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Livelihoods, Household Income and Indigenous Technology in South Sumatra WetlandsElisa Wildayana^{1*}, Dessy Adriani¹, and M. Edi Armanto²¹Agribusiness Study Program, Faculty of Agriculture, Sriwijaya University South Sumatra²Soil Department, Faculty of Agriculture, Sriwijaya University South Sumatra

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Abstract: The research aimed to analyze livelihoods, household income and indigenous technology in South Sumatra wetlands. The research method used field survey and interviews with respondents by using questionnaires. Respondents were determined with stratified random sampling method. The research data are classified into two parts, i.e. primary data and secondary data. The research showed that three main farmer's groups settling in wetlands are spontaneous migration (Buginese and Banjarnese), new comers (transmigration) and indigenous people (local people from South Sumatra). All these tribes running the different farming systems, new comers and indigenous farmers implement farms with rice monoculture, while spontaneous migration applied multi commodities. The average land ownership of farm households is 1.95 ha which is intended for rice fields (0.94 ha), estate (0.85 ha), and livestock and fisheries (0.16 ha). Indigenous farmers have the minimum land (0.75 ha), however the spontaneous migration has the largest lands (3.10 ha). The larger the land ownership by farmers, thus the farmer's income will increase if the land is cultivated by farmers. Household income structure of farmers is dominated by food crop farming and this has led to the vulnerability of farmer's income due to the uncertainty of agricultural activities. The more varied sources of farmer's income, the income of farmers will increase also. The learning process of spontaneous migration indicates that the farm should follow the nature, so the coercion of nature means to increase operational costs of farming.

Keyword: Livelihoods, household, income, indigenous technology, wetlands

Abstrak (Indonesian): Penelitian ini bertujuan untuk menganalisis mata pencaharian, pendapatan petani dan teknologi lokal di lahan basah Sumatera Selatan. Metode penelitian yang digunakan adalah survei lapangan dan wawancara dengan responden dengan menggunakan kuesioner. Responden ditentukan dengan metode stratified random sampling. Data penelitian diklasifikasikan menjadi dua bagian, yaitu data primer dan data sekunder. Penelitian menunjukkan bahwa tiga kelompok utama petani yang menetap di lahan pasang surut adalah migrasi spontan (Bugis dan Banjar), pendatang baru (transmigrasi) dan masyarakat lokal (orang lokal dari Sumatera Selatan). Semua suku ini menjalankan sistem pertanian yang berbeda, pendatang baru dan petani lokal menerapkan pertanian dengan monokultur padi, sementara migrasi spontan menerapkan konsep multi-komoditas. Kepemilikan tanah rata-rata rumah tangga tani 1.95 ha yang ditujukan untuk sawah (0,94 ha), kebun (0,85 ha), peternakan dan perikanan (0,16 ha). Petani lokal memiliki tanah minimum (0,75 ha), namun migrasi spontan memiliki tanah terluas (3,10 ha). Semakin besar kepemilikan lahan oleh petani, maka pendapatan petani akan semakin meningkat jika lahan tersebut dibudidayakan oleh petani. Struktur pendapatan rumah tangga petani didominasi oleh pertanian tanaman pangan dan ini telah menyebabkan kerentanan pendapatan petani karena ketidakpastian dari kegiatan pertanian. Jika sumber pendapatan petani bervariasi, maka pendapatan petani juga akan meningkat. Proses pembelajaran migrasi spontan menunjukkan bahwa pertanian harus mengikuti alam, sehingga pemaksaan alam berarti meningkatkan biaya operasional pertanian.

Katakunci: Mata pencaharian, rumah tangga, pendapatan, teknologi lokal, lahan basah

1. Introduction

Tidal wetland is mostly located along the Eastern coastal lines of Sumatra which covers an area of around 18-22% of the total Sumatra, but this area is inhabited by about 14-20% of the Sumatra population. Tidal wetland land clearing in South Sumatra is reclaimed by the

government since 1969 for transmigration and agriculture purposes because the tidal wetland has great potential for food crop production, especially rice and cereals, thus it is no wonder the tidal wetland has been determined as rice production centers and has been cultivated since the last hundred years ago [7] [9] [10].

The transmigration program aims to displace millions of people from Java, Bali and Madura to sparsely populated islands and to enable the equitable distribution of the Indonesian population. Transmigration also aims to alleviate poverty by providing land and employment opportunities for the poor and to improve the utilization of land resources. However, land and water in the transmigration sites are generally not fertile [1-3], so it will affect the income of farmers and farmer life as a whole [4-6].

There is no separation between "natives" and migrants in Indonesia, because Indonesia is a unitary state. Therefore, there are three main tribes settling in tidal wetlands, namely spontaneous migration (Buginese and Banjarnese), new comers (transmigration) and indigenous people (local people from South Sumatra). All the tribes (except new comers) settled exclusively inhabit along the major rivers, in narrow riverbank which is rich in minerals, so it is very profitable for sustainable crop production [8,11-13].

Farmers also cultivate other crops such as coconut, rubber, oil palm and others. Ownership and cultivation of arable farming by farmers is a major determinant for the high rate of low productivity of farmers that will directly affect the household income. In connection with that, the research was conducted to analyze livelihoods, farmer's income and indigenous technology in South Sumatra wetlands.

2. Experimental Sections

The research method used field survey and interviews with respondents by using open and closed questionnaires. Respondents were determined with stratified random sampling method. The stratified farmers were three farmer groups (namely spontaneous migration, indigenous farmers and new comers). Head of the family was being targeted interviews to obtain information on the levels and sources of household income. Primary data is collected through questionnaire including field data, structure and income sources of farm households. Secondary data were obtained from the literature and relevant data from related agencies. Data was performed and analyzed with descriptive analysis approach, which describes the structure of livelihood and household incomes.

3. Result and Discussion

The research area is sited in Telang I, Muara Telang Banyuasin district with a total area of around 26,680 ha. It is geographically located in position of 02° 29' to 02° 48' South Latitude and 104° 30' to 104° 52' East Longitude. Telang I is bordered by the Bangka strait in the north, by the Musi River in the East, by the Telang River in the West and the Sebalik River is found in South. The rainfall during the rainy season reaches 500-750 mm/month (November to June), but in the dry season, the average monthly rainfall is lower than 200

mm/month (August-October). The local agro-climatic zones of Telang I belong to climatic type of C1 (5-6 months belong to wet season and 1-2 months is classified as dry season). The more wet months, the index of planting intensity can be increased or it allows for two planting seasons. This research theme is livelihoods, household income and indigenous technology in tidal wetland Delta Telang I South Sumatra

Characteristics of Farmer's Groups

Generally, farmer's groups have very different characters from each other. Age of farmers (respondents) ranged between 25-65 years old with an average age of 42.67 years. About 85% of farmers are classified into the productive age (15-55 years). The education level of farmers was distributed that around 41.56% has completed and not completed primary school, junior high around 40.41%, around 12.57% has education level of senior high school and the rest has reached college level (5.46%). It can be concluded that the condition of the education level is still low because there are still so many farmers who have not reached the nine-year compulsory education. The low level of education has an impact on the ability to absorb farming technology also becomes low.

Spontaneous migration

Spontaneous migration are farmers from Buginese (South Sulawesi) and Banjarnese (South Kalimantan), indigenous farmers (coming from South Kalimantan). Both of tribes have farmed nearly with the same character because Buginese have learned farming with Banjarnese. Although the Buginese have spontaneously colonized without any intervention or support from the government, colonization never left to individuals but always achieved in a pattern that was ordered by the group well-organized. The Buginese farming systems that combine at least two large companies (paddy growing and cultivation of coconut, achieved through additional logging in the initial phase).

Tidal irrigation techniques introduced to the east coast of Sumatra by pioneer settlers Buginese from South Sulawesi, who have taken this technique from the Banjarnese in the swampy coast of Southern Kalimantan. Buginese begin their colonization of the tidal wetland between the delta of Telang and Musi Rivers around the turn of the century. Buginese achievement can be considered definitive as one of the most successful cases of spontaneous tidal wetland colonization by pioneer settlers in Telang I.

The main motive of the Buginese in wetlands Telang is probably not for agricultural purposes, but to log harvest in lowland rainforest and the establishment of growing timber trade between Sumatra and Java, with the help of their unique sailing vessel. Only at the second stage do they change the area cleared for agriculture. Buginese thus one of the few examples of pioneer settlers

who not only burns the trees cut on the plot cleared but that make a profitable business out of it. Some Buginese open swamp forest for cultivation of rice fields and coconut and then they live as a landlord in the cities. It can be said that farmers often just as clearers Buginese forest and open land lease on a profit-sharing agreement for the pioneer settlers of Java. As can be seen from the agricultural profile, the average agricultural company pioneers Buginese settlers did not show very favorable results with regard to the results. Yields on two major crops, rice fields and coconut, far below the average, which has necessarily to be attributed to the low quality of the peat applicable. However, farmers are clearly offset the disappointing results with relatively large holdings of about 3.10 ha, which is twice the average area for all of Sumatra. So, after all, a pioneer Buginese able to achieve average farm incomes are even slightly above the standard of Sumatra.

Sources of livelihood of farmers can be broadly divided into four groups, namely rice farming and food crops (paddy rice, corn, soybean, cassava, sweet potatoes, beans, vegetables), estate (covering palm, fruits, rubber and oil palm), livestock (including cattle swamp buffalo, cows, goats, sheep, chicken, etc.), fish (catfish, tilapia, trout and others) and off-farm (business builders, labors, carpenters, drivers, porters, beca, mechanics, merchants and others).

The eastern coast of Sumatra has been controlled spontaneously by settlers pioneer Buginese for tidal rice fields irrigated, often after many years of trial and error, has been able to develop a strategy for survival that is based on agricultural production system that is very specific and sometimes very sophisticated. The strategy adopted by farmers Buginese differ quite substantially compared to the transmigration program. Therefore, the experience of farmers Buginese can be used as a reference or learning to transmigration program in the long term because spontaneous pioneering strategy can provide a useful guide for regional planners and policy makers for the implementation of the resettlement program.

New comers

In the early 1970s the Indonesian government began a large-scale program for transmigration held from Java to the Eastern part of Sumatra's wetlands. By adopting the technique of tidal irrigation Buginese and with tremendous input of capital and machinery they have tried to change a large portion of these swamps into agricultural land for paddy cultivation. Most parts of the delta Telang has been cleared by the Ministry of Public Works, and the current improvement efforts are being made to open Telang delta downstream from the city of Palembang.

The new comers are farmers from Java through transmigration program sponsored by the government with the aim of moving Java people into low populated

areas like Telang I. Transmigration projects in the area of tidal wetland east coast of Sumatra was focused on farming rice plants. Rice monoculture is relatively vulnerable to the risk of failure. The settlers of Java in these projects clearly recognize their vulnerable position and getting to plant alternative crops, such as coconuts and bananas, in their home gardens.

Area for paddy cultivation is generally limited to a strip close to the river that reaches as far inland as the occurrence of a river mineral deposit. Most of the river mineral deposit would be converted from rice fields to oil palm cultivation. Strip behind oil palm is normally be too deep for any type of land use and therefore left uncultivated.

The rice harvest is generally below average in the first season after land clearing. The best results were achieved in the third to fourth year, and then gradually decline due to the spread of weeds. After six to eight years, many pioneers of the original Buginese leave their fields in order both to fully concentrate on the coconut cultivation and to move further upstream to open new sites. In the area settled early, like around the Musi River, several thousand hectares of former rice fields are currently uncultivated. Another alternative is to give the land to the second generation of newcomers, mostly consisting of spontaneous Javanese migrants who are willing to adopt a more labor-intensive method, such as hoeing (something Buginese never do), which is required to suppress weeds.

The indigenous farmers

The indigenous farmers generally come from South Sumatra Province and its surrounding. Naming indigenous farmers in general is originated from the name of the main river flowing where their ancestors lived and settled, such as the Komerling people, the Ogan people, the Musi people, the Lematang people and the Palembangnese. In general, indigenous farmers spread in almost all regions of Sumatra and they are generally moving in the area where there is development of the region, including the transmigration area. In general, indigenous farmers belong to the local traders, but due to the human resource limitations, they also cultivate the land for farming and follow the resettlement of the farmers. Indigenous farmers are classified as subsistent farmers. Their farming concept is how to work today for eating today only, tomorrow they find more to eat for tomorrow. Generally, they lack initiatives and lack in patience that is reflected from the struggling spirit and fighting spirit of its relatively weak. It is relatively difficult to change their mindset for agriculture system because they always satisfy with their conditions of life, although it is much under the life standard.

Ownership of Agricultural Wetlands

Research data of land ownership showed that around 78.79% of farmers are classified as landowners

and cultivated their own land, approximately 15.15% of farmers is the landowner, but they did not cultivate their land and 12.06% of farmers belonged to sharecroppers only. In general, the average land ownership of farmer households is 1.95 ha which is intended for rice fields (0.94 ha), estate (0.85 ha), and livestock and fisheries (0.16 ha). Extensive land ownership by farmer's groups are presented in Table 1.

Table 1. The average size of agricultural land ownership

Nr	Farmer's groups	Land use allocation (ha)			Total (ha)
		A	B	C	
1	New comers	1.14	0.63	0.23	2.00
2	Spontaneous migration	1.15	1.79	0.16	3.10
3	Indigenous farmers	0.53	0.12	0.10	0.75
Average		0.94	0.85	0.16	1.95

Note : A (Rice fields + tegalan/ladang planted with cereals); B (small estate); C (livestock and fishery)
Source: Field survey result (2016)

The tribes in tidal wetland gaining their land ownership are in different patterns not only in acreages, but also the ways how they got their lands. But generally the agricultural land can be divided on the base of agricultural commodities cultivated on the land, namely rice fields (generally planted with rice, corn, soybean, cassava, sweet potatoes, beans, vegetables and other food crops), small estate (generally planted with coconut, rubber, oil palm, fruits and others), livestock and fisheries (swamp buffalo, cows, goats, sheep, chickens, catfish, carp, tilapia and any others).

The new comers belong to the farmers of transmigration program and they emphasize on land use of rice monocultures (rice fields). At this time, they have average 2.00 ha per household. The land is intended for rice fields (1.14 ha), estate (0.63 ha) and livestock and fisheries (0.23 ha). Because of capital limitations, they concentrate on their rice fields or they work in other field (off farm), mostly in the district city or Palembang city as daily workers.

The spontaneous migration is dominated by Buginese and Banjarnese. Both tribes have similarities in managing their tidal wetlands. On average they have the largest wetlands because they are well known as famous land clearers, thus the land ownership was on average around 3.10 ha per household. However, unlike the new comers and the indigenous farmers, the spontaneous migration does not emphasize on rice fields only (1.15 ha), but also estates with an area of about 1.79 ha, while the rest is allocated for livestock and fisheries (0.16 ha). They have cultivated multi commodities to ensure the production success, while the new comers and the indigenous farmers cultivate mostly rice monoculture.

The indigenous farmers are local people coming from South Sumatra Province. They have the most minimal land (0.75 ha) with allocation of 0.53 ha for rice fields, 0.12 ha is utilized for estate and 0.10 ha for livestock and fishery. Most of them depend on the nature and less power to strive the nature, so that the agricultural results obtained are also minimal.

Farmer's Income based on Farmer's Group

The average income of household was Rp 10.02 million/year of which Rp 6.26 million/year (64.79%) was obtained from rice fields, the estate contributed approximately Rp 2.75 million/year (23.80%), fisheries and livestock Rp 0.57 million/year (5.59%) and off-farm contributed around Rp 0.51 million/year (5.82%). Income derived from off-farm was activities of trading, farm laborers, carpenters, drivers, salaries, honoraria, beca, teachers and others. This suggests that farmer's households are dependent on rice fields as a primary source of income as compared to the income contribution from other sectors (Table 2).

Table 2. Structure of the average income of farmers based on the farmer's groups

Farmer's groups	Income source (Mill Rp/year)				Total income (Mill Rp/year)
	A	B	C	D	
New comers	7.50 (71.91%)	1.85 (17.78%)	1.04 (9.98%)	0.25 (0.33%)	10.43 (100%)
Spontaneous migration	5.86 (47.22%)	6.03 (48.64%)	0.32 (2.64%)	0.19 (1.50%)	12.40 (100%)
Indigenous farmers	5.44 (75.23%)	3.61 (4.99%)	0.33 (4.16%)	1.08 (15.62%)	7.23 (100%)
Average	6.26 (64.79%)	2.75 (23.80%)	0.57 (5.59%)	0.51 (5.82%)	10.02 (100%)

Note : A (Rice fields + tegalan/ladang planted with cereals); B (small estate); C (livestock and fishery); D (off-farm)
Source: Field survey result (2016)

The income structure will be very different if it is analyzed on the bases of farmer's groups (namely the new comers, the spontaneous migration and the indigenous farmer). The new comers and the spontaneous migration relying on food crops that contribute around Rp 5.44 to 7.50 million/year (71.91-75.23%), while the estate sector contributed only Rp 1.85-6.61 million/year (4.99-17.78%), livestock and fisheries contribute Rp 1.04 to 3.33 million/year (0.32-9.98%) and the smallest contribution given by off-farm activities was around Rp 0.25 to 1.08 million/year. However, the spontaneous migration shows fantastic patterns of income where the income structure was dominated by estate, rice fields, livestock and fisheries and off-farm activities approximately Rp 6.03 million/year (48%), Rp 5.86 million/year (47.22%), Rp 0.32 million/year (2.64%) and Rp 0.19 million/year (1.50%) respectively.

From the comparison of the three farmer's groups, it can be concluded that the more commodities are cultivated, then the farmer's income will be increased. Thus, the key to success is based on business diversification and increase household income. In addition, action needs to agro-food system overhaul because this action will automatically increase the household income. It effort diversity is increased, it is also able to increase the household income as role played by the spontaneous migration. In addition, the search for finding an alternative source of income outside the farming sector is also recommended in order to become a stable household income, especially in times of

uncertainty of prices of agricultural products and production processes in the agricultural sector.

Learning Process from Spontaneous Migration

Good learning process was already demonstrated by the spontaneous migration which is expressed in the form of indigenous technology (indigenous knowledge) or the farming concept by soils. Indigenous knowledge is fundamental knowledge possessed by spontaneous migration to maintain harmonious contact with nature, in particularly how to manage tidal wetlands. Diversity efforts illustrate that farming should not be monocultures as applied by the new comer and indigenous farmers, while farming by soils means no coercion to the nature, but farmers follow the nature. The coercion to nature can only be accepted if we have sufficient and adequate information of the nature itself. Knowledge and information is acquired and developed on the basis of direct contact with nature through some trials to conserve tidal wetlands and to avoid degrade to the tidal wetlands. The processes of learning demonstrated by spontaneous migration to manage the tidal wetlands for hundreds of years, characterized by five characters, i.e.:

To ensure the tidal wetlands for agriculture based on the wetland typology related to topography, flooding conditions and availability of water for crops. Thus it did not happen coercion to the nature. Possibility of over-drainage and pyrite oxidation can be automatically avoided right from the planning. Soil treatment system by considering the depth of pyrite, thus pyrite compound will not disturb and are always in a state of inactive status, thus it does not become poison for food crops because it is able to lowering the soil pH and soil nutrient availability will be disturbed and imbalanced.

To make surjan system for micro and macro water regulation, in which the ridges (terrace) as dry land is planted with crops, vegetables, fruits, estate and industrial plans another, whereas waterlogged land is cultivated for rice and fish (mina rice).

To cultivate the lands by using multiple commodities, which combine land with plants, fish and livestock. The spontaneous migration planted not only rice, but also grow vegetables, coconut, fish, collect forest product and hunting wild animals. They are not just farming, but also conducted animal husbandry, fisheries, trade, crafts and services that are all related to resource use wetlands.

To carry out environmentally friendly farming techniques by selecting the appropriate plants to environmental conditions of wetlands, such as rice varieties that are resistant to tidal wetlands conditions. This ensures agriculture by using low energy approach.

To execute land management activities followed by weed control (slashing, flipping, deploy, and collecting). These actions are ways of conservation tillage because weeds will be used as organic fertilizer. The spread of weeds was placed on the soil surface as

mulching. It is very useful for controlling the growth of weeds grass.

4. Conclusion

The larger the land ownership by farmers, thus the farmer's income will increase if the land is cultivated by farmers. Household income structure of farmers is dominated by food crop farming and this has led to the vulnerability of farmer's income due to the uncertainty of agricultural activities. The more varied sources of farmer's income, the income of farmers will increase also. The learning process of spontaneous migration indicates that the farm should follow the nature, so the coercion of nature means to increase operational costs of farming.

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