Socioeconomic Problems on Adoption of New Technologies for Production of Paddy Rice by Farmers in Upland Areas of South Sulawesi

MANGILEP Muhammad Agung Ady

Abstract: This paper is a survey of literatures to identify the socioeconomic problems on adoption of new technologies by paddy rice farmers in the upland of South Sulawesi. The socioeconomic problems are ownership of land and the type of other jobs outside upland villages. Many paddy rice farmers there are classified as low income, and the government conceives that, to increase their income, farmers should use new technologies. Though many new technologies can be implemented in the upland areas, literatures identify several obstacles to implement them, among which the unwilling dependence on middlemen and the lack of loans and insurances by banks play a major role in the upland of South Sulawesi. A literature also identifies four other socioeconomic problems as such obstacles, but those other than the ownership of land are misspecified for the upland of South Sulawesi. This paper also argues that the type of other jobs outside upland villages influences negatively on the morale for the adoption of new technology.

Keywords: Adoption of new technologies, financial problems, socioeconomic problems.

1. Introduction

This research is aimed to find out socioeconomic problems on adoption of new technologies for production of paddy rice by farmers in upland areas of South Sulawesi by surveying literatures. It is found that there are many new technologies which can be implemented in the upland area of South Sulawesi. However, literatures finds that there are several obstacles to implement them, among which unwilling dependence on middlemen and the lack of loans and insurances by banks play a major role in the upland of South Sulawesi. A literature identifes four other socioeconomic problems, but those other than the ownership of land are misspecified for the upland of South Sulawesi. This paper also argues that the type of other jobs outside upland villages influences negatively on the morale for an adoption of new technology.

About 70% of Indonesians are farmers, so Indonesia's economic growth are determined by the agricultural sector. However, Indonesian farmers are characterized as poor people. Although farmers live in food production center and the rural education has been improved, their income grows slowly. To increase income, farmers should apply new technologies but they think that these changes will waste their time and energy without assurance of increasing income. These problems are caused by farmers' social values on economic welfare. Their social value approves that working together cooperatively for improving their living standard would increase the income of each farmer, but farmers disagree on the way of cooperation and the distribution of profit in their decision making.

South Sulawesi, as a part of Indonesia, has contributed for rice production in Indonesia. Data from Indonesia's Central Bureau of Statistics (2014) shows that production of paddy rice in South Sulawesi has been increasing from 3.4 million tons in 2005 to 5.4 million tons in 2014 (by Indonesian government's first prediction). So paddy rice production has increased 160 percent over 10 years. However, the growth tends to fluctuate from year to year in the period 2005-2014.

According to Central Bureau of Statistics in 2014, Indonesia's population has been increasing from 238.52 million people in 2010 to 255.46 million people in 2015. In 2035, it is predicted that it is going to be 305.65 million people or 1.28 times of that in 2010. Rice is a part of Indonesian basic needs in Indonesia because it is a popular main meal. That big population, which tends to rise, will need a big amount of rice, so that the domestic market for rice will continue to grow. It also predicts that population in the city area will continue to increase. It is predicted that 53.3 percent of population will live in cities in 2015 and 66.6 percent in 2035.

2 . Adoption of New Technology in South Sulawesi

The Indonesians is among the largest groups of rice consumers and rice is one of the basic needs in Indonesia. Production of rice became an important issue for the Indonesian government. According to the Indonesian Ministry of Agriculture (2014), the Indonesian government has predicted that Indonesia will produce almost 70 million tons of paddy rice in 2014. The production is below that in 2013 which reached over 71 million tons.

City people need high quality rice products and their demand will increase. They have higher income and they consume goods of premium quality. Hotels, restaurants, and catering businesses in many cities have been growing, and most of them need high quality rice.

Several local rice varieties produced in the upland are very competitive in cities because they have a better taste and a better fragrance than other rice varieties. As the demand for a high quality rice increases, the economic opportunuity for rice production in the upland improves. To gain from this improved opportunuity, the production of high quality paddy rice in the upland area must increase. For that, upland areas need new agricultural technologies because the characteristics of upland areas is more difficult for paddy rice production than that of lowland areas.

Paddy rice is grown from seeds. It can be directly spread or planted by rows in fields, or planted on a seedbeds then transferred to fields. Direct seeding can be done on a dry field. Paddy rice fields in upland areas consist of irrigated fields and dry or rainfed fields, and most of them were rainfed fields. On the dry land, seeds are spread after land has been prepared and then they are covered by a thin layer of soil. Seeding is usually done after a continuous heavy rain.

In upland areas, land is prepared in the dry season and seeds are spread at the beginning of the rainy season. Sometimes paddy rice is planted simultaneously or alternately with other crops such as corn, cassava, and peanuts. Paddy rice fields are plowed by bulls, cows or hand tractors in the dry season.

Prosea (2014) explains that there are several disadvantages in this method. First, it has a problem of weed control. Second, the farming risk increases because of the plant stress in the dry field. Third, this method makes paddy rice need a large amount of fertilizer.

There are many technologies which can be adapted and implemented for upland farming. Examples are,

a. The Genetic Evaluation and Utilization, supported by International Rice Research Institute (IRRI) as explained in Brady and Athwal (1975),
b. Weeds control, supported by Australian Center for International Agricultural Research (ACIAR) as explained in Adiningsih, Semali, Effendi, and Hadiwigeno (1991),
c. Soil fertility management, supported by ACIAR as explained in Adiningsih, Semali, Effendi, and Hadiwigeno (1991),
d. Soil conservation and erosion control, supported by ACIAR as explained in Adiningsih, Semali, Effendi, and Hadiwigeno (1991),
e. The Integrated Farming System, supported by ACIAR as explained in Adiningsih, Semali, Effendi, and Hadiwigeno (1991),
f. The System of Rice Intensification, supported by IRRI as explained in Rajendran and Daksinamoorthy (2005),
g. Integrated Crop Management, supported by IRRI as explained in Rajendran and Daksinamoorthy (2005),
h. Drone for agriculture, supported by Massachusetts Institute of Technology (http://www.technologyreview.com/featuredstory/526491/ agricultural-drones).

However, most of those technologies have not been applied in the upland area of South Sulawesi so far.

There are many new varieties of paddy rice that have been invented, but only a few of them have been implemented. The Government of Indonesia with IRRI has sponsored many inventions of new rice varieties. Many institutions in Indonesia also supported invention of new varieties, such as universities and research centers.

There were not many paddy rice varieties that has been launched before 1970. Suprihatno and Daradjat (2009) claims that IRRI had launched the more modern varieties of paddy rice type at the end of 1960. In the period of 1970-1984, many types of paddy rice varieties were launched. In the period of 1985-2005, many types of paddy rice varieties, more than those in previous periods, were launched. One of them, IR64, has became the most popular paddy rice variety in this period. In 2000, IR64 had became susceptible to bacterial leaf blight, and to green and brown leafhoppers. To overcome those problems, several new paddy rice varieties were developed such as Ciliwung (1989), Way Seputih (1989), Barumun (1991), Memberamo (1995), Way Apo Buru (1998), Widas (1999), Ciherang (2000), Konawe (2001), and Cigeulis (2003). From 2004 to 2008, The Indonesian Paddy Rice Research Centers released a lot of new types of paddy rice varieties for irrigated land, swamp land, and upland. A variety called Sarinah had been developed for upland area.

Lestaria, Abdullah, Junaedib, and Aswidinnoorb (2011) explains that 49.4 percent of paddy rice fields use Ciliwung variety in South Sulawesi. In upland area, farmers use local varieties and there are some local varieties such as Pulu Mandoti, Pinjan, Pare Bau and Lambau which are treated as parents of the aroma gene source for New Plant Types (NPTs) of aromatic lines by the Bogor Institute of Agriculture (IPB).

Though many types of new varieties have been released, only a few of them are used widely. The decision for adoption of a variety depends on the middlemen such as seed producers who do not like to produce unpopular types of rice seeds and rice mill companies who make disincentive for grains of unpopular rice types. Suprihatno and Daradjat (2009) claims that adoption of new varieties is depends on five actors. They are farmers, seed producers, grain traders, rice mill owners, and consumers. Many researchers and public officers in agricultural extensions of the government have not concerned the role of the five agricultural actors.

3．Financial Problems of Upland Farmers

Middleman plays an important role in a local agribusiness as a fund provider. He could be a seeds producer, a grain trader, a rice mill owner, or a person who offers a loan privately. A seed producer or a seed seller offers a service that allows farmers to take rice seeds and pay for them after the output is harvested, and farmers do not object if he sells seeds in a high price. The seed sellers also sell fertilizers and herbicides. Most of seed sellers has their targeted customers in certain areas and they can control types of rice seeds they sell and their prices.

The grain traders offers to buy all farmers' products and pay them before outputs are harvested, and farmers agree to sell their output at a low price. Farmers accept their offers regarding on risk aversion of crops failure. Most of grain traders has their targeted farmers in certain areas and they can control the rice price they buy. The rice-mill owners offer farmers a loan for agricultural activities. So he can receive interest payments from that loan. Ruf (2002) claims that farmers sometimes pledge their land as a collateral for the loan. Smeru (2002) explains that the head of a farmer association offers loans to the members of the association. The heads of farmer associations are mostly creditors or the owners of rice mills.

On the other hand, banks are reluctant to offer loans to farmers because a bank want for farmers to pay back for the credit monthly, but farmers can pay only once in a year. In Malaysia, Agrobank Bhd. offers a lot of schemes of credit for farmers, so they have no problem in finding fund for an agricultural improvement and an adoption of new agricultural technology. According to http://www.agrobank.com.my/, there are 28 schemes of loans and 2 types of insurances for farmers which are offered by Agrobank Bhd. These loans can be classified into consumption loans and business loans. There are 3 types of consumption loans offered by Agrobank Bhd., which are AgroCash-i, Hartani-i, and Ar-Rahnu. There are 7 types of business loans offered by Agrobank Bhd., which are Credit Guarantee Scheme, Tabung untuk Makanan, Micro Financing, MY AGROSIS, Commercial Financing, Agrobank Entrepreneur Program, Trade Finance. Consumption loans offered by Agrobank Bhd. provide finance on farmers' consumption, land development, and cash-flow needs. Meanwhile, most of business loans provide finance for entrepreneurial investments in agriculture.

Most of loans offered by Agrobank Bhd. are Islamic financial products and their maturities varies from 14 days to 20 years. Most of them can be used by paddy rice farmers, but several products are served for specific agriculture products, such as Task (Sawit-i) for palm oil plantation and MARDEC for rubber plantation.

Agrobank Bhd. also offers insurance products. There are 2 types of insurance products, Takaful

Credit Protection Scheme and Takaful Kasih. The Takaful Credit Protection Scheme covers the risk of natural or accidental death and total permanent disability under the Islamic insurance system. The Takaful Kasih covers the risk of personal accident under the Islamic insurance system.

As a comparison, PT. Bank Rakyat Indonesia (BRI) serves only one loan scheme that is Kredit Usaha Pedesaan (Kupedes). BRI has no insurance product in either the general system or the Islamic system. Kupedes is a part of general loan and it has no Islamic system variant. It serves for not only agricultural sectors but also all businesses in all economic sectors.

Supanggih and Widodo (2013) explains that farmers have limited access to get bank loans. Farmers feel hard to deal with banks because their administrative processes are so complicated and costly. On the other hand, farmers have a limited information about bank loan products. They also believe that interest payments will hurt them financially in a long-term. For upland farmers, beside these problems, they also find it difficult to provide collaterals because most of upland farmers have a small land. Bank loans have not reached to most of farmers in South Sulawesi, especially small scale farmers. According to South Sulawesi's Central Bureau of Statistics (2014), Indonesian's Central Bureau of Statistic classified small scale farmer as a farmer household who owns paddy rice field of less than 5,000 m^2, and big scale farmer as a farmer household who own paddy rice field of equal to or larger than 5,000 m^2. 38.94 percent of farmer households in 2013 and 35.58 percent farmer households in 2014 were classified as small scale farmers. On the other hand, 61.06 percent farmer households in 2003 and 64.42 percent farmer households in 2013 were big scale farmer. However, for agricultural production both small scale and big scale farmers need fund for their agricultural activities. They allocate these fund for investment and operational purpose. For investment purpose, farmers use fund to buy land and machinaries, and maintain agricultural infrastructures.

For operational purpose, they use fund for labor cost, buying inputs, and pay electricity. Big scale farmers mostly need fund for both for operational and investment cost. Small scale farmers mostly need fund to cover their operational cost, but they also need to invest in the development of erosion control. Big scale farmer mostly can finance operational cost from their own revenue, but they need loan to invest in buying land and machinaries, and maintain paddy rice fields. Small scale farmers need loan to finance their operational cost and to invest on the development of erosion control, and on buying new varieties.

Farmers have problems to access loans from banks though an adoption of a new technology needs a lot of money. Adopting new technologies such as buying new machienaries, new rice varieties, or new structures for erosion control will benefit farmer in the future. Small scale farmer who can adopt new technology can increase their production and also increase their income. Although banks need monthly payment for their credit schemes, it is possible for banks to implement a special way of loan payment to meet farmers' need e.g. a special payment system with a guarantee by local government or a farmer cooperative. In this system farmers can be charged for extra payment on the replacement of payment system, and it will be a revenue making for banks and also a way of funding their investment for farmers.

Central government had tried to solve the problem on lack of credits for farmers. Smeru (2002)

explains that central government launched the Kredit Ketahanan Pangan (KKP) which replaced an unsuccesfull credit scheme implemented previously, the Kredit Usaha Tani (KUT).

In 2000, in the period from October 2000 to March 2001, the KKP's rate of realized lending was only 1.57 percent of the entire fund which amounted to 2.3 trillion rupiahs. The main cause was that the default on KUT was high, and KUT repayment was the prerequisite for KKP application. Smeru (2002) claims that one of the serious factors which had contributed to the default on KUT was its misappropriation by the farmers associations and cooperatives. It was caused by a bad fund management and a low morale among their members. Farmers' knowledge and experience in finance were too limited to cope with repayments and roll-overs of a large borrowing. Farmers also knew that there had been a debt write-off for the default in Bimas/Inmas scheme, a credit scheme before KUT. Hence farmers believed there would be another write-off in KUT, and they were not serious for repaying.

Soetrisno, Almaidafiani and Sudirman (2006) explains that agricultural production is associated with various risks of natural disaster that any farmers must deal with. Problems such as pests and rainfall uncertainty contributes to a crop failure, which have been a serious risk for farmers. So farmers tried to eliminate those issues by securing purchase of inputs and sales of outputs. For these reasons, farmers relied on middlemen, the input sellers, the grain traders, and the rice mill owners. Although farmers knew the middlemen activities would reduce their profit, they relied on them because, as far as they knew, it had worked for satisfying their needs. Farmers had not tried to find other ways to solve agricultural problems and kept their traditional way of agricultural production.

4．Socioeconomic Problems of Upland Farmers

Farmers in upland areas of South Sulawesi face social problems. Perdew and Shively (2009) identifies social problems in agricultural area to be categorized into location, identified problems, ownership of specific assets, and access to information. That paper does not include the type of other jobs outside agricultural areas as a part of agricultural problems.

Here I would like to evaluate each problems one by one, including the type of other jobs outside agricultural areas as a part of agricultural problems.

Location of paddy rice fields in upland areas have an advantage. Although some of those locations have the transportation problems such as being far away from highways and too risky to get there, upland areas are benefited by a good climate condition such as a low temperature to produce a good taste rice, and almost constant supply of water by regular rainfalls. Those are important to produce a good quality paddy rice and to reduce the cost of production.

Problems such as disease and pests are important, but sometimes too costly to fix those problems. Those problems happen in both lowland and upland areas. In upland areas, the cost of herbicides and pesticides can be lower than that in lowland areas. In lowland areas, they are used three times in a year, while in upland areas, they are used once or twice in a year.

Specific asset such as land become more important nowadays in upland areas. Farmers face problems about their lands. In rural areas of upland South Sulawesi, many farmers hold areas of paddy rice fields which are bigger than 5,000 m^2. However, most of those lands do not have land owner-

ship documents. Banks need collateral as one of their loan requirement. So when farmers need extra money for investment, operational expenses, and consumption expenses, they cannot use their lands as collateral so that they fail to get a loan from banks. Middlemen serve fund for farmers without any collateral requirement, and it is the only opportunity for farmer to get a loan.

Access to information is not really an important problem in upland areas. In upland areas of South Sulawesi, the easiest way to get information is by talking with other farmers. Information about agricultural technologies may also come from government officers and researchers. However, farmers have no incentive to buy the newest technology products, and there are no insurances supporting them. These circumtances may contribute to the lack of farmers' efforts to find information about new agricultural technology.

The type of other jobs outside upland villages has become one of the factors that can reduce employees of paddy rice production nowadays and in the future. Labor is important in paddy rice production in upland. For paddy rice production, farmers depend on their family members, their wifes and children. They can get some help from their relatives too. However, many young farmers go to find jobs in other places after paddy rice germination. To add their income, young farmers go to the other villages to find agricultural jobs or go to the nearby cities to find jobs in manufacturing or services sectors. These circumstances will contribute to a lack of labor for their paddy rice production in the future. Young farmers who get a job in manufacturing or servies sectors will increase their chance to get a monthly salary. Having a job in the city area with a regular salary may make people stick to their jobs, and it may make people who come from other regions will never return to settle in their hometown. In that case, farmers will not find it easy to provide legacy of their agricultural land. Farmers want to continue production intergenerationally, but emergence of the other jobs in cities may discourage such wishes and create disincentive to continue a paddy rice production.

In conclusion, socioeconomic problems of paddy rice production in upland can be caused by uncompleted land documents and the type of other jobs outside upland villages. Uncompleted land document has reduced farmer's opportunity to get a loan from banks. The type of other jobs outside upland villages influences negatively on the morale for an adoption of new technology.

References

Adiningsih, J. S., Karama, A. S. (1994) *Sustainable Upland Farming System for Indonesia*. Retrieved from http://www.fao.org/prods/gap/database/gap/files/1264_INDONESIA_UPLAND_FARMING.PDF

Adiningsih, Semali, Efendi, Hadiwigeno (1991) *ACIAR: Technologies for Sustainable Agriculture on Marginal Uplands in Southeast Asia*. Retrieved from http://aciar.gov.au/publication/pr033

Almaidafiani, Sudirman (2006) *Pengaruh Program Penyuluhan Pertanian Organik Terhadap Sosial Ekonomi Petani*. Retrieved from http://repository.usu.ac.id/bitstream/123456789/15684/1/pkm-sepdes2006-%20(4).pdf

Brady, N. C., Athwal, D. S. (1975) Future Emphasis on Upland Rice. *IRRI: Major Research in Upland Rice*. Retrieved from http://books.google.co.jp/books?id=8 PXmRSBvIOgC&printsec=frontcover&hl=id&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Indonesian Ministry of Agriculture (2014) *Data Terkini Subsektor Tanaman Pangan*. Retrieved from http://www.pertanian.go.id/Indikator/tabel-1-prod-lspn-prodvitas-padi-palawija.pdf

Indonesia's Central Bureau of Statistics (2014) *Statistik Tanaman Pangan*. Retrieved from http://www.bps.go.id/tnmn_pgn.php

Lestaria, A. P., Abdullah, B., Junaedib, A., Aswidinnoorb, H. (2011) *Performance of Grain Quality and Aroma of Aromatic New Plant Type Promising Rice Lines*. Retrieved from http://pustaka.litbang.deptan.go.id/publikasi/

as122115.pdf

Perdew J. C., Shively G. E. (2009) *The Economics of Pest and Production Management In Small-Holder Cocoa: Lessons From Sulawesi*. Bulletin of Indonesian Economic Studies, 45:3, 373-389, DOI: 10.1080/00074910903416288

Prosea (2014) *Detil Data Oryza Sativa L*. Retrieved from http://www.proseanet.org/prohati4 /browser.php?docsid=230

Rajendran, R., Daksinamoorthy, M. (2005) *Innovative Production Technologies for Maximizing Rice Productivity and Profit*. Retrieved from http://www.slideshare.net/mdmoorthy/innovative-production technologies-for-maximizing-rice-productivity-and-profit

Ruf, F. (2002) *From Rice to Cocoa through a Political Economy of Dishonesty, Sulawesi, Indonesia*. Retrieved from ftp://ftp.fao.org/upload/Agrippa/611_en.pdf

Smeru (2002) *Pendanaan Usahatani Padi Pasca KUT, Kredit Ketahanan Pangan (KKP)*. Retrieved from http://www.smeru.or.id/report/research/kkp/kkpind.pdf

South Sulawesi's Central Bureau of Statistics (2014) *Laporan Hasil Sensus Pertanian 2013 (Pencacahan Lengkap)*. Retrieved from http://st2013.bps.go.id/st2013esya/booklet/at7300.pdf

Supanggih, D., Widodo, S. (2013) *Aksesibilitas Petani terhadap Lembaga Keuangan (Studi Kasus pada Petani di Desa Sidodadi Kecamatan Sukosewu Kabupaten Bojonegoro)*. Jurnal Agriekonomika. Retrieved from http://journal.trunojoyo.ac.id/agriekonomika/article/download/ 134/146

Suprihatno B., Daradjat A. A. (2009) *Kemajuan dan Ketersediaan Varietas Unggul Padi. Publikasi Balai Besar Penelitian Tanaman Padi*. Retrieved from http://www.litbang.deptan.go.id/ special/padi/bbpadi_2009_itkp_12.pdf