0	21
Other costs (seed, fertilizer, pesticide) (thousands of IDR/year)	1,575	4,901	985
b. Total production cost (thousands of IDR/year)	15,585	10,141	3,626
c. Successor's wage (thousands of IDR/year)	4,230	0	0
d. Net profit (a-b-c) (thousands of IDR/year)	10,835	2,949	10,812

Source: Field survey, 2018.

Notes: 1) Sales price of rice, 9,000 IDR/kg; chili peppers, 10,000 IDR/kg; corn, 3,700 IDR/kg.

2) Total labor-days: one person's working time per day in three seasons (one year).

Table 2.7 Profiles of full-time successors and opinions about farming as an occupation

Succession pattern	Directly become successor		Indirectly become successor
Farmer age (years)	A (70)	B (68)	C (50)
Successor age (years)	D (46)	E (36)	F (37)
Gender	Male	Male	Male
Marital status	Married	Single	Married
Years of education	6	12	12
No. of family members residing together (persons)	3	-	3
Personal relationship with farmers	Son	Son	Son-in-law
Profession before farming	-	-	Construction worker
Farm size (ha)	0.30	0.40	0.56
Acquisition of farmland	Sharecropping	Sharecropping	Fixed-rent (0.50 ha); Purchase (0.06 ha)
Land tenure system	Same land with parents	Same land with parents	Separate land with parents
Harvested area (ha)	0.30	0.40	0.56
Paddy	0.30	0.30	0.50
Chili peppers	0.30	0.10	0.06
Head of livestock	-	-	6 poultry
Cash rent or lease payments (yes/no)	No	No	Yes
Total agricultural income (thousands of IDR/year)	4,230	-	15,300

Source: Field survey, 2018.

Successor F had experienced a non-agricultural job before becoming a farmer. He quit his job and bought farmland in the 2000s. He pays cash rent or lease payments for the farmland by himself. He was managing his farmland separately from his father-in-law. In contrast to successors D and E, it was not necessary to pay cash rent or lease farmland because it remains their parents' responsibility. They were practicing a sharecropping system on the same farmland with their parents. Successor F was also able to earn a higher agricultural income than others. He was doing integrated farming or mixed crop-livestock farming.

Table 2.8 presents the successors' opinions about farming as an occupation. Successor F had a good perception of agriculture, which positively affected his work performance and earned income. Unlike successor F, who showed willingness to be a farmer independently, successors D and E were farming because they were unable to find other jobs. They were forced by the

circumstances and conditions to be farmers. However, successor E's parents encouraged him, casting farming as a noble profession. His parents also stated that working in farming is worthwhile because rice is produced for family consumption. For that reason, he had a desire to help his parents work the farmland. He was remunerated from harvests from the farmland. Successor D was paid wages from farmer A (Table 2.6).

Table 2.8 Successors' opinions about farming as an occupation

Successor	D	E	F
Reason for engaging in farming	Difficult to find other work	Difficult to find other work; decided to help parents with farming	Insufficient income from earlier work; quit the earlier job; invested in agriculture
Have management training of farming? (yes/no)			
Farming operation	Yes	Yes	Yes
Plan day-to-day work	Yes	Yes	Yes
Farm planning	Yes	Yes	Yes
Farm accounts	No	No	No
Management trainer	Father	Father and mother	Father, father-in-law, self-taught
Personal statement of agricultural income	Uncertain, hopeful	Uncertain, hopeful	Certain, sure

Source: Field survey, 2018.

Successor F, who was also knowledgeable about agriculture, had been self-motivated to learn, although he came from a farm family. He was highly motivated to expand the farm size and learn about agribusiness by himself. He was sure about the stability of future agricultural income, although successors D and E were not sure about it. Parents might provide various training and skills to raise the successor as a farm operator. No successor had learned about overall farm management from their parents, particularly in farm accounts, which indicates that they were on the step ladder of gradually accumulating responsibilities to take over the farmland in the future until the farmers retire from farming. It is not surprising then, that Indonesian farmers never intend to retire from farming as long as they are able to work. Usually, successors pursue farming management training and engage in farming simultaneously as on-the-job training.

2.4. Conclusion

This study has clarified that 56.2% of farmers in the study area have identified a potential successor to continue their future farming. Furthermore, succession patterns of two types were identified in the study area, with potential successors achieving their eventual status directly and indirectly. Results show that the characteristic of farm households without a potential successor indicate that the farmland will be returned to the landlord or to the government. Alternatively, it will be bestowed equally to children and non-family members. It might be used for residence. The land tenancy system of sharecropping will be increasingly common as a fate of farmland in the future. The sharecropping system, if well managed, might be a good alternative strategy to improve farm succession. Although some difficulties make a good income from farming less likely, results clarified that farmers earn considerable income from agricultural yields, including the sale of livestock.

To improve farm succession, planning is important for farmers. Evidence suggests that the role of parents in the primary socialization process is the key factor for family farm succession. Before the successor becomes a farmer, they typically assist their parents' farm work and learn various applicable skills. Training usually takes place within the family. However, most farmers in the study area are producers with small landholdings. They have limited farm assets; therefore, they cannot transfer them to a potential successor. Farm succession planning is expected to benefit smooth succession immensely. Operations should be ongoing, commencing when family members are learning farming practices and becoming involved in the family farm. Policies to facilitate young farmers' access to capital and land tenure are also needed.

Chapter 3 Factors Influencing Farm Household Succession in Agricultural Occupations

3.1. Introduction

Agricultural laborer availability in Indonesia has been declining. According to Rayasawath (2018) agricultural labor is extremely important because it drives progress in agricultural productivity, efficiency, and sustainability. The declining number of farm households in Indonesia can be attributed to a rapid transfer of laborers from agricultural to non-agricultural sectors. The Central Bureau of Statistics of Indonesia census also reports a decline in the productive age population employed in the agricultural sector. Data show that the country is becoming an aging society. In 2004, 40.61 million people 15 years of age and older worked in the agricultural sector, constituting 43.33% of the total Indonesian population. By contrast, in 2013, the productive age population working in the agricultural sector had dwindled to 39.96 million or 35.05%.

Young people are the core actors expected to take over agricultural occupations and maintain agricultural sustainability, thereby maintaining future agricultural economic development (Chiswell, 2014). Finding agricultural successors has become a major issue in economically developed countries. Earlier studies clarifying factors that affect farm succession have accumulated (Aldanondo Ochoa et al., 2007; Kerbler, 2012; Leonard et al., 2017; Lobley et al., 2016). For instance, economic factors such as farm size, marketability of livestock production, and the amount of annual income from farm sources are not the only factors affecting succession on Slovenian farms. Factors reflecting traditions or traditional thought patterns and behaviors, as well as factors expressing standpoints, perceptions, and opinions of farm owners also affect farm succession in Slovenia (Kerbler, 2012).

In Spain, farm location, firm size, and farm children's level of education affect farm succession (Aldanondo Ochoa et al., 2007). However, in Australia, the factor exerting the greatest power for predicting whether farmers had chosen a successor was their obedience to particular cultural mores about succession and inheritance. Three factors influence farm succession in Switzerland: farm size, number of sons, and region. In Switzerland, structural change in farming takes place primarily in the context of intergenerational succession. The farmers planned to hand over their farms on average between the age of 62 for partial handover and 65 for full handover (Lobley et al., 2016). Moreover, in Ireland, farmers over 55 years old

have been increasing in number, whereas farmers under 40 years old are becoming fewer (Leonard et al., 2017). Like many economically developed countries, some economically developing countries recently are facing farm succession-related difficulties (Abdullah and Sulaiman, 2013; Anwarudin et al., 2019; Kwanmuang, 2011; Foguesatto et al., 2020; Rayasawath, 2018; White, 2012).

In Malaysia, education or knowledge, and government support might persuade young people to engage in agricultural entrepreneurship (Abdullah and Sulaiman, 2013). In Thailand, various factors strongly affect young people on issues of farm succession: marital status, household agricultural work experience, number of household agricultural laborers, farmers who experienced problems with agricultural resources, and attitudes toward agricultural occupation. As a matter of fact, because of inadequate welfare and labor protection, inconsistent income, and challenges brought about by hardships and difficulties in working with nature, young people in Thailand do not seek to become farmers. Consequently, a shortage of agricultural laborers has occurred in that country (Rayasawath, 2018).

Furthermore, the farmer's age, the value of agricultural land, the value of non-agricultural household assets, the younger generation's experience in farming, and the irrigation ratio all significantly affect farmer's plan for succession in Thailand. Because of the competing effects of the farmers' better management ability and better non-farm job opportunities afforded to the educated younger generation, farmers' education level is not a significant factor (Kwanmuang, 2011). In Brazil, main factors that influence expectations of a successor in the farm succession process are the number of family members employed, farm size, farm annual income, and incentives for succession (Foguesatto et al., 2020).

In Indonesia, according to White (2012), the decreasing number of farmers in Indonesia is attributable to the lack of regeneration of young laborers (farm boys). Young people, who are needed, simply do not want to work as farmers. Anwarudin et al. (2019) reported that the entrepreneurial capacity of young farmers in Indonesia is influenced by education, motivation, access to information and communication technology, external factors, and the role of agricultural agents. Some studies described earlier have examined farm succession in Indonesia, but those studies have not revealed factors underlying succession in agricultural occupations.

No report of the relevant literature has described a study of factors influencing farm household succession with potential successors in Indonesia. Maintaining agriculture in Indonesia is important to identify factors influencing farm succession in Indonesian farm households. Furthermore, according to Glauben et al. (2004a), results of econometric analysis demonstrate that farm characteristics influence succession considerations to the degree that

they affect the farm value for a potential successor. In this chapter, the findings are expected to yield valuable insights for the development and sustainability of agriculture in Indonesia.

3.2. Material and Methods

3.2.1. Sample size and data collection

This study used a combination of quantitative and qualitative data. Households considered in the study include farm households within Margokaton village. Data were collected from a sample group that represents all farm households in the village. The sample comprised 99 farmers selected randomly from four farmer groups. From 99 farmers, only 82 farmers with children older than 15 years were deemed relevant to our examination of farm succession.

This study was conducted through interviews and questionnaire surveys of farm households conducted during February–March in 2020. With assistance of the Agricultural Extension Office Center, the 82 farmers were interviewed using a structured questionnaire. During the questionnaire survey, respondents were briefed on necessary information and were asked to respond to the questionnaire, face-to-face. The survey specifically examined the parents rather than children in an effort to identify the probability of farmers having a potential successor.

The questionnaire contents were adjusted to cover all information necessary to meet the study goals, such as (1) farm household characteristics (age, gender, marital status, education, main occupation, side job, household income from agriculture, experience in farming, number of children, etc.), and (2) farming business background (number of agricultural labors in farm households, farmland areas, production, and marketing). Finally, content analysis was used to expound and describe qualitative data.

3.2.2. Statistical analysis

This study used a statistical model (logistic regression), which was appropriate because it took only one of two possible values, which are binary values. Before using the logistic regression model to analyze the collected binary data, tests that were appropriate for the model was applied using a multicollinearity test, chi-square values, *R*-squared values, and percent correction prediction (Rayasawath, 2018).

1. Multi-collinearity: Multivariate correlation analysis determines the correlation among independent variables, so that if the Pearson correlation is more than 0.8, then there is multi-collinearity.

2. Chi-square and *R*-squared values: Chi-square is used to test the null hypothesis (H_0). The logistic regression model achieves a goodness of fit when the Chi-square statistics are highly significant at 1.0% ($p < 0.00001$). If the *R*-squared value of the Cox and Snell test, and the Negelkerke test support the goodness of fit of the model, the value is between 0 and 1.
3. Percent correction prediction: When the value of the percent correction prediction is high, this means that the ability or the accuracy of the model prediction is high.

Using this model, some factors (X – independent variable) were inferred as affecting household succession in agricultural occupation. The results (Y – dependent variable) were measured. The formula used for the analysis is the following:

$$P_r\,(Y_i = 1|X_i) = \frac{\exp\,(\beta_0+\beta_i X_i+\varepsilon)}{1+\exp\,(\beta_0+\beta_i X_i+\varepsilon)}$$

In the equation, P_r represents the probability of dependent variables in this study, which are defined as 1 if farmers have identified a successor and otherwise 0. The β_0 and β_i are defined as model parameters for this study, whereas X_i is the independent variable. As hypothesized, the independent variable for this study consisted of some parameters, which are representatives of X (human, institutional, economic, and natural conditions), on an individual scale, which was selected mostly based on parameters used in the study reported by Rayasawath (2018). These parameters were divided into two groups: personal factors of farmers and agricultural production factors.

The personal factors of farmers were expressed as variables including sociodemographic characteristics such as age, gender, marital status, education, number of children, main occupation, side job, household income from agriculture, and experience in farming (Aldanondo Ochoa et al., 2007; Cavicchioli et al., 2018; Foguesatto et al., 2020; Glauben et al., 2004a; Kwanmuang, 2011; Rayasawath, 2018). Regarding agricultural production factors, the variables include the number of the agricultural laborers in farm households, farmland areas, revenues from selling farm products, and production costs (Cavicchioli et al., 2018; Glauben et al., 2004a; Rayasawath, 2018).

Finally, the ten parameters presented in Table 3.1 are used as representative of independent variables in this study.

Table 3.1 Independent variables used for data analysis

Variable	Code	Data Entry
Personal factors of farmers		
1. Age	X_1	Age (year)
2. Education	X_2	1 = ≥12 years; 0 = <12 years
3. Experience in farming	X_3	Year
4. Children with non-agricultural jobs	X_4	1 = children have a permanent job; 0 = children have no permanent job
5. Household income from crops farming per land	X_5	Amount (million IDR/year)
Agricultural production factors		
6. Farmland areas	X_6	1 = ≥ 0.5 hectare; 0 = < 0.5 hectare
7. Productivity of paddy	X_7	Unit (ton/hectare)
8. Productivity of other crops	X_8	Unit (ton/hectare)
9. Number of family laborers	X_9	Number (persons)
10. Number of hired laborers	X_{10}	1 = ≥ 1 person; 0 = < 1 person

The ten parameters used for this study constitute two groups as described below.

(1) Personal factors of farmers

These factors represent the availability of the farmers' socioeconomic profile and household assets. They also present the ability of farmers who desired to retain the family farm as a whole unit and who were more likely pass it on to the chosen successor (Lobley et al., 2016). Age represents the comprehensiveness to operate farms suitably (Kerbler, 2012). The educational level might reflect the ability of a person to allocate resources and to adopt new technologies effectively for operating farms, leading to increased farm income.

Household income earned from agriculture can be a major determinant, influencing people to engage in agriculture activities, especially for people or families with low income. Agricultural experience can strengthen one's ability to aim at high productivity (Rayasawath, 2018). Children with non-agricultural jobs might affect the farm succession process. As described earlier, the research site is near an urban area: village residents can readily access non-agricultural job opportunities.

(2) Agricultural production factors

These factors mainly represent the ability of forms producing agricultural products in terms of quality and quantity. Large farmland areas are more attractive than small areas. In our study area, most landless farmers lease farmland from landowners to expand their farm size. Results show that land tenure arrangements provide land access to landless farmers. They have

frequently extended their farmland by renting additional land or through sharecropping system. Yet, farmland areas with land ownership can provide reasonable successor potential and secure incomes. Numbers of agricultural laborers in farm households, in suitable numbers and quality, can play an important role in producing agricultural products. They can help farmers in attaining stable productivity (Rayasawath, 2018).

Furthermore, as described earlier, to analyze which of the independent variables affect household succession for agricultural occupations as the dependent variable, this study used logistic regression analysis with an enter method. That is a procedure for variable selection by which all variables in a block are entered in a single step. Once the independent variables are identified, the marginal effect is computed to elucidate the increasing or decreasing probability of farm succession at the farmer level. In the other words, it is to clarify the effects of independent variables on the dependent variable.

3.3. Results and Discussion

3.3.1. Characteristics of farm households

Descriptive statistics of farm households are presented in Table 3.2. Of 82 farm households, 23 respondents reported designating a potential successor. Others (59 farm households) reported no potential successor. All farmers (100%) in farm households with a potential successor were male; they were in the non-productive age category, with average age of 66.74 years. They had secondary school education: most had received formal education in the past. In Indonesia, the school system is structured into three different stages. Children from the age of 7-12 years attend primary school or elementary school. Afterward, a secondary school or junior high school. Following up, children can attend regular high school or choose among different vocational or religious schools. While based on the data statistics from UNESCO in 2019, 9 years of school education are compulsory in Indonesia and plans to expand compulsory schooling to 12 years exist. The net enrollment rate for secondary education was only 89% in 2018 while 94% for primary school.

Table 3.2 also shows that farm households with a potential successor have more than three members engaged in agriculture. They manage less than one hectare of farmland. They have more than two children as the average number of children. Farmers also have more than one child who resides with them. As mentioned in the previous chapter, farm households in this study area also acquired agricultural land through inheritance, purchase, fixed-rent contracts, and sharecropping. Sharecropping is a share tenancy contract in which the sharing rate of the

tenant is usually fifty percent of the gross output. While fixed-rent contracts usually involve advanced cash payments from the tenant farmers to the landowner. Moreover, in agreement with the research by Iwamoto and Hartono (2009), in this study area, some of the share tenancy contracts were characterized by personal ties such as kinship relationships and friendship relationships.

Table 3.2 Characteristics of farm households (*n*=82)

Variable	Farm households	
	With potential successor **(*n*=23)**	Without potential successor **(*n*=59)**
Gender		
Male	23 (100%)	59 (100%)
Female	0 (0%)	0 (0%)
Age	66.74	60.71
Education	7.00	9.56
Occupation		
Full-time farmer	14 (60.87%)	30 (50.85%)
Part-time farmer	9 (39.13%)	29 (49.15%)
Farmer as a main job	2 (8.70%)	5 (8.47%)
Others as a main job	7 (30.43%)	24 (40.68%)
Average number of children	2.83	2.31
Children reside with farmers	1.89	1.71
Family laborers engaged in agriculture (persons)		
1	0 (0.00%)	36 (61.02%)
2	10 (43.48%)	22 (37.29%)
3	10 (43.48%)	1 (1.69%)
4	3 (13.04%)	0 (0.00%)
Farmland areas (hectare)	0.82	0.80
Inheritance	0.14	0.17
Purchase	0.08	0.18
Fixed-rent	0.36	0.07
Sharecropping	0.24	0.37
Head of livestock		
Yes	13 (56.52%)	25 (42.37%)
None	10 (43.48%)	34 (57.63%)
Fish farming	3 (13.04%)	4 (6.78%)
Experience in farming (year)	44.35	30.80

Source: Field survey, 2020.

As shown in Table 3.2, 13 farmers (56.52%) in farm households with a potential successor were doing integrated farming or mixed crop-livestock farming. Furthermore, three farmers (13.04%) were doing fish farming to earn more income from agriculture. By contrast, 25 farmers (42.37%) in farm households without a potential successor were doing mixed crop-

livestock farming; 4 farmers (6.78%) were doing fish farming. In farm households with no potential successor, 59 farmers were in the productive age category of 15–64 years. The average age of farmers was 60.71 years. Their education level was higher than that of farmers with a potential successor. Farm households without a potential successor have at least one or two members engaged in agriculture. They manage the farmland, which is also less than one hectare. Like farmers in farm households with a potential successor, they also have more than two children, on average.

Characteristics of farmers' children in this study area are presented in Table 3.3. The farmers' children in both farm households were of average age, categorized as a productive age. Most had been employed. They had a higher education level than that of the farmers. The percentages of farmers' children who had non-agricultural jobs in farm households with and without a potential successor were, respectively, 49.23% and 64.71%. Permanent non-agricultural jobs include factory worker, entrepreneur, trader, company employee, and civil servant. Others included a housewife, recently graduated children, and retirees. By contrast, among farm households with a potential successor, 12 respondents or 18.46% of farmers' children were working as a farmer (2 respondents) or as a farm laborer (10 respondents).

Table 3.3 Characteristics of farmers' children

Variable	Farm households	
	With potential successor (***n*=23**)	Without potential successor (***n*=59**)
Farmers' children	**(*n*=65)**	**(*n*=136)**
Age	34.46	29.53
Education	11.89	12.06
Gender		
Male	35 (53.85%)	66 (48.53%)
Female	30 (46.15%)	70 (51.47%)
% of children employed	44 (67.69%)	88 (64.71%)
Main occupation (%)		
Non-agricultural jobs	32 (49.23%)	88 (64.71%)
Others	13 (20.00%)	25 (18.38%)
Student	8 (12.31%)	21 (15.44%)
Farmer/farm laborers	12 (18.46%)	2 (1.47%)

Source: Field survey, 2020.

Table 3.4 presents a description of the farmers' income in farm households. In this study area, the average yield of rice per crop could be more than five tons per hectare in a normal year. Although the farmland is well-irrigated, the farmers are unable to support themselves on the agricultural income from rice and other crops alone because the farms are small: less than

one hectare (Table 3.2). Table 3.4 also revealed that most farmers in farm households were able to earn income from agriculture. Three income sources are from paddy rice, other crops, and fish and livestock incomes. Other crops include chili, corn, bean, cucumbers, and tomatoes. An interesting result was found in relation to the agricultural income of farm households. The agricultural income of farm households with a potential successor was lower than the agricultural income of farm households without a potential successor.

Table 3.4 Farm household income (*n*=82)

Variable	Farm households	
	With potential successor (*n*=23)	Without potential successor (*n*=59)
Production (ton/hectare)		
Paddy	6.53	8.33
Rainy (Nov–Feb)	2.52	2.52
Dry I (March–June)	2.56	2.49
Dry II (July–Oct)	1.45	3.32
Other crops	2.75	12.63
Rainy (Nov–Feb)	0.00	0.00
Dry I (March–June)	0.00	8.75
Dry II (July–Oct)	2.75	3.88
Average of hired laborers	2.91	2.61
Production cost (thousands of IDR/year)	3,435	2,785
Revenue (thousands of IDR/year)	12,040	19,722
Paddy	5,040	5,472
Other crops	6,000	6,250
Fish and livestock	1,000	8,000
Agricultural income (thousands of IDR/year)	8,605	16,937
Household income from crops farming per land (thousands of IDR/year)	22,405	31,459
Non-agricultural income (thousands of IDR/year)	18,000	13,800
Farm household income (thousands of IDR/year)	26,605	30,737

Source: Field survey, 2020.

Based on Table 3.4, although there is a big difference in the production of other crops, there is no big difference in farm household income. Differences might be attributable to management practices, the marketing system of the farmers, the type of commodities, and the type of livestock or fish farming. For instance, not all farmers would sell their agricultural production after harvesting seasons. Some farmers would 100% sell their rice produce to the middleman or to the market. The rest of the farmers usually they would store their produce for their family's food consumption. However, all farmers would sell 100% of their production of

other crops to the middleman or to the market. For the fish and livestock, farmers would store it for a later sale. In the study area, paddy fields had also frequently been damaged by rat and pest infestations. Thus, some farmers delayed the planting time in anticipation of another infestation, or they used varieties that have longer maturing periods to disperse the risk of damage.

The non-agricultural income also becomes the source of income in farm households of both types (Table 3.4). Based on Table 3.2, 9 farm households with a potential successor (39.13%) and 29 of farmers in farm households without a potential successor (49.15%) became part-time farmers. Therefore, they also had other jobs, such as civil servant, laborer, and employee. Furthermore, based on the Central Bureau of Statistics of Indonesia (2013), both farm households' incomes exceeded the Indonesian farmers' average income (12,400 thousand IDR/year).

3.3.2. Factors influencing farm households in agricultural occupation

As hypothesized, the dependent variable for this study was influenced by 10 independent variables (Table 3.1). The suitability of the model was tested using econometric analysis based on results presented in Table 3.5. The table shows that, overall, logistic regression models generated from the analysis are useful to predict the probability of farmers having a successor.

Table 3.5 Statistical test of the model (n=82)

Test Statistics	Value		Notes
Omnibus tests of model coefficients	Chi-square	Significance	Significant influence
	65.12	0.00	
Model summary	Cox & Snell R^2	Nagelkerke R^2	Significant influence
	54.80%	78.90%	
Hosmer and Lemeshow test	Chi-square	Significance	Model is fit
	0.78	0.99	
Classification table	Overall percentage correct		Model is accurate
	92.70%		

Source: Field survey, 2020. Data analysis using software (SPSS 26).

In logistic regression analysis, a classic assumption test is needed: a multicollinearity test. As mentioned before in this chapter, if the correlation coefficient among independent variables is <0.8, then it includes no multicollinearity problem. Results of data analysis revealed that the correlation coefficient between independent variables is <0.8: no independent variable has a high mutual correlation (Table 3.6). We infer that the model was unaffected by a multicollinearity problem.

Table 3.6 Correlation matrix of independent variables

Variable	Age	Education	Experience in farming	Children with non-agricultural jobs	Household income from crops farming per land	Farmland areas	Productivity of paddy	Productivity of other crops	Number of family laborers	Number of hired laborers
Age	1.000									
Education	-0.394	1.000								
Experience in farming	-0.267	-0.013	1.000							
Children with non-agricultural jobs	-0.480	0.233	-0.020	1.000						
Household income from crops farming per land	0.069	-0.120	0.124	0.188	1.000					
Farmland areas	-0.644	0.407	0.158	0.211	-0.181	1.000				
Productivity of paddy	-0.445	0.302	-0.088	0.109	-0.439	0.552	1.000			
Productivity of other crops	0.109	-0.352	0.201	-0.174	-0.348	0.039	0.151	1.000		
Number of family laborers	0.419	-0.204	0.056	-0.590	-0.113	-0.331	-0.369	0.155	1.000	
Number of hired laborers	0.359	-0.377	0.337	-0.243	0.291	-0.300	-0.142	0.321	0.037	1.000

Source: Field survey, 2020. Data analysis using software (SPSS 26).

Furthermore, Table 3.7 presents results of the logistic regression analysis of factors influencing farm household succession.

Table 3.7 Results of analysis of the factors influencing farm household succession (*n*=82)

Variable	Coefficient	S.E.	Sig.	Marginal effect	S.E.	Sig.
Constant	-16.049	5.312	0.003***			
X_1	0.135	0.071	0.058*	0.009	0.005	0.088*
X_2	-1.919	1.377	0.163	-0.120	0.076	0.113
X_3	0.026	0.033	0.422	0.002	0.002	0.446
X_4	-3.857	1.850	0.037**	-0.626	0.322	0.052*
X_5	-0.015	0.023	0.513	-0.001	0.002	0.537
X_6	-2.768	1.834	0.131	-0.123	0.073	0.092*
X_7	-0.154	0.180	0.392	-0.010	0.012	0.377
X_8	0.190	0.239	0.426	0.013	0.015	0.404
X_9	4.963	1.524	0.001***	0.333	0.179	0.063*
X_{10}	1.647	1.534	0.283	0.096	0.081	0.235

Source: Field survey, 2020. Data analysis using software (SPSS 26 and Stata 16).

Note: Log likelihood = -16.1001. Pseudo *R*-squared = 0.6691. * Level of significance at 0.1, ** Level of significance at 0.05, *** Level of significance at 0.01.

Regarded comprehensively, 10 parameters were inferred as affecting farm household succession. The next stage is to ascertain factors influencing farm succession in farm households with a potential successor and without a potential successor. Based on Table 3.7, the independent variables that significantly influenced farm household succession were the farmers' age, farmers' children with non-agricultural jobs, and the number of family laborers in farm households. The variable of farmland areas was not significantly influenced farm household succession. However, the marginal effect was found to be significant.

After obtaining the results and estimating the marginal effects of the results, the factors influencing farm household succession in agricultural occupation were established as described below.

a) Farmer's age (X_1)

This variable has a marginal effect of 0.009 and a significance level of 0.088, which is inferred as significant at the 10% level. The result shows that this factor affects farm succession. Farmer age is a key factor because it determines when the farmer will begin to seek a successor. As farmers age, the tendency of these farmers to have a successor increased by 0.9%.

This factor is related to the timing of farmland transfer. In line with the study by Kerbler

(2012), it turns out that the farmer very often formally retains the farms in their own hands until death. While in Australia, the farmers plan to retire or semi-retire at the age of 65 years. The majority of those who plan a full retirement intend to leave the farm between 65 and 69 years (Lobley et al., 2016). It is also possible to transfer the farmland only when their strength is giving out or they become ill and become no longer capable of running the farm. One of the farmers made the statement presented below:

...I never think about retirement. There is no retirement for farmers. If I am capable to do farming, I will still do that... (Field survey, 2020)

As mentioned in Chapter 2 before, indeed the Indonesian farmers never intend to retire from farming as long as they can work. Yet, at the research site, if a farmer is becoming older or they are in the non-productive age category, then successors will gradually receive responsibilities to manage the farmland in the future until farmers quit. Therefore, the probability of farmers having a successor is high.

b) Farmers' children with non-agricultural jobs (X_4)

The marginal effect of this variable is -0.626; it has a level of significance at 0.052, which is less than 0.1. Although this variable is only significant at the 10% level, the farmers' children with non-agricultural jobs influence the farm succession probability. It would decrease the probability of farmers having a successor by 62.6%. This result implies that, among children with a permanent job outside of the agricultural field, most have not been identified as a potential successor by the farmers.

Like the result revealed by Kerbler (2012), the level of the annual income reflects the current and not the future economic capacity of a farm. Farmers' children who regard the farms as too small to provide a proper living might seek non-agricultural jobs. One of these children stated the following:

...The farmland is too small, so the income of farmers is not certain. The harvest might also fail sometimes... (Field survey, 2020)

That is true because usually only farms that will generate sufficient income can continue to operate. Some farmers also encourage their children for choosing non-agricultural jobs. Non-agricultural income can engender greater stability and raise the economic strength of a

household. It can also decrease the likelihood of finding a farm successor. Farmers generally felt appreciated in their profession but criticized the physical challenges and income stability.

c) Farmland areas (X_6)

This variable has a marginal effect of -0.123 and a significance level of 0.092, which is below 0.1. Unexpectedly, the result demonstrates that farmers with small farmland size are more inclined to have a successor than those with a large farm size. The result implies that if the farmers have a large farm size, the chance of farm succession in farm households falls to 12.3% compared to those with a small farm size.

It is difficult to account for this finding because, if farmers plant food crops with larger farm size, they tend to gain a higher level of income. The reason might be that their children still have no other job. Their children might follow them to become a farmer because they are compelled by circumstances and other conditions.

...Because my son has no another job, he should be a farmer to earn a living... (Margokaton farmer – Field survey, 2020)

In contrast, farmers with larger farms tend to support their children to find and accept employment outside of agricultural occupations.

...Well, I hope that my children can be more than me (a farmer): Get a higher education and work in the office. Farming is very hard. Sometimes we harvest, sometimes we fail... (Margokaton farmer – Field survey, 2020)

Other reasons might lie in the inheritance system in the study area. The influence of cultural mores upon succession planning was assessed using a question that asked farmers what they believed was the best plan for their family farm succession and why. Most farmers believed that passing the farmland to all those with inheritance rights within the family was the best way to maintain the farm in the farm households. However, rather than sell the farmland, they prefer to bestow the farmland equally among their children to retain family ownership of the farmland. Moreover, they need to ensure that their children receive an equal share of the inheritance farmland to avoid conflict within the family. Some farmers gave the following opinion (Field survey, 2020):

...Well, of course I must divide the farmland evenly among my children...

...I got the farmland from my parents before. I hope that it will not be for sale because that is an inherited landholding. It is important to keep the inherited land in the future as it is...

In line with the study by Rigg (2020), based on farmers' comments is not one reason but several jostling for attention to explain small-scale farmers' continued attachment to their land and to rice farming: a sense that rice land provides security, a fear of what the future might hold, an attachment to place and a connection with the past, a deep-seated desire to grow rice to meet subsistence needs, historical inertia, and a feeling of filial obligation. According to this finding, the Indonesian government or local government should devote attention to this traditional community inheritance system. If such considerations persist over generations, then the average size of landholdings will engender smaller farm size.

In the case of Indonesian farmers, the inheritance system makes the farmland smaller and smaller. For example, if the father has one-hectare of farmland, it will be divided among all children equally. In case there is no chance for his children to go to the city, all children will do farming in the small plot. Therefore, if one farm household has four children, then one hectare will be divided into four plots of only quarter hectare... (Agricultural extension worker – Field survey, 2020)

Furthermore, this finding is like those of a study by Kerbler (2012): in Slovenia, factors reflecting tradition have a greater influence on succession than economic factors. In Australia, the persistence and strong obedience to a rural ideology strongly influences the farm succession planning of farm families (Lobley et al., 2016).

d) Number of family laborers in farm households (X_9)

The marginal effect of this variable is 0.333, with a level of significance of 0.063, which is less than 0.1. Rayasawath (2018) reported that farmers living in households with a greater number of agricultural laborer members have a higher tendency to support succession in agricultural occupations. The chance of succession in agricultural occupations increases to 33.3% if the farm household has more than one family member who is a laborer.

The number of laborers in farm households for which there is at least one laborer represents increasingly greater chances to take over the farmland. Family member laborers in farm households include parents, siblings, and other individuals residing together. These results are consistent with earlier reported findings Rayasawath (2018): existing laborers are available for

agricultural labor-demanding work and can advise a potential successor to take over the agricultural occupation. The notion of working with one's parents is also reason speaking in favor of taking over the farm. Continuation of the family tradition is also cited as a motive, albeit a less compelling one. For the farm successors, material interests and the relative social status of the job play a far less important role than their enjoyment of the work (Lobley et al., 2016).

...I am doing rice farming and horticulture farming. However, my son will help me to do the horticulture farming only... (Margokaton farmer – Field survey, 2020)

3.3.3. Case study of a farmer with a potential successor

A case study of a selected farmer was conducted to identify reasons and succession patterns of farmers who have a potential successor. Table 3.8 presents a profile of the selected farm household based on an approach to the characteristics of farm households with a potential successor and the personal history of a farmer at the research site. Farmer A, 77 years old, is a rice farmer in the non-productive age category. He received his own farmland through the inheritance system and acquired more farmland through the fixed-rent contracts system (0.50 hectares). In the past, his parents had 0.28 hectares, divided equally among seven children. Therefore, he acquired 0.04 hectares as inherited land. That finding indicates that in this farm household, the farmland strongly influences the farm succession process.

The total farmland of farmer A was 0.54 hectares. However, he was doing rice farming only on the fixed-rent farmland (0.50 hectares). Farmer A was not doing integrated farming style. His farm household income comprises two income streams: agricultural income and non-agricultural income. The non-agricultural income came from his wife. This fact implies that the farm household of farmer A cannot obtain sufficient income solely from agriculture. In line with results of a study by Iwamoto and Hartono (2009), reasons for explaining this condition are the small scale of the farming business and that the labor market in the study area has been developed to some degree.

Table 3.8 also presents profiles of successor B, the first son of farmer A. The age of successor B is categorized as a productive age (54 years old). He also had higher education than farmer A. Successor B expects to inherit farmland (0.04 hectares) from farmer A in the future. Farmer A expects to retain the inherited farmland for future use. Farmer A has six children, but he intends to transfer the inherited farmland to successor B because the farm is too small. The other children will inherit another farm household asset, except for the farmland from farmer

A. In fact, successor B had a non-agricultural job in the past, but he always helped his father as a family laborer until he quit his job.

At present, farmer A has given responsibility for successor B to take over the inherited land. As described previously in this chapter, the farmer age is a significant factor affecting farm succession. If farmer A is becoming older, then successor B will gradually receive responsibilities to manage the farmland in the future until farmer A quits farming. Moreover, farmer A would not receive the harvested rice from successor B. By this succession pattern, he can directly become a farm successor in the farm household. In line with the Chapter 2 before, a potential successor can gradually receive the accumulated responsibilities to take over future management of the farmland.

Table 3.8 Profile of selected farm households (*n*=1)

Variable	Farm household
Farmer A (years)	77
Gender	Male
Education	6
Number of children	6
Total farmland (hectare)	0.54
Inheritance	0.04
Purchase	-
Fixed-rent	0.50
Sharecropping	-
Production cost (thousands of IDR/year)	4,480
Agricultural income (thousands of IDR/year)	10,640
Livestock	No
Non-agricultural income (thousands of IDR/year)	12,000
Farm household income (thousands of IDR/year)	22,640
Successor B (years)	54
Gender	Male
Marital status	Married
Education	12
Main occupation	Farm labor
Relationship with farmer A	Son
Reside with farmer A	No
Total farmland (hectare)	0.22
Farmer A's land	0.04
Fixed-rent	0.18
Agricultural income (thousands of IDR/year)	22,485
Responsibility shared	
Rice farming	100%
Horticulture farming	100%

Source: Field survey, 2020.

Successor B also acquired more farmland through a fixed-rent contract system (0.20 hectares) with a different landlord from farmer A. Successor B was not only doing the rice farming, but also horticulture farming. However, he emphasized horticulture farming, particularly chili. He was using a sharecropping system (50:50) for rice farming on his father's land with other people, but he paid for the cost of production. He would store the harvested rice for his family's needs, especially for family consumption. Thereby, he would gain agricultural income only from the sale of the chili. He believed that being a horticultural farmer is more profitable than being a rice farmer. Therefore, in the future, he wants to emphasize agribusiness with chili as his main commodity crop. In general, Table 3.9 presents farmers' reasons for identifying a successor in the study area.

Table 3.9 Reasons for identifying a successor based on farmers' opinions (*n*=82)

Reasons	No. of farm households	Percentage (%)
Farmers with potential successor (*n*=23)		
To continue father's job	11	47.83%
To keep the farmland	7	30.43%
As a side job	5	21.74%
Farmers without potential successor (*n*=59)		
Children have a non-farm job	33	55.93%
Have no farmland of their own	9	15.25%
Other reasons	9	15.25%
Farmers only have daughters	8	13.56%

Source: Field survey, 2020.

Based on Table 3.9, most farmers in the farm households with a successor, 47.83%, wanted their children to continue their job as a farmer. The other reasons were to keep the farmland as it is and to work as a farmer as a side job only. According to Lobley et al. (2016), farmers feel a responsibility to provide the opportunity to keep the farmland in existence in case their successors wish to succeed them. Farmers do, however, wish their farmland to be kept in the family and not sold, even if it does not provide an income. This is fulfilling their sense of responsibility to their forefathers.

Of farm households without a successor, 55.93% have children working outside of agriculture. The other reasons were because they have no farmland of their own to be inherited by their children or potential successors. As other reasons in farm households without a successor, farmers stated that choosing a successor depends on the children's decisions, and on farmers' hopes to have a future successor. In addition, the children are still in school. Farmers who only have daughters were also likely to have no potential successors in the future. It was

because some farmers were still concerned about the physical challenges and how struggling it is to become a farmer.

3.4. Conclusion

From the findings, it shows that the factors affecting farm household succession in agricultural occupations include farmer age, farmer children with non-agricultural jobs, farmland areas, and the number of family laborers. Older farmers tend to have a successor. However, farmers with smaller holdings also have a high probability of having a potential successor. Farmers' children with non-agricultural jobs decrease the probability of farm succession. However, family laborers have a strong positive effect on farm succession in farm households. The greater the number of family laborers in farm households, the higher the probability of eventually having a successor.

These results improve our understanding of farm succession. Farmers with small farm size tend to have a potential successor, but it remains difficult for them to subsist and thrive from agricultural income because the farm holding is too small. Therefore, policies aimed at farm succession should be revised to favor of farmland acquisition. Future succession-related and inheritance-related policies in Indonesia should specifically examine solutions for the land splitting difficulties. Supporting farmers in efforts to prevent fragmentation of their farmland within the succession process might help to secure future profitability and sustainability of agricultural occupation in the study area.

Chapter 4 Farmers' Motivation to Continue Farming

4.1. Introduction

Farm succession in Indonesia begins with people of younger generations helping parents in the farmland. Recently, however, many younger people are not involved in farming activities or continued their parents' jobs as farmers. Some studies have revealed that the decreasing number of young farmers has been influenced by aging farmers' unwillingness to bequeath farms to younger farmers because of educational, financial, and motivational reasons (Lobley et al., 2016; May et al., 2019). In relation to education, it revealed that higher education of farmers had a negative effect on intra-family farm transfer. It is argued that this may reflect a correlation between the educational attainment of farm holders and their children, suggesting that the latter can be obtain higher off-farm wages (Bertoni and Cavvichioli, 2016). In terms of financial reasons, it has been found that older farmers who are concerned about their financial future and/or who do not have formal retirement plans are unwilling to transfer their farm assets, negatively affecting intra-family farm transfer (Lobley et al., 2010). Finally, in relation to motivational reasons, it is argued that ageing farmers' unwillingness to pass the farm to younger generations is related to emotional, identity, and human factors (May et al., 2019).

In the United Kingdom, the quantitative assessment revealed that the construct of young farmers' motivation is positively influenced by involvement progression and a sense of control over the farm. This means that increasing involvement with farm activities and decision making, and having more control over the farm positively affect young farmers' enjoyment at work and allow them to obtain recognition and prestige (May et al., 2019). While in Indonesia, the farmer groups play a role in increasing farmers' motivation. Motivation has a strong relationship with the learning process in a farmer group. Generally, farmers learn by exchanging experiences with other farmers (Nurlaela, 2021).

The main characteristics of small farmers are having limited capital, education, and experience. To start farming, small-scale farmers generally will encounter several challenges. With such constraints, it would be difficult to gain access to capital from commercial banks because they do not have any collateral so that the credit is deemed to have a high risk in the repayment. The rising prices of land and the absence of collateral to the bank make farmers, especially beginner farmers find it difficult in gaining access to land (Kauffman, 2013). In countries that do not adhere to the system of land inheritance from parents to their children,

their children as successor generation would start their farming as farmers. They generally develop their farming business by buying the land or renting through a profit-sharing system. With limited capital land assets, access to farmland is a real challenge for young farmers (Katchova and Ahearn, 2014).

The condition is different from Indonesia, where the inheritance system is still widely applied (Iwamoto and Hartono, 2009). Parents will divide the land according to the number of their children so that land fragmentation occurs along with the increasing number of new farm households. Rising land prices have sometimes made the inducement to sell so great that it is hard for historically small-scale farmers to resist. Many of the core elements of the farm-size transition also seem to be placed in Thailand and Vietnam: rice smallholders cannot survive from their farms alone; the region's economic growth is providing an abundance of other employment opportunities; incomes are rising and economies diversifying; the young are being educated so that they can take advantage of these opportunities; mobility is becoming normal and the cultural and physical constraints to mobility are diminishing; and there may be growing social reasons for the young to avoid farming (Rigg, 2020).

Therefore, this study was conducted to elucidate the motivations of farmers to continue farming including factors related to motivation, both internal and external factors of farmers, particularly for farmers in Margokaton Village, Sleman District, Yogyakarta Province, Indonesia.

4.2. Material and Methods

4.2.1. Sample size and data collection

The data of this study were collected from interview surveys of farm households during February–March in 2020. The sample comprised 82 farmers selected randomly from four farmer groups in Margokaton village. The questionnaire contents were adjusted to address all information necessary to meet the study goals, such as (1) farm household characteristics (age, gender, marital status, education, main occupation, side job, income, number of children, etc.), (2) farming operation (farmland areas, production, cost of agricultural inputs, and marketing), and (3) motivation of farmers to continue farming.

4.2.2. Data analysis

The data of this study were analyzed using descriptive and multiple regression analysis. This study used Alderfer's Existence–Relatedness–Growth (ERG) theory (Schneider and

Alderfer, 1973) to ascertain farmer motivations. A Likert scale was used to estimate the score for each item of ERG needs theory. Then, the validity and reliability tests were used to make sure that the data was valid and reliable for this study (Appendices 2). The scoring method was also used to ascertain the rice farmer's motivation. Motivation measurements were done by estimating the mean score of each item. Motivation levels of farmers can also be inferred by the measurement of motivation categories (Table 4.1).

Table 4.1 Categories for motivation levels of farmers

Items	Category		
	Low	Moderate	High
Existence	0–9	10–19	20–28
Relatedness	0–9	10–19	20–28
Growth	0–9	10–19	20–28
Motivation (Y)	**0–28**	**29–56**	**57–84**

Source: Field survey, 2020.

Overall measurement of motivation score was calculated to determine the dependent variable of this study. Multiple regression analysis with Backward method was used to infer significant factors that influenced the motivations of farmers in relation to rice farming, with the formula shown below.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + \varepsilon_i$$

In that equation, Y represents the dependent variable of this study, defined as the farmers' motivation. β_0 represents a constant value, whereas β_n is the coefficient of regression. Also, X_n are defined as independent variables for this study (Table 4.2). It consists of both internal and external factors of farmers. Internal factors include farmer age, education, number of children, occupations, household income, experience in farming, and farmland size (Aldanondo Ochoa et al., 2007; Rahayu et al., 2018). External factors include parents' encouragement for farming activities (Pamungkaslara and Rijanta, 2017), farmers' circumstances, and the environment of farmers. The environment of farmers related to the farmer's relationship with their neighbors.

Table 4.2 Independent variables used in analysis

Independent variable (X)	Data Entry
Internal factors	
Age (X_1)	Age (year)
Education (X_2)	Years
Number of children (X_3)	Number (persons)
Main occupation (X_4)	1 = Farmer; 0 = Not farmer
Side jobs (X_5)	1 = Have; 0 = Have not
Perception of farmer as a job (X_6)	1 = Yes; 0 = No
Children have non-agricultural job (X_7)	1 = Yes; 0 = No
Farmland areas (X_8)	Farm area (ha)
Inheritance land status (X_9)	1 = Have; 0 = Have not
Purchased land status (X_{10})	1 = Have; 0 = Have not
Rent land status (X_{11})	1 = Have; 0 = Have not
Sharecropping land status (X_{12})	1 = Have; 0 = Have not
Productivity of paddy (X_{13})	Unit (ton/ha)
Productivity of other crops (X_{14})	Unit (ton/ha)
Household income from crops farming/land area (X_{15})	Amount (million IDR/year)
Farming experience (X_{16})	Year
Number of family laborers (X_{17})	Number (persons)
Number of hired laborers (X_{18})	1 = ≥ 1 person; 0 = < 1 person
Interested in agriculture (X_{19})	1 = Yes; 0 = No
Being a farmer by own will (X_{20})	1 = Yes; 0 = No
Keeping the farmland as it is (X_{21})	1 = Yes; 0 = No
Children think of farming as a side job (X_{22})	1 = Yes; 0 = No
Only have daughters (X_{23})	1 = Yes; 0 = No
External factors	
Parents' encouragement (X_{24})	1 = Yes; 0 = No
No other jobs (X_{25})	1 = Yes; 0 = No
Affected by the environment (X_{26})	1 = Yes; 0 = No

4.3. Results and Discussion

4.3.1. Characteristics of farmers in the study area

Table 4.3 presents the characteristics of farm households. Of 82 farm households, the farmers residing in our study area were predominantly principal farmers who have their own farmland. Results suggest that, of the sample respondents, 91.46% have a main occupation as a farmer. Other main occupations include civil servant, laborer, and entrepreneur. Also, 46.34% of farmers have a side job such as farm laborer, farmer, retirement, and construction worker. They had secondary school education level. Moreover, 84.15% of farmers' children have a main occupation outside of the agricultural field. The average farmland areas in our study area

were only about 0.34 ha or less than 0.5 ha. In line with Rigg (2020), some 80% of land holdings in Java are less than 0.5 ha in area, tenant farming is prevalent, and landlessness is widespread.

Table 4.3 Characteristics of farm households' samples (*n*=82)

Variable	Mean
Farmer type	
Principal farmer	32 (39.02%)
Tenant farmer	26 (31.71%)
Principal–tenant farmer	24 (29.72%)
Age	62.40
Education	8.84
Number of children	2.40
Main occupation as a farmer	0.91 (91.46%)
Side jobs	0.46 (46.34%)
Children have non-agricultural jobs	0.84 (84.15%)
Farmland areas (ha)	0.34
Inheritance land	60 (0.11)
Purchased land	15 (0.02)
Rent land	9 (0.03)
Sharecropping land	54 (0.18)
Production (ton/ha)	
Paddy	5.23
Other crops	1.23
Head of livestock	
Yes	38 (46.34%)
No	44 (53.66%)
Fish farming	7 (8.54%)
Average hired laborers involved in agriculture	2.55
Production cost (thousands of IDR/year)	4,197
Revenue from farming (thousands of IDR/year)	22,681
Agricultural income (thousands of IDR/year)	18,484
Non-agricultural income (thousands of IDR/year)	22,235
Farm household income (thousands of IDR/year)	40,719

Source: Field survey, 2020.

Based on the local custom in our study area, the parents bestow most farmland equally among the children. (Barlinti, 2013) stated, based on her research, that three main systems exist in support of the legal inheritance system in Indonesia: 1) Customary *(Adat)* inheritance law is an unwritten law in society and the oldest legal system based on the norms of local custom; 2)

Islamic inheritance law consists of patrilineal, bilateral, and compilations of Islamic law; and 3) Western inheritance law, applied for particular groups, is the norm of heritage based on Dutch government. The farm households in our study area acquired farmland through the inheritance system, purchasing the farmland, rent contracts, and sharecropping system. However, most farmers acquired their farmland through the inheritance system and the sharecropping system. The landowner and tenant farmer generally will share the harvest about 50:50 or depending on the sharecropping contract system between them.

The average farm size was very small. As a result, farmers were unable to meet their farm households' needs only by agricultural income. Besides, not all famers were doing livestock and fish farming. This indicates that the farmers could not survive without non-agricultural income, although land leases partially helped the farmers to enlarge their farm sizes. Based on Iwamoto and Hartono's (2009) research, in this study area, the non-agricultural income had been increasing constantly after the economic crisis, which compensated for the reduction in agricultural income. Based on the Indonesian statistics data in 2021, the country's average monthly salary for the non-agricultural income is 12,1 million IDR or 837 USD.

4.3.2. Rice farmers' motivation to continue farming

Table 4.4 and 4.5 shows findings related to the motivation of farmers to continue farming. The indicators used to measure farmers' motivation are the need for existence, relatedness, and growth. The need for existence and security includes basic needs such as food, water, and shelter, as well as security, manifested in the form of savings. However, when engaged in rice farming, the income earned by farmers is applied mostly to meet primary needs, secondary needs, and education for children. Furthermore, based on the motivation rate of Table 4.4, 90.24% of farmers want to meet material needs such as those for food, from farming activities.

Relatedness needs include social needs and the need for external esteem. Farmers need other people or society to interact and communicate with, to develop their farms. Data also show that 90.24% farmers want to share good relationships with other farmers (Table 4.4). The need for growth consists of internal esteem and self-actualization. Farmers must to develop their potential to become more productive, which is beneficial to themselves and the environment (Rahayu et al., 2018). The motivation of farmers shows that 60.67% farmers want to increase their family income (Table 4.4). Overall, based on Table 4.5, the rice farmer motivation in the study area can be categorized as moderate. This finding is like research findings by Rahayu et

al. (2018) in Central Java the motivation of farmers in cabbage farming is also at the moderate level.

Table 4.4 Motivation rate of farmers to continue farming (*n*=82)

No	Items	Interval Score	Mean Score	Motivation Rate (%)
	Existence			
1	Farmers want to meet material needs such as food	0–4	3.61	90.24
2	Farmers want to meet material needs such as clothing	0–4	3.51	87.80
3	Farmers want to meet material needs such as shelter	0–4	2.35	58.84
4	Farmers want to be guaranteed about future life	0–4	2.17	54.27
5	Farmers want to have a guaranteed income faces the risk of failure of other businesses	0–4	2.09	52.13
6	Farmers want to meet the savings	0–4	1.99	49.70
7	Farmers want to attain good social status in society	0–4	1.55	38.72
	Relatedness	0–4		
1	Farmers want to have many farmer friends	0–4	3.60	89.94
2	Farmers want to have a good relationship with other farmers	0–4	3.61	90.24
3	Farmers want to cooperate with other farmers	0–4	3.44	85.98
4	Farmers want to have a good relationship with extension workers	0–4	2.23	55.79
5	Farmers want to have a good relationship with the traders	0–4	2.02	50.61
6	Farmers want to have a good relationship with researchers	0–4	1.85	46.34
7	Farmers want to build a relationship with the related institution	0–4	2.55	63.72
	Growth	0–4		
1	Farmers want to increase the family income	0–4	2.43	60.67
2	Farmers want to improve the experience and skills in agribusiness	0–4	2.15	53.66
3	Farmers want to improve knowledge of agribusiness	0–4	2.15	53.66
4	Farmers want to increase the farming scale	0–4	1.88	46.95
5	Farmers want to improve and develop agricultural innovation and new technology	0–4	1.95	48.78
6	Farmers want to obtain rewards from their own ideas	0–4	1.94	48.48
7	Farmers want to be respected by others farmers	0–4	1.83	45.73

Source: Field survey, 2020; Rahayu et al., 2018.

Note: Likert Scale: 0 = do not want, 1 = rarely want, 2 = doubtful, 3 = want, 4 = highly want.

Table 4.5 Farmers' motivation to continue farming

Items	Interval Score	Mean Score	Category
Existence	0–28	17.27	Moderate
Relatedness	0–28	19.30	Moderate
Growth	0–28	14.32	Moderate
Motivation (Y)	**0–84**	**50.89**	**Moderate**

Source: Field survey, 2020.

Based on Table 4.5, the highest score of farmers' motivations to continue farming is from the relatedness needs, although this item is categorized as a moderate level. Thus, farmers are motivated to do farming because of the desire to work with other farmers. This effort is carried out by supplying seeds, fertilizer assistance, borrowing capital and agricultural machinery, also providing wells and watering equipment. By working together, farmers can produce more efficiently and deal with intermediary traders and market strongly.

4.3.3. Factors affecting farmers' motivation to continue farming

A farmer owning a small family farm can also be considered a manager. They also have experiences, motivations, and capabilities (Maican et al., 2021). Table 4.6 presents results of factors associated with farmers' motivation to continue farming. The result show that factors strongly influencing rice farmers' motivation to continue farming (Y) were farmers' education (X_2), number of children (X_3), side jobs (X_5), inheritance land status (X_9), and encouragement by parents to be a farmer (X_{24}). Formal education also has significance and a positive relation with the motivation of farmers in cabbage farming. In contrast, the factors of farmland areas and land status were found to have no significant relation with the motivation of farmers for cabbage farming (Rahayu et al., 2018).

Table 4.6 Factors affecting farmers' motivation to continue farming

Variable	Coefficient	S.E.	Sig.
Constant	39.030	3.121	0.000
Education (X_2)	0.727	0.229	0.002***
Number of children (X3)	2.392	0.783	0.003***
Side jobs (X_5)	4.239	1.810	0.022**
Inheritance land status (X_9)	-6.025	1.919	0.002***
Parents' encouragement (X_{24})	3.892	1.724	0.027**

Source: Field survey, 2020. Data analysis using software (SPSS 26). *$R^2 = 0.307$. Adj. $R^2 = 0.262$. $F = 6.743$.* Note: * Significance at 0.1, ** Significance at 0.05, *** Significance at 0.01.

After obtaining the results, the factors affecting farmers' motivation to continue farming were established as described below.

a) Farmers' education (X_2)

Based on Table 4.6, the motivation of farmers to continue farming will increase by 0.727 points when the education of farmers is also high. The Central Bureau of Statistics Indonesia stated that the educational background of the farmers has improved only slightly in 2015. Data of 38.3 million farmers Indonesia showed that, in 2015, 31.9% and 38.7%, respectively, had not finished primary school and had graduated from secondary school. Consequently, 7 out of 10 farmers in Indonesia have little or no educational background beyond the primary school level. Based on research findings by Rahayu et al. (2018), low level education of farmers made them difficult to accept new innovations, so they still used manual methods. However, at the research sites, most farmers had completed their education through the secondary school level. One can infer that more highly educated farmers can think more forward and solve farming problems so that they can continue farming.

b) Number of farmers' children (X3)

Farmers with more children will also tend to create higher motivation to continue farming to meet their family needs. If the number of children increases by 1 person, then the farmer motivation also increases by 2.392 points. After farmers' first child was born usually, farmers started to seek another job in outside of agricultural fields. They will do farming after work or in their leisure time as "a part-time farmer". Thus, they will gain the household income not only from agriculture, but also from non-agricultural activities. They assumed that being a farmer can do the savings, because they can consume the yield of their crops after harvesting season to meet their family's needs of foods. The basic unit of subsistence, the farm household, can be defined as a group of people living under one roof and sharing meals (head of households, wife, children, etc.) (Gasson and Errington, 1993).

Indeed, family relationships in the farm have important implications on production decisions, such as choice of crops, the organization of family labor and its allocation to different tasks, management of farmland and other assets, and questions of inheritance (Toulmin and Guèye, 2003). While other studies also mentioned that factors such as number of children, age, and gender composition of the household play an important role in labor divisions and management decisions to continue farming (Garner and de La O Campos, 2014).

c) Side jobs (X_5)

Table 4.6 also shows that farmers who have a side job will show different motivations to continue farming because farmers tend to increase their family income through engagement in other occupations. Moreover, farmers at research sites can readily find jobs outside of the agricultural field because they are living in rural areas next to the urban areas. If farmers have a side job, then the farmers' motivation to continue farming can increase to 4.239 points. As mentioned before in this chapter, the non-agricultural income had been increasing constantly after the economic crisis. It can lead to greater of profitability and continuation of farming, and at the same time, this can represent a first step in giving up and abandoning farming, especially if these sources begin to dominate in the total annual income on the farm. However, the source of income from non-agricultural jobs will all be controlled by the farm household.

d) Inheritance land status (X_9)

Unfortunately, the inheritance land status tends to decrease farmers' motivation to continue farming. As implied by results reported by May et al. (2019), even if farmers are highly motivated, economic conditions that negatively affect the farming sector can reinforce the decision to leave the farm. If the inheritance land status increases, then it will decrease the motivation to continue rice farming by 6.025 points. It is because in this study area the average of farmland areas is extremely small. The farmers' motivation for buying and selling farmland is very weak because the farmland is the most valuable assets for them, and they expect that land price will increase. Therefore, it is extremely difficult to enlarge farm size in this study area. Small-scale farmers will have problems because fathers and children do not have sufficient space to get away from one another. The volume of management decisions is limited and it is difficult to split off any one part of the decision-making.

If the farmers continue to do the equal inheritance system, their successors may not survive in farming. It is because the area of each holding may be occasionally unchanged, or decreased in most cases. As well as the shrinkage of land holdings by subdivision, the acreage cropped in each fragment becomes much smaller, because the plots owned by the successors are fragmented and each fragment is divided at the time of inheritance. For this reason, their productivity remains low, and the associated disadvantages of management, such as movement of labor, input and output, loss of land used as field boundaries, and disputes and tension over trespass, remain (Ram et al., 1999).

e) Parents' encouragement (X_{24})

Farmers who have been encouraged by their parents are likely to have high motivation in farming continuation. That can be expected to increase the farmers' motivation to 3.892 points. In line with Pamungkaslara and Rijanta's (2017) findings that parents' encouragement also affects the farmers to continue farming in rural-urban areas. It is also related to the farm succession issues. Farm succession or regeneration of family farmers means that agricultural business management is inherited from parents to their children (Inwood and Sharp, 2012; Joose and Grubbstrom, 2017). When farmer grow older, there is a critical decision-making point about who is the farm successor (Inwood and Sharp, 2012). Parents have a role in transforming young people into farmers and becoming agricultural entrepreneur.

4.4. Conclusion

This study revealed that most farmers acquired farmland through the inheritance system and sharecropping system. Based on local customs, most farmland is bestowed by parents to children equally. It makes the future farmland size smaller. Farmers are also unable to support themselves if they must do solely based on agricultural income. Results clarified that, overall, the rice farmers' motivation to continue farming must be categorized as moderate. In detail, the relatedness needs have the highest score of farmers' motivations, although this item is categorized as a moderate level. It indicates that farmers want to share good relationships and work with other farmers.

The factors found to have a significant and positive relationship with the famers' motivation to continue farming are farmers' education, number of children, side jobs, and encouragement by parents to be a farmer. Inherited land status negatively influences the famers' motivation to continue farming. Attracting younger people and inspiring high motivation for farming is better for successful farm succession. Farmers must be supported to avoid fragmenting their farmland or organize a community farming to consolidate the farmland. Further research must be conducted to ascertain inheritance system effects by bestowing the farmland equally during farm succession.

Chapter 5 General Discussions and Conclusion

5.1. General discussions

In general, the resulting data set of this study was used to not only describe the process of farm succession and its challenges but also to identify factors influencing farm household succession and rice farmers' motivation to continue farming in the study area (Figure 5.1).

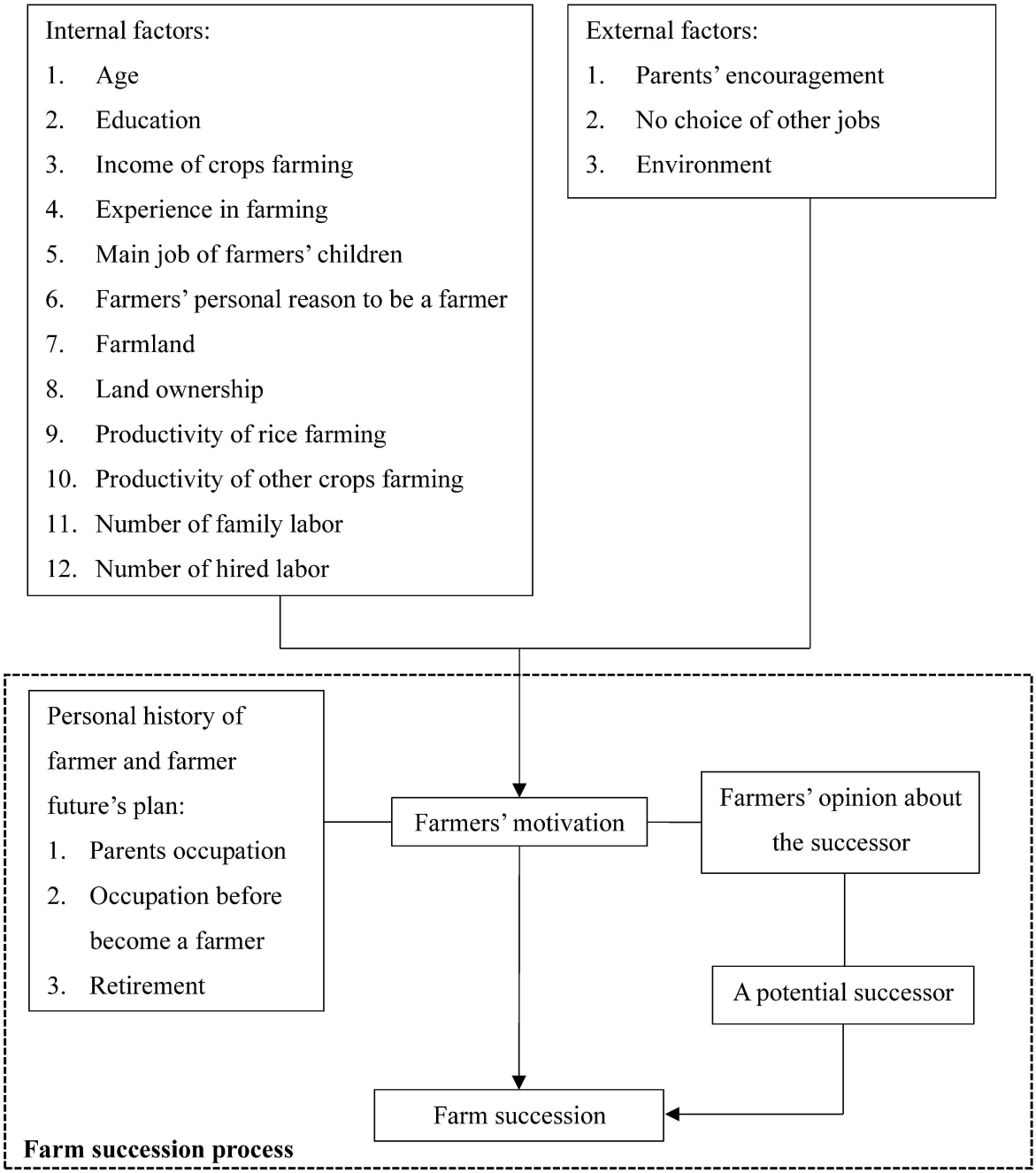

Figure 5.1 Outline of study

This study on farm household succession expands the viewpoint of existing literature and provides a valuable insight into the topic in Indonesia. By including data from a farm household survey and in-depth interviews with farmers, a comprehensive assessment of the current situation of farm succession in the study area was achieved.

5.1.1. Farm succession process

Farm succession issues in Indonesia have not been subjected to intense research so far, little was known about the procedure of succession, its current trends, and challenges in the study area before this research. Results suggest interesting differences between this study and previous literature. In contrast to the young farmers' problem in Europe (Zagata and Sutherland, 2015) and the rising average age of farmers around the globe (Zou et al., 2018), the existence of young people willing to take over the farming management was not really a problem observed within this study – several farmers even had more than one designated successor, although there were some of the interviewed farmers did not expect their children to take over the farms.

Furthermore, low farm household succession did not only lie in the unwillingness of the children, but also the aspirations of the parents for their child. While the number of farmers expecting and not expecting farm household succession was surprisingly not so different in the study area, results of the household survey suggest differences in the underlying reasons. However, as a lack of successors in the study area, underlying reasons for the case of farmers who have a potential successor become of interest. Therefore, in the following sections, results concerning the process of farm household succession will be discussed first.

The investigation of the farm succession process in the study area showed strong traditional components of farm management in rural areas. Due to the overall tradition that farmland must be bestowed equally between all children during inheritance, average farm sizes all over Java Island are declining dramatically. Although this decline is not perceived as a problem by most local farmers, it has several negative consequences – farming practices need to be constantly adapted and optimized, fragmentation of plots complicates efficient cultivation, and likelihoods are endangered by insufficient incomes.

A study from India observed similar inheritance traditions which lead to an increase in monoculture and continuous cultivation of land – decreasing land sizes can therefore relate to less sustainable farming practices (Ram et al., 1999). The research findings by Ram et al. (1999) are like current farming practices in the study area, where intensive rice farming was

pursued by all local farmers. It is conceivable, that the decreasing farm size favored the prevailing farming system, as farmers were confirmed to constantly adapt to the shrinking of the farmland.

In order to slow down the shrinkage of farmland, a renewal of the inheritance system is necessary. A possible solution would be the passing on of farmland to one heir while paying out other siblings or supporting their education program. To achieve this change, government action may be needed. However, introducing changes to engraved traditions like inheritance would be undoubtedly a difficult and slow endeavor. Shrinking farm sizes have been shown to affect farm succession negatively, as smaller farms decrease the likelihood of succession (Bohak et al., 2010). In addition, it is obvious that the inheritance tradition in the study area will make a difficulty for future farm successors due to the low farm incomes.

While most farmers in the study area expected farm household succession, those without successors often planned to pass on farmland to their children and leave its usage up to them. Many of these farmers still expected their children to take care of the land in form of a side occupation, or by hiring workers, or by following the sharecropping system. However, they did not have a plan for future land use in case the child would not want to cultivate the land in any way. Other farmers without successors planned to plant less work-intensive crops and take care of the fields themselves until not capable anymore, or for the worst case, they will sell the farmland. While future land use for farms without successors in the study area still underlies the strict inheritance practices, the observed lack of plans different than leaving the decision up to the children agrees with previous findings (Zou et al., 2018).

Another aspect of farm household succession concerning farmland, the transfer of management decisions was investigated, where a strong parental dominance was observed. Farmers that had not yet passed on farmland to their children were usually solely in charge of the management decisions, without including their successor. Only a few farmers handed over more responsibilities to their successors and included them in the management. While no clear succession ladder or successor effect (Errington, 1998) could be observed among the interviewed household, most farmers simply appreciated the additional workforce provided by their successor. These observations resemble a succession pattern described as “farmers boy” by Errington (1998), in which the future successor merely contributes as a worker to the parental farm. As the successor is not involved in managerial decisions and therefore does not develop adequate skills, the succession process may be less efficient.

Farmers in the study area had often no intentions of retiring. Most farmers planned to work as long as possible on their farms. The actual handing over of farmland and management

decisions was observed to go along with the passing on of a share of farmland to the successor. The timing of this step was decided by the farmer but often triggered by the marriage of the successor. If younger successors were still living in the parental home, they would cultivate the remaining farmland together with the farmer until receiving their share. Even if farmland was already passed on to the successor, many farmers were not willing to retire completely and leave the cultivation of the farm completely up to their child. An unwillingness to retire and difficulties in handing over the farm to the successor were observed in several other studies (Fennel, 1981; Glauben et al., 2004b; Lobley et al., 2010) and found to hamper an efficient succession process (Lobley et al., 2010).

Once the farmers retired, an informal security system ensures their livelihood in the study area. Similar as to the traditions recorded in other countries (Cassidy et al., 2019; Kimhi and Nachlieli, 2001). It is common for successors in the study area to take care of their elderly parents. Former farmers who cannot provide their own living anymore often live with their youngest child or at least receive support from their children in form of money or goods, such as food or clothes.

Taken together, some problems were observed in the study area that can challenge an efficient farm household succession process or impose a potential difficulty in the future. Farmland areas are shrinking due to the strong tradition of dividing the farmland between children, which leads to endangered livelihoods, difficult cultivation, and possibly intensified farming systems. In addition, strong parental dominance and unwillingness to retire challenge an efficient generational transfer of farms in the study area. According to Kimhi (1994), these include possible bargaining between parents and children about the terms of farm transfer, including its timing, choice of succeeding child among potential successors, and effects of uncertainty, especially about parents' life expectancies and health.

5.1.2. Influences of farm households' succession in agricultural occupation

Several factors were found to influence the farm households' succession in the study area. While the number of farmers with and without successor was comparable between the villages, some interesting differences between influencing factors were noticed. Binary logistic regression analysis revealed that four variables significantly influence farm household succession in agricultural occupations: farmers age, farmers children with non-agricultural jobs, farmland area, and the number of family laborers in farm households.

A prior study observed a positive impact of the farm age on farm households' succession (Cavvichioli et al., 2019). The result is in line with previous studies, which older farmers show a stronger tendency to have a successor. Several studies also reported a positive influence of age on succession as older farm managers more actively address the topic of farm succession (Glauben et al., 2004a; Kimhi and Nachlieli, 2001). Slovenian farms also have very deeply rooted traditional patterns regarding the timing of the farm transfer. It turned out that very often the farmers formally retain their farms in their own hands until their deaths, or that they transfer them only when their strength is giving out or they become ill and are no longer capable of running the farm (Kerbler, 2012).

Job opportunities are also related to the influence on farm household succession in the study area. While farming has a long tradition in most families, farmers think that there are better professional options for their children. Most parents still encourage their children towards farming, but some, specially educated and young farmers, aspire for higher education and different career paths for their children. A study of rice-producing villages in Indonesia did indeed find migration, especially connected to the pursuit of careers outside agriculture and higher education, to be an important factor influencing the future of local farms (White, 2015).

Children of higher educated farmers are more likely to obtain more education themselves and therefore choose a different career than farming (Bertoni and Cavvichioli, 2016). Aldanondo Ochoa et al. (2007) suggest that the social status of educated farmers is passed on to potential successors who therefore do not become farmers themselves. The negative influence of the children with non-agricultural jobs on farm household succession was further explained by farmers of in-depth interviews, who described the difficulties of being a farmer made them aspire for their child to follow a different career path than farming.

The farmland areas were also found to influence farm household succession significantly in the study area. It showed to increase the farmers' probability of having a successor although the farmland areas were extremely small. As mentioned in the result findings that most farmers with potential successors were in the category of non-productive age or getting older. It can be a reason for farmers in this study area to have a potential successor although they have a small farm size. These observations resemble a succession pattern described as "keeping the name on the farmland" by Lobley, et al. (2016), farmers have a great emotional attachment to their farms made them have a responsibility to provide an opportunity for keeping the existence of the farmland. The farmers often hope that their children will adopt professions outside of farming, however, they still feel an intense responsibility to keep the farm going in case their

children wish to succeed. Therefore, the inheritance system might affect farm succession processes in the study area.

The numbers of family laborers in farm households are also associated with higher chances of having a successor. According to Gasson and Errington (1993), a labor-hiring decision in farming is much more complicated in a reality, and probably more complicated than it is in most industries. Thus, the farmers will take into consideration of his decision. Where family labor is concerned, parallel considerations will apply. Indeed, one of the attractions of using family labor is the avoidance of transactions costs by internalizing the labor market.

However, the assessment of the marginal cost of family labor will now involve a complex computation that considers the wage or allowance paid to the children remaining at home as well the opportunity cost of the domestic resources they absorb. They tend to assume the farm household to be a single-decision-making utility-maximizing entity, thus side-stepping complex distributional and effort-sharing issues that arise as a result of power relationships within the household. Other studies by Rayasawath (2018) revealed the benefit of family members who engaged in agricultural occupations, which is that family laborers could help ensure succession in agricultural occupations.

5.1.3. Relationship between farm succession and farmers' motivation in rice farming

The factors related to the motivation of farmers in cabbage farming are internal and external factors. The factors found to have a significant and positive relationship with the famers' motivation to continue farming are farmers' education, number of children, side jobs, and encouragement by parents to be a farmer. In line with the study by Rahayu et al. (2018), formal education will make farmers become more advanced and open-minded in accepting and adapting the breakthrough of modern agricultural technology that facilitate the development of farming. Farmers in the study area stated to believe in the high importance of education, it is noticeable that the average on-site is still comparably low. Only few farmers achieved a high education level and keep continue to do the rice farming.

The number of children tends to increase the farmers' motivation in rice farming. It was also expected that the probability of succession should be higher with every additional child that lives on the farm. This result is also in line with the study by Glauben et al. (2004b) which mentioned that the number of farmers' children has a positive influence on farm succession. On the contrary, regarding the timing of succession, Kimhi and Nachlieli (2001) expect the number of children to delay the succession decision, as it generates competition among the

potential successors that hurts their bargaining position. However, this hypothesis cannot be supported for the farms surveyed as in this study area implementing the equal inheritance system.

Job opportunities besides farming are closely linked to farmers' motivation in rice farming. During the in-depth interviews, all respondents were questioned about typical or at least available professions for inhabitants in the study area. Indeed, all of them named farming as by far the most common job. Only when asked repeatedly, some farmers would mention such as the work in construction or as farm laborer is mostly pursued as a side occupation, next to cultivating own farmland. While most farmers who are currently in managing positions thought that there may be better professional options than farming for the next generation, they still stated farming to be a good job and to feel appreciated in their profession.

Even though respondents could not find strong arguments in choosing farming as a profession, many encouraged and expected their children to become farmers. During the survey, respondents even named their infants to become farm successors in the future. The certainty of parents for their children to become farmers even at a very early age may be caused by not only the lack of other professional options but also by the strong local tradition of the farm households. A strong farming tradition was confirmed not only by most interviewed farmers but also by the high numbers of generations farms were usually owned by the same family. Several farmers started to feel attached to their farm and wanted to pass it on to the next generation, which may influence succession decisions and farmers' motivation positively.

Inherited land status apparently has a negative influence on the farmers' motivation to continue farming. The size of a farm and the investment in it does motivate the farmers to continue farming, but clearly that if the inheritance land gets smaller, they may not survive in farming. It will also affect the future of farm household succession. This finding is also confirmed by several studies, which mentioned that the main reason the farmers' children do not take over farms is that they are too small.

5.2. Conclusions and recommendations

The high relevance of farm household succession in the context of agricultural socioeconomics is agreed on for several decades (Bohak et al., 2010) but is gaining even more topicality due to the worldwide aging of farmer communities and decreasing number of farms (Cassidy et al., 2019; Rigg et al., 2016; Zagata and Sutherland, 2015; Rayasawath, 2018). The aim of this study was to explore the farm succession practices, by conducting farm household

surveys and in-depth interviews with farmers in two villages representing farming systems in rural areas of Indonesia.

Indonesian farmers often ask how Indonesian agricultural sector will survive if younger people leave the sector. This study cannot directly answer this question, but it can at least explain which type of farm household is more likely to have a succession plan, and which is less likely. It was observed that farmers in the study area continue to have a potential successor. Farmers mentioned having one or more than one successor. It seems that farmers with a potential successor will show two types of succession pattern, in which the potential successors achieving their eventual status directly and indirectly. However, the main reason for farm successors to continue farming is the lack of other job opportunities, possibly perceived by the overall low education level.

Aspirations of educated and productive farmers for their children pursuing non-agricultural jobs may indicate a pending turning point leading to higher education levels and potentially lower succession rates among the next generations. Results also revealed that the type of farm households without a potential successor indicates farmers have remained unmarried and because potential successors might be too young. However, farmers believe that they will find and identify such a successor. Some farmers apparently hold out hope that they might identify a successor among their grandsons, relatives, or sons-in-law. The future's plan of these farmers indicates that the farmland will be returned to the landlord or to the government. Alternatively, it will be bestowed equally to children and non-family members. It also might be used for residence. The land tenancy system of sharecropping will be increasingly common as a fate of farmland in the future.

While the farmers have a potential successor in the study area, its process is also challenged by the local inheritance tradition of splitting the farmland between all children within the generational transfer. The dramatically shrinking farm sizes raise the question of whether farming can sustain the livelihoods of local farm households in the next generations or not. As this is one of the first studies to investigate farm households' succession in the cultural context of Yogyakarta Province, Indonesia, it opens several avenues of follow-up research.

Regarding farm households' succession *per se*, future work could focus on the generation of solutions for the land splitting problem. Alternatives to the current inheritance tradition could be created and with governmental support introduced to areas highly affected by shrinking land sizes. Broadening perspectives concerning job opportunities outside farming and supporting farmers to not fragment their land within the succession process may help to secure future profitability and sustainability of farm households in the study area.

In addition, sociodemographic, economic, and social influences on the likelihood of farm household succession were identified in this study. The findings revealed that farmer age, farmer children with non-agricultural jobs, farmland areas, and the number of family laborers were significantly influenced the farm household succession in an agricultural occupation. These are additionally strongly dependent on the specific characteristics of the villages, such as farming systems. Changes in those influential factors could be monitored to predict the impact on farm household succession. Awareness of how the factors influence farm households' succession could be useful for fine-tuning related governmental policies, allowing better forecasting of their outcomes. Securing the future of smallholder farms through adequate succession rates is fundamental to ensuring food security and the sustainability of farm households.

Furthermore, the relationship and factors affecting farmers' motivation to continue farming can be determined to assess the future farm succession. Overall, the rice farmers' motivation to continue farming must be categorized as moderate. Farmer education, number of children, side jobs, and encouragement by parents to be a farmer were found to have a significant and positive relationship with the famers' motivation to continue farming. While the inherited land status negatively influences the famers' motivation to continue farming. Attracting younger generation and inspiring high motivation for farming is necessary for successful farm succession. Further research must be conducted to ascertain inheritance system effects by bestowing the farmland equally during farm succession. Such extensions should be addressed in future research, possibly using the present framework as a starting point.

Because this study is conducted in only one region, the generalizability of the results of the present analysis is constrained. Furthermore, the questionnaire used for this study is based mainly on socioeconomic statements. Moreover, the farm household survey only reflects the perspective of current farm managers (farmers). Further research must be conducted in other regions or other provinces for a comparative case study of farm succession. It is expected that the variables of other types (e.g., successor characteristics, labor market, government support, family support, the motivation of young generation, the participation of young generation in agriculture, local custom, religion) might affect farm household succession. It might also be necessary to conclude more detailed policy suggestions for farm succession issues in Indonesia. In summary, the general conclusions of this study can be seen in Figure 5.2.

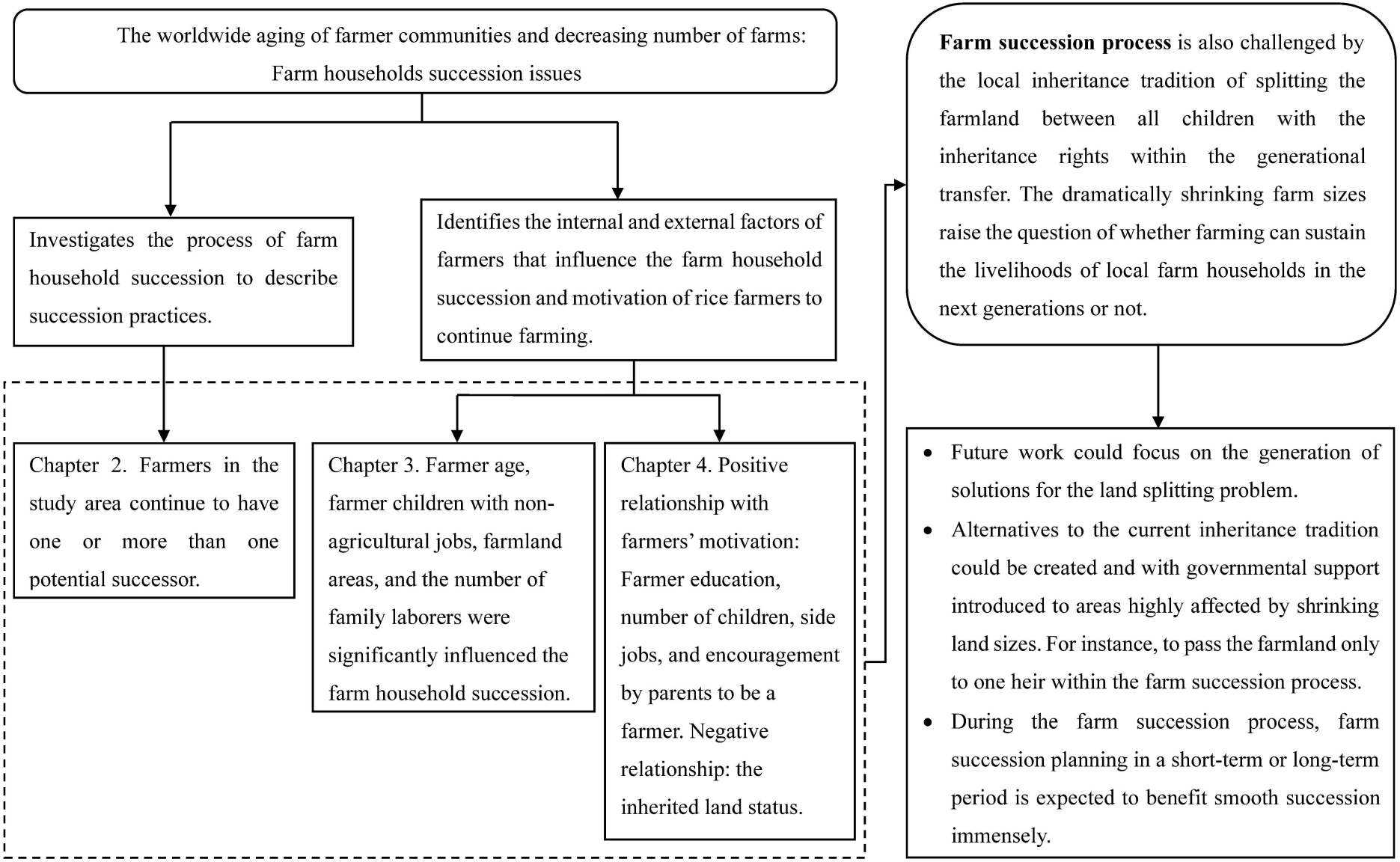

Figure 5.2 General conclusions of this study

ACKNOWLEDGEMENTS

First and foremost, praises and thanks to the God, the Almighty, the Lord of the Universe, the Beneficent, the Merciful, for the showers of blessing throughout my research work to complete the research successfully.

I would like to express my deep and sincere gratitude to my research supervisor, Prof. Wataru Ozawa (Yamagata University), for giving me the opportunity to do research and providing invaluable guidance throughout this research. His dynamism, vision, sincerity, and motivation have deeply inspired me. He has taught me the methodology to carry out the research and to present the research works as clearly as possible. It was a great privilege and honor to work and study under his guidance. I am extremely grateful for what he has offered me. I would also like to thank him for his friendship, empathy, and great sense of humor.

I would also like to thank my co-supervisor Prof. Rie Watanabe (Yamagata University) and Prof. Satoshi Yoshinaka (Hirosaki University) for their advice, discussion, encouragement, revisions, and ideas throughout this research. My sincere acknowledgement also for Dr. Aofei Chen (Yamagata University), always gives her best knowledge and insight during the discussion. I also extend my appreciation to Dr. Hiroyuki Yasue and Dr. Asato Mizuki from NARO Tohoku Agricultural Research Center, that have collaborated to the work presented here. Boundless gratitude is expressed to Prof. Tsuyoshi Sumita (Tohoku University), Dr. Jamhari and Dr. Alia Bihrajihant Raya (Gadjah Mada University), for their valuable advice and generous help during my field survey.

I am also deeply thankful to my respondents and the students from Gadjah Mada University, who helped me during my field survey. I want to acknowledge and appreciate their participation and kindness during my research. Their valuable information helped me complete this dissertation.

My study in this beautiful and enchanting country, Japan, would not have been possible without the financial support by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT). Also, for all staff of The United Graduate School of Agricultural Sciences, Iwate University and Faculty of Agriculture, Yamagata University for all their help, cooperation, and kindness.

My dear friends during my study in Yamagata University, Shafadila Astari, Tenagy, Valensi Kautsar, Tantriani, and all my international friends, thank you very much. For all Indonesian students, we are not only friends but we are a big family, thank you for the fun and the love. For all my laboratory members, particularly Ieki Onishi, who have made my study become a

memorable and enjoyable journey, I am truly grateful. Many thanks to Hideo-san and Hiroko-san (Kimura's family) for the valuable knowledge of Japanese agriculture and become my host family from the beginning of my life in Tsuruoka, Japan.

I am extremely grateful to my mother Agustina and my father Jan Seleky for their love, prayers, caring, and sacrifices for educating and preparing me for my future. Also, I express my thanks to my sister Natasya Mariana Seleky for her support and valuable prayers. Finally, I am very grateful to my dearest best friend Ikeyama Naoto, for the support and encouragement he provided me on this journey.

Last but not the least, I would like to thank all people who extended their help during the research work. Thank you so much for your support and valuable prayers.

Tsuruoka, December 13th, 2021

ROSALIA NATALIA SELEKY

REFERENCES

Abdullah, A. A., & Sulaiman, N. N. (2013). Factors that influence the interest of youths in agricultural entrepreneurship. *International Journal of Business and Social Science*, *4*(3), 288–302. www.ijbssnet.com.

Aditya, T., Maria-Unger, E., vd Berg, C., Bennett, R., Saers, P., Syahid, H. L., Erwan, D., Wits, T., Widjajanti, N., Santosa, P. B., Atunggal, D., Hanafi, I., & Sutejo, D. (2020). Participatory land administration in Indonesia: quality and usability assessment. *Land*, *9*(79), 1–27. https://doi.org/10.3390/land9030079.

Aldanondo Ochoa, A. M., Casanovas Oliva, V., & Almansa Sáez, C. (2007). Explaining farm succession: the impact of farm location and off-farm employment opportunities. *Journal of Agricultural Research*, *5*(2), 214–225.

Anandita, D. A., & Patria, K. Z. (2016). Agriculture challenges: Decline of farmers and farmland study from Indonesian family life survey. *JIEP*, *16*(1), 48–53.

Anwarudin, O., Sumardjo, S., Satria, A., & Fatchiya, A. (2018). A review on farmer regeneration and its determining factors in Indonesia. *International Journal of Progressive Sciences and Technologies (IJPSAT)*, *10*(2), 218–230. http://ijpsat.ijsht-journals.org.

Anwarudin, O., Sumardjo, S., Satria, A., & Fatchiya, A. (2019). Factors influencing the entrepreneurial capacity of young farmers for farmer succession. *International Journal of Innovative Technology and Exploring Engineering (IJITEE))*, *9*(1), 1008–1014. https://doi.org/10.35940/ijitee.A4611.119119.

Barlinti, Y. S. (2013). Inheritance legal system in Indonesia: A legal justice for people. *Indonesia Law Review*, *1*(3), 23–41.

Bertoni, D., & Cavicchioli, D. (2016). Farm succession, occupational choice, and farm adaptation at the rural-urban interface: The case of Italian horticultural farms. *Land Use Policy*, *57*, 739–748. https://doi.org/10.1016/j.landusepol.2016.07.002.

Bjarnason, T., & Thorlindsson, T. (2006). Should I stay or should I go? Migration expectations among youth in Icelandic fishing and farming communities. *Journal of Rural Studies*, *22*(3), 290–300. https://doi.org/10.1016/j.jrurstud.2005.09.004.

Blanc, M., & Perrier-Cornet, P. (1993). Farm transfer and farm entry in the European community. *Sociologia Ruralis*, *33*, 319–335.

Boehlje, M. D., & Eisgruber, L. M. (1972). Strategies for the creation and transfer of the farm estate. *American Journal of Agricultural Economics*, *54*, 461.

Bohak, Z., Borec, A., & Turk, J. (2010). An appraisal of family farm succession studies: a review. *Agricultura*, *7*, 9–13.

Cassidy, A., Srinivasan, S., & White, B. (2019). Generational transmission of smallholder farms in late capitalism. *Canadian Journal of Development Studies*, *40*(2), 220–237. https://doi.org/10.1080/02255189.2019.1592744.

Cavicchioli, D., Bertoni, D., Frisio, D. G., & Pretolani, R. (2019). Does the future of a farm depend on its neighborhood? Evidence on intra-family succession among fruit and vegetable farms in Italy. *Agricultural and Food Economics*, *7*(10), 1–17. https://doi.org/10.1186/s40100-019-0129-5.

Cavicchioli, D., Bertoni, D., & Pretolani, R. (2018). Farm succession at a crossroads: The interaction among farm characteristics, labor market conditions, and gender and birth order effects. *Journal of Rural Studies*, *61*, 73–83.

Central Bureau of Statistic Indonesia (CBS). (2013). *Agricultural Census 2013*.

Chiswell, H. M. (2014). The importance of next generation farmers: A conceptual framework to bring the potential successor into focus. *Geography Compass*, *8*(5), 300–312. https://doi.org/10.1111/gec3.12131/abstract.

Errington, A. (1998). The intergenerational transfer of managerial control in the farm-family business: A comparative study of England, France, and Canada. *The Journal of Agricultural Education and Extension*, *5*(2), 123–136.

Fennell, R. (1981). Farm succession in the European community. *Sociologia Ruralis*, *21*, 19–42.

Firman, A., Budimulati, L., Paturochman, M., & Munandar, M. (2018). Succession models on smallholder dairy farms in Indonesia. *Livestock Research for Rural Development*, *30*(10), 176. https://www.researchgate.net/publication/330041872.

Firman, A., Paturochman, M., Budimulyati, S. L., Hadiana, M. H., Tasripin, D., Suwartapradja, O. S., & Munandar, M. (2019). Sucession decisions in Indonesia family dairy farm business. *Livestock Research for Rural Development*, *31*(9), 136.

Foguesatto, C. R., Mores, G. de V., Kruger, S. D., & Costa, C. (2020). Will I have a potential successor? Factors influencing family farming succession in Brazil. *Land Use Policy*, *97*, 1–6. https://doi.org/10.1016/j.landusepol.2020.104643.

Food and Agriculture Organization of the United Nations (FAO). (2017, August). Country Fact Sheet on Food and Agriculture Policy Trends. *Food and Agriculture Policy Decision Analysis, (FAPDA), Indonesia*, 1–6.

Garner, E., & de La O Campos, A. P. (2014). Identifying the "family farm" An informal discussion of the concepts and definitions. *ESA Working Paper*, No. 14-10. www.fao.org/economic/esa.

Gasson, R., & Errington, A. (1993). *The Farm Family Business*. CAB International.

Glauben, T., Tietje, H., & Vogel, S. (2004a). The transfer of family businesses in Northern Germany and Austria. *FE Working Paper No. 0405, Kiel University, Department of Food Economics and Consumption Studies, Kiel*, 1–14.

Glauben, T., Tietje, H., & Weiss, C. R. (2004b). Intergenerational Succession in Farm Households: Evidence from Upper Austria. *Review of Economics of the Household*, *2*, 443–461.

Guither, H. D. (1963). Factors influencing farm operators' decisions to leave farming. *Am. J. Agri. Econ.*, *45*, 567–576. http://ajae.oxfordjournals.org.

Hennessy, T. C., & Rehman, T. (2007). An investigation into factors affecting the occupational choices of nominated farm heirs in Ireland. *Journal of Agricultural Economics*, *58*(1), 61–75.

Inwood, S., & Sharp, J. S. (2009). Succession and enterprise adaptation at the rural urban. *Social Responsibility Initiative Topical Report 09-03. Department of Human and Community Resource Development. the Ohio State University*, 1–4.

Iwamoto, I. (2006). Family farm issues in the new farm policy. *Japanese Journal of Farm Management*, *127*, 17–25.

Iwamoto, N., & Hartono, S. (2009). *Economic Structure and Social Institutions in Rural Java* (N. Iwamoto & S. Hartono, Eds.). Gadjah Mada University Press.

Jamal, E., & Dewi, Y. A. (2009). Technical efficiency of land tenure contracts in West Java Province, Indonesia. *Asian Journal of Agriculture and Development*, *6*(2), 21–33. https://www.researchgate.net/publication/238597980.

Joosse, S., & Grubbström, A. (2017). Continuity in farming - Not just family business. *Journal of Rural Studies*, *50*(2017), 198–208. https://doi.org/10.1016/j.jrurstud.2016.11.018.

Katchova, A. L., & Ahearn, M. (2014). Farmland ownership and leasing: Implications for young and beginning farmers. *Agricultural Economic Staff Paper* (486).

Kauffman, N. S. (2013). Credit markets and land ownership for young and beginning farmers. *The Magazine of Food, Farm, and Resource Issues*, *28*(2), 1–5. http://www.choicesmagazine.org.

Kerbler, B. (2003). A conception of developmental typology of mountain farms: A case study of the municipality Ribnica na Pohorju. *Acta Geographica Slovenica*, *43*(2), 87–120. https://doi.org/10.3986/AGS43203.

Kerbler, B. (2012). Factors affecting farm succession: The case of Slovenia. *Agricultural Economics*, *58*(6), 285–298. https://doi.org/10.1080/21513732.2017.1315742.

Kimhi, A. (1994). Optimal timing of farm transferal from parent to child. *American Journal of Agricultural Economics*, *76*, 228–236. http://ajae.oxfordjournals.org.

Kimhi, A., & Bollman, R. (1999). Family farm dynamics in Canada and Israel: The case of farm exits. *Agricultural Economics*, *21*(1), 69–79. https://doi.org/10.1016/S0169-5150(99)00015-8.

Kimhi, A., & Nachlieli, N. (2001). Intergenerational succession on Israeli family farms. *Journal of Agricultural Economics*, *52*(2), 42–58.

Kliebenstein, J. B., Heffernan, W. D., Barrett, D. A., & Kirtley, C. L. (1981). Economic and sociologic motivational factors in farming. *Journal of American Society of Farm Managers and Rural Appraisers (ASFMRA)*, *45*(1), 10–14.

Kwanmuang, K. (2011). Succession decisions on family farms in Nakhon Si Thammarat Province, Thailand. *Journal of Development in Sustainable Agriculture*, *6*, 181–188.

Lanya, I., Subadiyasa, N. N., Sardiana, K., & Ratna Adi, G. P. (2017). Transfer function control strategy of Subak rice field land and agricultural development in Denpasar city. *IOP Conference Series: Earth and Environmental Science 54*, *54*(1), 1–10. https://doi.org/10.1088/1755-1315/54/1/012004.

Lehberger, M., & Hirschauer, N. (2016). Recruitment problems and the shortage of junior corporate farm managers in Germany: the role of gender-specific assessments and life aspirations. *Agriculture and Human Values*, *33*(3), 611–624.

Leibert, T. (2016). She leaves, he stays? Sex-selective migration in rural East Germany. *Journal of Rural Studies*, *43*, 267–279. https://doi.org/10.1016/j.jrurstud.2015.06.004

Leonard, B., Kinsella, A., O'Donoghue, C., Farrell, M., & Mahon, M. (2017). Policy drivers of farm succession and inheritance. *Land Use Policy*, *61*, 147–159. https://doi.org/10.1016/j.landusepol.2016.09.006.

Lobley, M., Baker, J. R., & Whitehead, I. (2010). Farm succession and retirement: Some international comparisons. *Journal of Agriculture, Food Systems, and Community Development*, *1*(1), 49–64.

Lobley, M., Baker, J. R., & Whitehead, I. (2016). *Keeping It in the Family: International Perspectives on Sucession and Retirement on Family Farm*. Routledge.

Maican, S. Ștefania, Muntean, A. C., Paștiu, C. A., Stępień, S., Polcyn, J., Dobra, I. B., Dârja, M., & Moisă, C. O. (2021). Motivational factors, job satisfaction, and economic performance in Romanian small farms. *Sustainability (Switzerland)*, *13*, 1–23. https://doi.org/10.3390/su13115832.

May, D., Arancibia, S., Behrendt, K., & Adams, J. (2019). Preventing young farmers from leaving the farm: Investigating the effectiveness of the young farmer payment using a behavioural approach. *Land Use Policy*, *82*, 317–327.

Ministry of Agriculture. (2011). *Strategic Plan of the Ministry of Agriculture, 2009-2014* (Revised Edition). The Ministry of Agriculture.

Mishra, A. K., & El-Osta, H. S. (2008). Effect of agricultural policy on succession decisions of farm households. *Review of Economics of the Household*, *6*, 285–307. https://doi.org/10.1007/s11150-008-9032-7.

Morais, M., Borges, J. A. R., & Binotto, E. (2018). Using the reasoned action approach to understand Brazilian successors' intention to take over the farm. *Land Use Policy*, *71*, 445–452. https://doi.org/10.1016/j.landusepol.2017.11.002.

Nurlaela, S. (2021). The Motivation of young chili farmers in sandy land of Special Region of Yogyakarta, Indonesia. *E3S Web of Conferences*, *232*, 1–7.

Olson, K. D. (2011). *Economic of Farm Management in a Global Setting. Department of Applied Economics. College of Food, Agriculture, and Natural Resource Sciences.* University of Minnesota, United States of America: John Wiley and Sons.

Organization for Economic Cooperation and Development (OECD). (2012). *Review of Agricultural Policies: Indonesia 2012*. OECD Publishing.

Otomo, Y., & Oedl-Wieser, T. (2009). Comparative analysis of patterns in farm succession in Austria and Japan from a gender perspective. *Journal of the Austrian Society of Agricultural Economics*, *18*(2), 79–92.

Pamungkaslara, S. B., & Rijanta, R. (2017). Regenerasi petani tanaman pangan di daerah perkotaan dan perdesaan Kabupaten Grobogan. *Jurnal Bumi Indonesia*, *6*(3).

Pasaribu, S. M., Saliem, H. P., Soeparno, H., Pasandaran, E., & Kasryno, F. (2011). *Land Conversion and Fragmentation: Threats to Food Self-sufficiency*. Badan Litbang Pertanian.

Potter, C., & Lobley, M. (1992). Ageing and succession on family farms: The impact on decision-making and land use. *Sociologia Ruralis*, *32*, 317–334.

Rahayu, L., Indiardi, & Apina, N. (2018). Motivation of farmers in cabbage farming in Central Java, Indonesia. *Advances in Engineering Research, Fourth International Conference on Food Agriculture Resources*, *172*, 20–25.

Ram, K. A., Tsunekawa, A., Sahad, D. K., & Miyazaki, T. (1999). Subdivision and fragmentation of land holdings and their implication in desertification in the Thar Desert, India. *Journal of Arid Environments*, *41*, 463–477. http://www.idealibrary.comon.

Rayasawath, C. (2018). Factors affecting the household succession in agricultural occupation in Nakhon Ratchasima Province, Thailand. *Journal of Agriculture*, *8*(7), 109–123. https://doi.org/10.3390/agriculture8070109.

Resosudarmo, I. A. P., Tacconi, L., Sloan, S., Hamdani, F. A. U., Subarudi, Alviya, I., & Muttaqin, M. Z. (2019). Indonesia's land reform: Implications for local livelihoods and climate change. *Forest Policy and Economics*, *108*, 1–14.

Rigg, J. (2020). *Rural Development in Southeast Asia: Dispossesion, Accumulation and Persistence*. Cambridge University Press.

Rigg, J., Salamanca, A., & Thompson, E. C. (2016). The puzzle of East and Southeast Asia's persistent smallholder. *Journal of Rural Studies*, *43*, 118–133.

Rondhi, M., Pratiwi, P. A., Handini, V. T., Sunartomo, A. F., & Budiman, S. A. (2018). Agricultural land conversion, land economic value, and sustainable agriculture: a case study in East Java, Indonesia. *Land*, *7*(148), 1–19. https://doi.org/10.3390/land7040148.

Rotgé, V. L. (2018). *Rural-Urban Integration in Java: Consequences for Regional Development and Employment*. Routledge.

Sato, S. (1991). Family farms in transition and development of group farming in Japan. *Japanese Journal of Farm Management*, *29*(3), 57–65.

Schneider, B., & Alderfer, C. P. (1973). Three studies of measures of need satisfaction in organizations. *Administrative Science Quarterly*, *18*(4), 489–505.

Soemardjan, S. (1962). Land reform in Indonesia. *Asian Survey*, *1*(12), 23–30.

Stanton, B. F. (1978). Perspective on farm size. *Am. J. Agri. Econ.*, *60*, 727–737. http://ajae.oxfordjournals.org.

Stiglbauer, A. M., & Weiss, C. R. (2000). Family and non-family succession in the Upper-Austrian farm sector. *Working Paper EWP 0008, Department of Food Economics and Consumption Studies, Kiel*, 1–25. http://www.uni-kiel.de/foodecon/ern-wirt.htm.

Suess-Reyes, J., & Fuetsch, E. (2016). The future of family farming: A literature review on innovative, sustainable, and succession-oriented strategies. *Journal of Rural Studies*, *47*, 117–140. https://doi.org/10.1016/j.jrurstud.2016.07.008.

Suryana, A., & Hermanto. (2016). *Toward a Resilience Food and Nutrition Security in Indonesia*. IAARD Press.

Suryantini, A. (2002). Optimal Cropping Pattern in Java Island, Indonesia: An application of linear programming for a case study in Yogyakarta Province. *Japanese Journal of Farm Management*, *40*(2), 124–127.

Susilowati, S. H. (2016). Farmers aging phenomenon and reduction in young labor: Its implication for agricultural development. *Forum Penelitian Agro Ekonomi*, *34*(1), 35–55. https://doi.org/0216 – 4361.

Syahyuti. (2011). De-land-reform as the indications of anti-land reform in Indonesia: Characters, causes, and measures. *Forum Penelitian Agro Ekonomi*, *29*(2), 67–81. http://ejurnal.litbang.pertanian.go.id/index.php/fae/article/view/3892.

Syahyuti, B. (2015). Farmland and policy for young generation in Indonesia. *Food and Fertilizer Technology Center*, 1–14.

Syuaib, M. F. (2016). Sustainable agriculture in Indonesia: Facts and challenges to keep growing in harmony with environment. *Agricultural Engineering International: The CIGR Journal*, *18*(2), 170–184. https://doi.org/10.1002/ecy.1521.

Toulmin, C., & Guèye, B. (2003). Transformations in West African agriculture and the role of family farms. *Issue Paper* (No. 123).

Uchiyama, T. (2014). Recent trends in young people's entry into farming in Japan: An international perspective. *FFTC Agricultural Policy Article. The FFTC-RDA International Seminar on Enhanced Entry of Young Generation into Farming*, 1–14.

Uchiyama, T., Lobley, M., Errington, A., & Yanagimura, S. (2008). Dimensions of intergenerational farm business transfers in Canada, England, the USA, and Japan. *Japanese Jounal of Rural Economics*, *10*, 33–48.

Utrecht, E. (1969). Land reform in Indonesia. *Bulletin of Indonesian Economic Studies*, *5*(3), 71–88. https://doi.org/10.1080/00074916912331331482.

Väre, M. (2006). Spousal effect and timing of retirement. *Journal of Agricultural Economics*, *57*(1), 65–80.

White, B. (2012). Agriculture and the generation problem: rural youth, employment, and the future of farming. *IDS Bulletin*, *43*(6), 9–19.

White, B. (2015). Generational dynamics in agriculture: Reflections on rural youth and farming futures. *Cahiers Agricultures*, *24*(6), 330–334. https://doi.org/10.1684/agr.2015.0787.

Wilcox, W. W. (1932). The human factor from the viewpoint of farm management. *Am. J. Agri. Econ.*, *14*, 119–127.

World Bank. (2003). *Land Policies for Growth and Poverty Reduction: A World Bank Policy Research Report*. The World Bank.

Yang, C.-L., Hwang, M., & Chen, Y.-C. (2011). An empirical study of the existence, relatedness, and growth (ERG) theory in consumer's selection of mobile value-added services. *African Journal of Business Management*, *5*(19), 7885–7898.

Zagata, L., & Sutherland, L. A. (2015). Deconstructing the "young farmer problem in Europe": Towards a research agenda. *Journal of Rural Studies*, *38*, 39–51. https://doi.org/10.1016/j.jrurstud.2015.01.003.

Zou, B., Mishra, A. K., & Luo, B. (2018). Aging population, farm succession, and farmland usage: Evidence from rural China. *Land Use Policy*, *77*, 437–445. https://doi.org/10.1016/j.landusepol.2018.06.001.

APPENDICES 1

Questionnaire A (For farmer)

Name of Respondent：_____ **Number of samples: _____**

I. Family's background

1. Address
   A. RT/RW (Number of neighborhood association):
   B. Hamlet:
   C. Village:
   D. Sub-district:

2. Please write the information of the farm household in the table below.

Personal data of farm households

No	Status in family	Name	Marital status M/N (year)	F/M	Age	T/S	Education level I/G (Grade)	Occupation		Income		Helping family's financial	Involved or not in farming operation (Day/working hours)
								Main Job	Side Job	Main Job	Side Job		
1	HH											① Yes · ② No	
2												① Yes · ② No	
3												① Yes · ② No	
4												① Yes · ② No	
5												① Yes · ② No	
6												① Yes · ② No	
7												① Yes · ② No	

Notes: Marital status: M (Married)/N (Not yet); Gender: F (Female)/M (Male); Residence form: T (Living together)/S (Separated)

3. After married, when was your first child born? _____

4. Do you receive financial aid from the members who are not living together with you? **Yes/No** (If yes, please write the information in this table)

No	Status in family	Age	Occupation	% Helping the financial family
1				
2				
3				
4				
5				

5. Are you a member of farmers organization (For example: Farmer Group)?

① Yes If Yes, please describe it _____

① No (For example: how many years become the member)

6. Do you have any experience in agriculture before?

① Yes, I had some experience in helping the family in the agriculture

② No, never had experience in helping the family in the agriculture

7. If you ever had an off-farm job for main job/side job, what are the skills that you experienced from off-farm job?

	Skill	Rank
a.	Communication with people	
b.	Negotiation with people	
c.	The ability to solve the problems	
d.	The ability to think about a strategy	
e.	Marketing management	
f.	Others ( )	

8. How long have you been a food crops farmer (rice farmer)?

Approximately _____ years.

9. Do you ever consider farming as an occupation? **Yes / No**

Reason: _____

10. When did you start to learn how to farm?

a.	Before graduate from senior high school	
b.	During senior high school and at the time of graduation	
c.	During college and at the time of graduation	
d.	During working (off farm; industry, company, etc.)	
e.	After retire from off farm job (industry, company, etc.)	
f.	Others ( )	

11. House condition

A. Land ownership (house/building)	① One's own ② Inheritance (belong to family) ③ Rented ④ Subsidy a. From Government b. From others
B. Land size	m^2
C. Building area	m^2

II. Asset / Resources

1. Land

A. Rice farming

	Early period	Present
A1. Land ownership	① One's own ② Inheritance land ③ Rented land ④ Share land ⑤ Subsidy a. From Government b. From others	① One's own ② Inheritance land ③ Rented land ④ Share land ⑤ Subsidy a. From Government b. From others
A2. Land size (Ha)		
A3. Amount of land (Block)		

A4. Distance

Land's block	Distance from house (km)		Distance from main road or market (km)	
	Early period	Present	Early period	Present
1				
2				
3				
4				
5				

B. Horticulture farming

	Early period	Present
A1. Land ownership	① One's own ② Inheritance land ③ Rented land ④ Share land ⑤ Subsidy a. From Government b. From others	① One's own ② Inheritance land ③ Rented land ④ Share land ⑤ Subsidy a. From Government b. From others
A2. Land size (Ha)		
A3. Amount of land (Block)		

A4. Distance				
Land's block	Distance from house (km)		Distance from main road or market (km)	
	Early period	Present	Early period	Present
1				
2				
3				
4				
5				

C. Other Land

	Early period	Present
B1. Land ownership	① One's own ② Inheritance land ③ Rented land ④ Share land ⑤ Subsidy a. From Government b. From others	① One's own ② Inheritance land ③ Rented land ④ Share land ⑤ Subsidy a. From Government b. From others
B2. Land size (Ha)		

Land use	B3. Land size (Ha)		B4. Commodity/product	
	Early period	Present	Early period	Present
① Field				
② Pond				
③ Livestock				
④ Shop				
⑤ Others ( )				
⑥ Others ( )				

Please describe in detail how did you get access to the farmland:

① Rice farming:

② Horticulture farming:

③ Other land:

2. Labor in Rice and Horticulture Farming

A. Total of labor: _____ person

B. Labor's composition

B1. Family member

No	a) Gender ① Male ② Female	b) Status in family ① Husband/Wife ② Parents ③ Children ④ Siblings ⑤ Family-in-law ⑥ Grandchild ⑦ Uncle/aunt ⑧ Cousins ⑨ Nephew ⑩ Others (_____)	c) Status of labor ① Full-time – Be paid ② Full-time – Not paid ③ Part-time – Be paid ④ Part-time – Not paid (If the answer is ① and ③, please continue to Q. d)	d)Payment method ① Daily ② Weekly ③ Monthly ④ Annual ⑤ Others (_____) ∑people x time of works x wage per person
1				
2				
3				
4				
5				
6				

B2. Non-Family member

a) Age category and gender	b) Total of labor (person)	c) Relationship (Neighbor, friend, etc.)	d) Status of labor ① Full-time – Be paid ② Full-time – Not paid ③ Part-time – Be paid ④ Part-time – Not paid (If the answer is ① and ③, please continue to Q. e)	e) Payment method ① Daily ② Weekly ③ Monthly ④ Annual ⑤ Others (_____) ∑people x time of works x wage per person
Male (7-12 y/o)				
Female (7-12 y/o)				
Male (13-20 y/o)				
Female (13-20 y/o)				
Male (21-65 y/o)				
Female (21-65 y/o)				

3. Farming operation

No	Item	Total unit	Year of purchase	Purchase / Rented price (Rupiah per Unit)
BUILDING				
1	Granary/warehouse			
2	Shop			
3				
4				
5				
TOOLS				
1	Hoe			
2				
3				
MACHINE				
1	Hand tractor			
2	Tractor			
3	Transplanting machine			
4	Harvesting machine			
5	Threshing machine			
6	Rice Mill Unit			
7	Truck/Pick-up			

4. Please write the amount of production of last year in this table below.

No	Commodity	Total amount of product (ton/year)	
		Unit	Yield (ton/year)
1	Paddy		
2			
3			
4			
5			
6			

A. Total of production cost: Rp _____

A1. Seed: Rp _____

A2. Fertilizer: Rp _____

A3. Irrigation: Rp _____

A4. Tax: Rp _____

A5. Other cost: Rp _____

5. Livestock production

No	Livestock	Ownership (S: one's own, B: belong together)	The initial value (one year ago) Rp (1)	Present value Rp (2)	Livestock production		
					Increasing of value (2-1)	Sales revenue Rp	Egg, milk, etc. Rp
1							
2							
3							
4							
5							

6. Marketing management

1. Do you sell your product after the harvesting season?

(If the answer is in the option of ①～②, please continue to Q2)

① Yes, I sell it all

② Yes, I sell half of it

③ No, I do not sell it all

2. Please write down your target market with the amount of production (ton/year)

Commodities		Quantity [Q] (kg/year) & Price [P] (Rp/kg) in each target market										
		Middleman		Cooperatives		Market		Consumer		Others ( )		Total
		Q	P	Q	P	Q	P	Q	P	Q	P	
1	Paddy											
2												
3												
4												
5												
6												

3. Who is become a price maker of your product?

① Farmer ④ Government

② Farmers group ⑤ Others: _____

③ The buyer

4. In your opinion, is it difficult to sell your product?

① Yes (If yes, please continue to Q4A)

4A. What are the factors that make you have difficulties to sell your product?

(Circle the causative factors and write the rank of it)

a	Do not know the target market	
b	The price market is so high	
c	The demand is so small	
d	The price market is fluctuating	
e	Others:	

② No

Notes:

III. Motivation to be a farmer and On-Farm Training

1. Please write down your motivation to be a farmer

(1 = Strongly disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, and 5 = Strongly agree).

Variable		**Rice farming**	**Horticulture farming**
Interest to agriculture before becoming a farmer	Interested		
	Not interested		
Reasons to be a farmer	Encouraged by parents		
	Own will		
	No other jobs		
	Others ( )		
Knowledge resources	Taught by parents		
	Self-taught/Autodidact		
Decision to be a farmer	Own will		
	Parents		
	Environment		

2. Do you want your child to be a farmer? **Yes / No**

Reason:

_____

3. Do you want to keep engaging in farming or not in the future? **Yes / No**
   Reason:

   _____

4. Do you want to extend your farm size in the future? **Yes / No, if yes then** how will you do that?
   Reason:

   _____

5. What are the benefits of doing rice farming/horticulture farming?

   _____

6. Please describe when did you start to have On-Farm Training? What kind of On-Farm Training did you have? Who is the trainer?

   a. Farming operations
      (Trainer: parents/siblings/relatives/neighbor/farmer groups/self-taught/extension worker/agriculture school/agriculture company/others_____)
   b. Accounting
      (Trainer: parents/siblings/relatives/neighbor/farmer groups/self-taught/extension worker/agriculture school/agriculture company/others_____)
   c. Decision making
      (Trainer: parents/siblings/relatives/neighbor/farmer groups/self-taught/extension worker/agriculture school/agriculture company/others_____)
   d. Others (_____)
      (Trainer: parents/siblings/relatives/neighbor/farmer groups/self-taught/extension worker/agriculture school/agriculture company/others_____)

8. Please write down your motivation to keep the farmland and keep being a farmer (0 = Never, 1 = Rarely want, 2 = Undecided, 3 = Want, and 4 = Very want).

Variable		Score
Existence	Wanted to meet the material needs such as foods	0 1 2 3 4
	Wanted to meet the material needs such as cloths	0 1 2 3 4
	Wanted to meet the material needs such as shelters	0 1 2 3 4
	Wanted to be guaranteed about future life	0 1 2 3 4
	Wanted to have a guaranteed income faces the risk of failure of other businesses	0 1 2 3 4
	Wanted to meet the savings	0 1 2 3 4
	Wanted to get the good social status from the society	0 1 2 3 4
Relatedness	Wanted to have many farmer friends	0 1 2 3 4
	Wanted to have a good relationship with farmers	0 1 2 3 4
	Wanted to cooperate with other farmers	0 1 2 3 4
	Wanted to have a good relationship with extension worker	0 1 2 3 4
	Wanted to have a good relationship with the traders	0 1 2 3 4
	Wanted to have a good relationship with the researchers	0 1 2 3 4
	Wanted to build a relationship with the related institution	0 1 2 3 4
Growth	Wanted to increase the income's family	0 1 2 3 4
	Wanted to improve the experience and skills in agribusiness	0 1 2 3 4
	Wanted to improve the knowledges in agribusiness	0 1 2 3 4
	Wanted to increase the farming scale	0 1 2 3 4
	Wanted to improve and develop agricultural innovation and new technology	0 1 2 3 4
	Wanted to get an award for on own idea	0 1 2 3 4
	Wanted to be respected by other farmers	0 1 2 3 4

Questionnaire B (For farmer)

I. Farm Succession

1. Do you think that it is important to have a successor?
   - ① Very unimportant
   - ② Unimportant
   - ③ Neutral
   - ④ Important
   - ⑤ Very important

   Reason: _____

2. In the past, when and why did you become a successor?

   Reason: _____

3. Do you have a successor for your farm? **Yes/No**
   a. If answer yes, the reason why I want a successor is _____
   b. If answer no, the reason is _____

4. Who is the successor for your farm in the future?
   a. Child (Son/Daughter), Reason: _____

      Please specify, is it first son/ second son/ third son, etc. or first daughter/ second daughter/ third daughter, etc. and the reason:

      _____

   b. Son in law, Reason: _____
   c. Relatives (_____), Reason: _____
   d. Others, please specify _____

5. If you have a successor, is your successor's education related to the agricultural field?

   Yes / No, Reason: _____

6. If you have a successor, do you work together in the farmland with your successor? **Yes/No**

   Work sharing system

   Farmer: rice farming _____%; horticulture farming _____%

   Please write down ✕ or ○ on the table below.

1. The farmer has his/her own labor force for their land, and so does the successor	
2. The successor's role also as a labor force and paid by the farmer	
3. The successor also taking part of the responsibility for the land (responsibility is shared)	
4. The farmer and successor have their own machines and tools	
5. The farmer and successor living together, but the revenue and the cost are distinguished	
6. The farmer and successor have a completely different management	

7. What is your solution if you do not have a successor?

Questionnaire C (For successor)

Name of Successor: _____ Number of samples: _____

I. Motivation to be a farmer

1. Please write down your motivation to be a farmer

   (1 = Strongly disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, and 5 = Strongly agree)

Variable		Rice farming	Horticulture farming
Interest to agriculture before becoming a farmer	Interested		
	Not interested		
Ambition to be a farmer	Have ambition		
	Never have		
Desire to be a farmer	Want to be a farmer		
	Never want		
Taught by parents	Yes		
	No		
Opinion about agricultural condition in present	Apprehensive		
	Ordinary		
	Boast		
Importance of young farmers	Important		
	Not important		
Believe that being a farmer is profitable	Yes		
	No		
Be motivated in running business	Yes		
	No		
Believe that this field has good future	Yes		
	No		

II. Successor's opinion about agricultural occupation

1. Do you ever consider farming as an occupation? **Yes/No**

   Reason: _____

2. Since when are you become a successor and why?

   Reason: _____

3. Do you want your child to be a farmer? **Yes / No**

   Reason: _____

4. Do you want to keep engaging in farming or not in the future? **Yes / No**

   Reason: _____

5. Do you want to extend your farm size in the future? **Yes / No**

   Reason: _____

6. Satisfaction to be a farmer

   (1 = Strongly disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, and 5 = Strongly agree)

Satisfaction	**Rice farming**	**Horticulture farming**
Free to make decisions		
Free to manage own business		
Free to manage work time		
Sharing of profit with family		
Offer employment to others		
Others:		

7. Do you work together in the farmland with your parents (father/mother)? **Yes/No**

   Work sharing system

   Successor: rice farming _____%; horticulture farming _____%

   Please write down ✕ or ○ on the table below.

1. The farmer has his/her own labor force for their land, and so does the successor	
2. The successor's role also as a labor force and paid by the farmer	
3. The successor also taking part of the responsibility for the land (responsibility is shared)	
4. The farmer and successor have their own machines and tools	
5. The farmer and successor living together, but the revenue and the cost are distinguished	
6. The farmer and successor have a completely different management	

8. What are the benefits of doing rice farming/horticulture farming?

9. Please describe when did you start to have On-Farm Training? What kind of On-Farm Training did you have? Who is the trainer?

a. Farming operations

(Trainer: parents/siblings/relatives/neighbor/farmer groups/self-taught/extension worker/agriculture school/agriculture company/others_____)

b. Accounting

(Trainer: parents/siblings/relatives/neighbor/farmer groups/self-taught/extension worker/agriculture school/agriculture company/others_____)

c. Decision making

(Trainer: parents/siblings/relatives/neighbor/farmer groups/self-taught/extension worker/agriculture school/agriculture company/others_____)

e. Others (_____)

(Trainer: parents/siblings/relatives/neighbor/farmer groups/self-taught/extension worker/agriculture school/agriculture company/others_____)

10. Are you a member of farmers organization (For example: Farmer Group)?

① Yes If Yes, please describe it _____

② No (For example: how many years become the member)

Questionnaire D (For farmer)

I. Management of Rice and Horticulture Farming

A. Management of Administration and Planning

1. Do you have farm record? **Yes/No**

2. Are you doing bookkeeping for your farming? **Yes/No**

3. Do you have a farming business plan?

(If the answer is in the option of ①～③, please continue to Q3A)

① I have a short-term farming business plan (for one year)

② I have a medium-term farming business plan (for 2-5 years later)

③ I have a long-term farming business plan (for more than 5 years later)

④ I do not have a farming business plan at all

4. Did you ever receive a subsidy for developing your farm business? **Yes/No**

(If yes, please continue to Q4A and Q4B)

4A. Who is giving you that subsidy?

① Central Government (Program's name: _____)

② Local Government (Program's name: _____)

③ Research Institution (Name: _____)

④ Community Organization / NPO (Name: _____)

⑤ Others (_____)

4B. What kind of subsidies that you received?

① Money (Amount: _____)

② Tools/machine (_____)

③ Seminar/Training (_____)

④ Others (_____)

B. Production management

1. Based on your opinion, how is the condition of rice and horticulture product in general? Please describe the background of it.

   ① Stay in the same cycle and the amount of production is relatively the same

   ② Stay in the same cycle but the amount of production is different

   (If the answer is option ②, how do you think the amount of production in recent 5 years?

   a. Increase b. Decrease c. Not stable

   ③ In the different cycle every year but the amount of production is relatively the same

   ④ Different cycle and different the amount of production every year

   Reason / The background of condition:

2. Capital resources

   A1. How much the cost to start rice farming? Rp_____

   A2. How much the cost to start horticulture farming? Rp_____

   B. Please write the capital resources percentage of the cost above.

Capital resources (%)	Rice farming	Horticulture farming
1. Personal funds		
2. Bank credit		
3. Others① ( )		
4. Others② ( )		
5. Others③ ( )		

3. Production Cost

Code	Type of cost	Unit	Cost Per Unit	Total Cost Per Year
Variable cost				
A. Seed		Amount (kg, pack, etc.)	Price/kg	Total/Year
1	Seed of rice			
2	Seed 1 ( )			
3	Seed 2 ( )			
4	Seed 3 ( )			
5	Seed 4 ( )			
B. Fertilizer/Pesticide/Herbicide		Amount (kg, l, etc.)	Price/kg	Total/Year
1	Urea			
2	SP-36			
3	Potassium			
4	Compost			
5	Pesticide ( )			
6	Herbicide ( )			
7				
C. Tools/Building/Machine/Animal labor		Cost/Day	Cost/Month	Cost/Year
1	Rent the granary/warehouse			
2	Rent the transportation			
3	Rent the tools			
4	Tractor			
5	Rice Mill Unit			
7				
E. Packaging Cost		Cost/Week	Cost/Month	Cost/Year
1	Packaging cost (plastic, etc.)			
2	Label / Sticker			
3	Box			
Fixed cost				
A. Land			Cost/Month	Cost/Year
1	Rented farmland			
2	Others rented land			
3				
B. Tax				Cost/Year
1	Land tax			
2	Building tax			
C. Interest			Cost/Month	Cost/Year
1	Loan interest			
2				

II. Open Questions

1. When you are being a farmer, have you ever had some problems below and how to solve it?
   a. Capital & Technology (Agricultural machine, farmland)
      Problems:
      Solution:
   b. Cultivation & Harvesting（For example: the yield was not optimal, plant diseases, etc.）
      Problems:
      Solution:
   c. Marketing（Price fixing, consumer satisfaction, price fluctuating, etc.）
      Problems:
      Solution:
   d. Others
      Problems:
      Solution:

2. If you think that your farmland size is too small, would you like to gather the farmland with other farmers to extend the farmland? What is the role of a farmer group/extension worker in order to extend your farmland? Please describe the benefit of farmer group for your farm.

   Land extension:

   Extension worker:

   Farmer group:

3. In your opinion, what kind of policies that you wish from the Government? Please give an example for the program that you wish from the Government.

APPENDICES 2

1. Validity test of farmers' motivation based on ERG needs theory.

a) Existence (*n*=82)

Variable		E_1	E_2	E_3	E_4	E_5	E_6	E_7	Total Existence
E_1	Pearson correlation	1							
	Sig. (2-tailed)								
E_2	Pearson correlation	0.729	1						
	Sig. (2-tailed)	0.000							
E_3	Pearson correlation	0.439	0.673	1					
	Sig. (2-tailed)	0.000	0.000						
E_4	Pearson correlation	-0.106	-0.122	0.053	1				
	Sig. (2-tailed)	0.341	0.277	0.639					
E_5	Pearson correlation	0.149	0.225	0.246	0.084	1			
	Sig. (2-tailed)	0.182	0.042	0.026	0.452				
E_6	Pearson correlation	-0.064	0.042	0.138	0.183	0.359	1		
	Sig. (2-tailed)	0.567	0.707	0.216	0.100	0.001			
E_7	Pearson correlation	-0.055	0.110	0.249	0.144	0.152	0.582	1	
	Sig. (2-tailed)	0.621	0.323	0.024	0.197	0.172	0.000		
Total Existence	Pearson correlation	0.449	0.603	0.692	0.376	0.564	0.607	0.611	1
	Sig. (2-tailed)	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	

Source: Field survey, 2020. Data analysis using software (SPSS 26).

Note: * Level of significance at 0.1, ** Level of significance at 0.05, *** Level of significance at 0.01.

Results: All data is valid because of total Sig. values <0.05.

b) Relatedness (*n*=82)

Variable		R_1	R_2	R_3	R_4	R_5	R_6	R_7	Total Relatedness
R_1	Pearson correlation	1							
	Sig. (2-tailed)								
R_2	Pearson correlation	0.817	1						
	Sig. (2-tailed)	0.000							
R_3	Pearson correlation	0.656	0.737	1					
	Sig. (2-tailed)	0.000	0.000						
R_4	Pearson correlation	0.424	0.398	0.532	1				
	Sig. (2-tailed)	0.000	0.000	0.000					
R_5	Pearson correlation	0.373	0.424	0.512	0.534	1			
	Sig. (2-tailed)	0.001	0.000	0.000	0.000				
R_6	Pearson correlation	0.287	0.265	0.329	0.645	0.604	1		
	Sig. (2-tailed)	0.009	0.016	0.003	0.000	0.000			
R_7	Pearson correlation	0.339	0.317	0.560	0.758	0.510	0.631	1	
	Sig. (2-tailed)	0.002	0.004	0.000	0.000	0.000	0.000		
Total Relatedness	Pearson correlation	0.696	0.710	0.812	0.815	0.764	0.729	0.784	1
	Sig. (2-tailed)	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	

Source: Field survey, 2020. Data analysis using software (SPSS 26).

Note: * Level of significance at 0.1, ** Level of significance at 0.05, *** Level of significance at 0.01.

Results: All data is valid because of total Sig. value <0.05.

c) Growth (*n*=82)

Variable		G_1	G_2	G_3	G_4	G_5	G_6	G_7	Total Growth
G_1	Pearson correlation	1							
	Sig. (2-tailed)								
G_2	Pearson correlation	0.498	1						
	Sig. (2-tailed)	0.000							
G_3	Pearson correlation	0.395	0.752	1					
	Sig. (2-tailed)	0.000	0.000						
G_4	Pearson correlation	0.433	0.552	0.548	1				
	Sig. (2-tailed)	0.000	0.000	0.000					
G_5	Pearson correlation	0.373	0.667	0.748	0.616	1			
	Sig. (2-tailed)	0.001	0.000	0.000	0.000				
G_6	Pearson correlation	0.364	0.422	0.444	0.472	0.423	1		
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.000			
G_7	Pearson correlation	0.070	0.175	0.266	0.367	0.311	0.439	1	
	Sig. (2-tailed)	0.534	0.115	0.016	0.001	0.004	0.000		
Total Growth	Pearson correlation	0.594	0.792	0.815	0.796	0.819	0.703	0.543	1
	Sig. (2-tailed)	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	

Source: Field survey, 2020. Data analysis using software (SPSS 26).

Note: * Level of significance at 0.1, ** Level of significance at 0.05, *** Level of significance at 0.01.

Results: All data is valid because of total Sig. value <0.05.

2. Reliability test of farmers' motivation based on ERG needs theory.

Variable	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Existence_1	47.281	77.636	0.181	0.637	0.876
Existence_2	47.378	77.497	0.209	0.767	0.875
Existence_3	48.537	75.955	0.236	0.600	0.876
Existence_4	49.061	76.428	0.184	0.572	0.878
Existence_5	48.720	74.501	0.375	0.433	0.871
Existence_6	48.805	72.826	0.533	0.595	0.867
Existence_7	48.902	72.336	0.454	0.583	0.869
Relatedness_1	47.293	74.531	0.463	0.724	0.869
Relatedness_2	47.281	74.698	0.485	0.798	0.869
Relatedness_3	47.451	69.954	0.532	0.763	0.867
Relatedness_4	48.659	70.499	0.635	0.726	0.863
Relatedness_5	48.866	70.710	0.564	0.599	0.865
Relatedness_6	49.037	70.431	0.572	0.716	0.865
Relatedness_7	48.342	72.228	0.601	0.695	0.865
Growth_1	48.463	73.215	0.502	0.485	0.868
Growth_2	48.744	71.230	0.607	0.707	0.864
Growth_3	48.744	70.415	0.644	0.763	0.863
Growth_4	49.012	71.346	0.497	0.609	0.868
Growth_5	48.939	70.601	0.595	0.756	0.864
Growth_6	48.951	71.849	0.543	0.684	0.866
Growth_7	49.342	73.092	0.375	0.530	0.872

Source: Field survey, 2020. Data analysis using software (SPSS 26).

Results: All data is reliable because of the Cronbach's Alpha value in each item >0.6.

3. Results of farmers' motivation before using the Backward method.

Variable	Coeff.	S.E.	Sig.
Constant	33.882	9.539	0.001***
Internal factors			
Age (X_1)	-0.023	0.134	0.865
Education (X_2)	0.601	0.286	0.040**
Number of children (X_3)	2.464	0.927	0.010**
Main occupation (X_4)	3.123	4.360	0.477
Side jobs (X_5)	5.819	2.288	0.014**
Perception of farmer as a job (X_6)	2.499	3.409	0.467
Children have non-agricultural job (X_7)	-3.912	3.551	0.275
Farmland areas (X_8)	2.337	4.667	0.619
Inheritance land status (X_9)	-3.333	2.717	0.225
Purchased land status (X_{10})	3.457	3.404	0.314
Rent land status (X_{11})	5.423	3.549	0.132
Sharecropping land status (X_{12})	2.023	2.524	0.426
Productivity of paddy (X_{13})	0.037	0.406	0.928
Productivity of other crops (X_{14})	-0.017	0.514	0.974
Household income from crops farming/land area (X_{15})	-0.012	0.025	0.647
Farming experience (X_{16})	-0.062	0.082	0.453
Number of family laborers (X_{17})	-0.927	1.553	0.553
Number of hired laborers (X_{18})	2.181	2.089	0.301
Interested in agriculture (X_{19})	-0.271	2.997	0.928
Being a farmer by own will (X_{20})	3.350	2.942	0.260
Keeping the farmland as it is (X_{21})	-1.813	4.072	0.658
Children think of farming as a side job (X_{22})	3.277	4.490	0.469
Only have daughters (X_{23})	-5.625	4.455	0.212
External factors			
Parents' encouragement (X_{24})	4.736	2.257	0.040**
No other jobs (X_{25})	0.025	2.239	0.991
Affected by the environment (X_{26})	1.392	2.331	0.553

Source: Field survey, 2020. Data analysis using software (SPSS 26). *$R^2 = 0.468$. Adj. $R^2 = 0.216$. $F = 1.859$.* Note: * Significance at 0.1, ** Significance at 0.05, *** Significance at 0.01.