

The Comparisons Among Household Economic Activities of Rubber Farmers in Indonesia: From Conventional to Organic Rubber Farming

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Abstract—The organic farming method is one alternative to increase productivity, farmers' income and improve the soil ecology. The objectives of this research were to: compare the time allocation of rubber farmers, the level of production and income farmers and analyze the changes of household expenditure of conventional to organic rubber farming. The samples were the farmers who changed the technology from conventional to organic farming. The samples were selected by simple random sampling. The result of this research showed that there was significant difference between the use of organic fertilizer and chemical fertilizer in the rubber farming, in terms of time allocation, production level, household income and expenditure. The level of time allocation revealed that organic farming was longer than the conventional one. The production level and income of organic farming were higher than the conventional farming. The household expenditure of organic and conventional farming was at the same level.

Keywords—conventional, organic, farming, rubber

I. INTRODUCTION

The low level of rubber productivity in Musi Banyuasin, one of the regencies in Indonesia, is caused by conventional farming method. Public rubber plantation there is characterized by bad management including the selection of good seeds, maintenance, post harvest handling, limited lands and capital owned, and lack of human resources. These factors become the reason of low income of the rubber farmers.

Rubber farming in Musi Banyuasin is generally maintained traditionally by using chemical fertilizers and pesticides. The capital constraints cause the conventional management inadequate since the farmers do not cultivate them as directed or without fertilizers. This is the ultimate aspect of the low rubber productivity in this region. In addition, the character of conventional technology is synonymous with the use of chemicals in farming activities which cause environmental pollution. The high concentration of chemical use gives bad impact on the soil structure and the microbes [1]. Agricultural systems based materials high input of energy (fossil materials) such as chemical fertilizers and pesticides can damage the properties of the soil and ultimately reduce the productivity of the land for the future [2].

Farm household is also a problem in changing the organic rubber cultivation technology and has great contribution for the present study. In reality each farmer households can run three roles at once, namely labor providers, manufacturers and consumers. Decision outpouring of household labor time both agricultural and non-farm will affect the production process. Farmers over the role as producer as well as consumer of a farm household are assumed rational maximizing satisfaction. Farmers as producers will produce more goods which are relatively expensive and produce fewer goods which are relatively cheap. Farmers as consumers will consume more goods that are relatively inexpensive and consume less valuable goods. Farmers as providers of labor factor are related with the income. If the main job does not meet all the needs of the household, then the rational farmer households will seek other employment alternatives outside their main job. One problem that is interesting to learn of the farm household is a complex interaction between production and consumption decision-making. It shows in an economic context, the goal is to achieve the satisfaction of households / maximum use of its available resources. Diversified economic activities in farming households can be studied consistently with the assumption that the activity is carried out based on the principle of utility maximization. In other words, the behavior of farmer households can be divided into three main groups; as a manufacturer, a source of labor and consumers of food and non food [3].

Seeing this problem, the researcher is interested in doing research on the economic behavior of household's rubber farmers in response to technological change to organic cultivation of conventional rubber in Musi Banyuasin. Based on the descriptions above, the research objectives are to compare the working hours of rubber farmers in conventional and organic rubber farming, to compare the level of production and income of conventional and organic rubber farming and to analyze changes in the consumption pattern of households of farmers who adopt organic rubber cultivation technology.

II. THEORETICAL FRAMEWORK

A. The Organic Rubber Farming

The principle of organic farming that is environmentally friendly does not pollute and damage the environment. In

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organic farming, compost and manure can replace chemical fertilizers to enrich the soil. Moreover, it can also use a plant belonging to the family Leguminosae eg, legumes, root nodules that can tie up nitrogen from the air and turn it into nitrogen that can be absorbed by plants. Meanwhile, the pesticides used in organic farming to combat pests and diseases is an organic pesticide [4]. Some plants that can be used as an organic pesticide is neem, tobacco, noni, mahogany, papaya, and others. These organic pesticides are harmless and easy to find, do not pollute the air and do not not poison the consumers because they can be unraveled and easy to obtain or plant in the garden [5].

The organic fertilizer is the result of the decomposition of organic materials broken down (dismantled) by microbes. The outcome of which could provide some nutrients that plants need for growth and development. Organic fertilizers are very important as a buffer to the physical, chemical, and biological soil so that it can improve fertilizer efficiency and land productivity. The effect of manure and compost to the improvement of soil fertility and increase crop yields has long been known. Manure can improve soil properties because it contains high levels of organic C, N, P, K, and has a high value of cation exchange capacity (CEC)[6].

B. Household Economic Activities

The definition of households based on CPM (2005) is a group of people living in part or all of the physical building and usually stay and eat from one kitchen. While farm household is a household that is at least one member of the household do farming or gardening, plant woody plants, raise fish in ponds, hunt or capture wildlife, commercialize livestock / poultry , or attempt in agricultural services with the aim of part or all of the results are to be sold or obtain income / profit on its own rehearsal (Census of Agriculture 2000).

Theoretically the household can be regarded as an economic unit whose behavior can be learned. The household is viewed as an economic unit that has a number of objectives to be fulfilled by utilizing a number of available resources. Analogous to household company (firm) in economic theory is an economic organization which aims to maximize profits by using a number of resources that are owned by the company. Their goals to be achieved and the number of available resources, the rational behavior of the company's organization can be studied. Similarly, the domestic unit can be studied if the household as a single economic unit has the objective to be achieved and there are a number of resources, which is certainly limited, which can be used for such purposes. The household objective is to maximize the utility function by utilizing a number of household resources. Households, therefore, must be assumed to be an economic unit that has a specific utility functions. If so, then the rational behavior is behavior towards a point of equilibrium to the maximum utility [7].

Economic behavior of farmer households is basically rational behavior in allocating domestic resources to produce goods and services, as well as in the use of goods and services

to meet the needs of the household [8]. Rational behavior of households in the allocation of resources can be grouped into a production decision, while rational behavior in the use of goods and services to meet the needs of the household can be grouped into consumption decisions. In addition, the farm households also act as providers of labor for the farming they earn [9].

The behavior of peasant households is shown from various economic activities, namely the allocation of labor, production and consumption. The behavior of economic activities farmer households, based on the primary objective, is to maximize the satisfaction of farm households. In the allocation of labor, peasant households with a position as a source of labor that aims for a wage use the workforce at their disposal to farming activities to reduce the cost of production [10]. In production activities, farm households as producers, who have the authority to determine the products they produce. In other words, farming households have power tips to determine the type of commodity they would try, taking into account the available resources. The behavior of the consumption side is that domestic farmers try to act as consumers. With the objective of maximizing satisfaction and the constraints of the budget line, another feature of the farmer's household consumption is the majority of the products consumed by the farmers' households [11].

The economic behavior of the peasant communities in the system of the rural economy is characterized by social networks that are less supportive, weak capacity in mobilizing the cooperation network with the modern institutional, increase its internal capacity to compete in the economic field and facing pressure from outside [12].

III. RESEARCH METHOD

This research was conducted in three villages in Musi Banyuasin, South Sumatra province namely Langkap Village, Lais, and North Lais. The choice of location is done intentionally (purposive) on the basis that this location is an area that most of the livelihood of rubber farming. The study was conducted in 2015. The research method used in this research is survey method. The sampling method used in this study is Proportionate Stratified Random Sampling against the peasant population in the group of organic rubber cultivation program of Lais, North and Langkap Lais villages. Each village consists of 30 farmer in which 10 farmers were taken as the sample from each village.

The calculation of working hours of peasant households from rubber farming was done byusing mathematical calculations as follows:

$$WHF = NF \times WD \times WH$$

$$WHF = \frac{JK_{total}}{JKS}$$

Notes :

HOK = Working Hours of Farmers

NF = Number of Farmers

WD = Working Days

JK = Working Hours

JKS = Standed Working Hours

Standard working hours in the above calculation use the provisions of Manpower and Transmigration (2007) that is equal to 7 hours. Then the calculation of household income of farmers of rubber farming according was performed by using a mathematical calculation as follows:

Revenue :

$$PNT = Y_i \times Py_i$$

Notes :

PNT = Total revenue

Y = Production for each farming

Py = Selling price

Total income :

$$\pi = PNT - BT$$

Notes :

π = Income per

Pn = Total income

BT = Total cost

Total household expenditures:

$$Pg.tot = Kpg + Knpg$$

$$Tb = \sum Pd - Pg.tot$$

Notes:

PG.tot= Total expenditure per year

K.pg = Food consumption

K.npg = Non-food consumption

Tb = Saving

Meanwhile, to see if there is any difference in working hours, income and expenses of conventional and organic household farmers is carried out by using tabulation and explained descriptively.

IV. RESULTS AND DISCUSSION

Overall, the age group of farmers who are still doing a lot of conventional and organic rubber farming is in the age group from 36 to 45 years old. Most of the farmers are physically productive farmers who are still able to work and generate economic household activities.

The level of education also has an effect for farmers in carrying out their farming. Higher education can assist farmers in taking a decision if the farmer is confronted by various obstacles associated with farming activities. In general, the level of formal education pursued by the farmers of conventional and organic rubber farming is still relatively low. Farmers education is very diverse starting from not completed primary school, elementary school, junior high school up to university. However, most of them had elementary education.

The number of household members can show the number of people who live together in the household. Member household consisting of a husband, wife, children and other relatives such

as parents, niece, or grandchildren. The number of household members looks quite varied, for instance, two people in one household and the most that amounted to 6 people in one household.

TABLE I:
SAMPLE PROFILE OF HOUSEHOLD FARMERS

No	Household Profile	Mean	Percentage (%)
1.	Age:		
	25-35	6	20,00
	36-45	10	33,00
	46-55	6	20,00
2.	56-65	8	27,00
	Education level:		
	Not finished with elementary education	3	10,00
	Elementary education	13	44,00
	Junior high school	6	20,00
3.	Senior high school	7	23,00
	Bachelor degree	1	3,00
	Family members:		
	1-2	2	6,66
4.	3-4	10	33,34
	5-6	16	53,34
	7-8	2	6,66
4.	Land area (Ha)	1-2,61	100,00

The land area is cultivated by growers ranging from 1 ha to 4 ha. Most of the farmers have a land with an area of 2.61 hectares. With enough land, it is expected that farmers are capable of producing large products so as to provide greater income for farmers, but it also must be balanced with their capital condition.

Working hours is the amount of time spent on household members for productive activities in rubber farming. Labor used in the conventional rubber and organic farming consists of labor in the family. Here is the outpouring of labor time on conventional rubber farming and organic rubber farming.

Before adopting organic farming techniques, farmers cultivate the rubber simply because of limited knowledge and capital. At the time of planting, they did not use a spacing so that the rubber trees scattered irregularly. Usually farmers use fertilizers with inorganic fertilizer with much lower doses than recommended. The condition of rubber plantations left not clean enough as there are weeds in the form of grass and other herbaceous plants. Tapping frequency does not comply with the rules, once in two days.

Organic rubber cultivation techniques uses enough material available around the settlement of farmers and does not cost money to get it. Local manufacture of micro organisms (MOL) farmers use raw materials such as bamboo shoots, banana weevil, maja fruit, vegetables and fruits that have been damaged, ss for helpers in the form of coconut water, rice water and brown sugar. In addition, the material is easily obtained, also the manufacturing process is not difficult and can be done by the farmers themselves [13].

In Table 2, it appears that there are differences of the conventional and organic farming activities, where there was an activity on conventional farming herbicide spraying

whereas in organic farming it did not exist. Besides a striking difference in fertilization activity, in which the organic one had more allocation of work time due to the allocation of time to make fertilizer MOL coupled with fertilization activity. Of all the rubber farming activity, it turns out the allocation of time working on organic farming more than the conventional one which is 56.32 hours/year.

TABLE II
SAMPLE TIME ALLOCATION OF CONVENTIONAL AND ORGANIC RUBBER FARMING

No	Activities	Conventional		Organic	
		hours/year	%	hours/yea	%
1.	Fertilization	12,7	5,4	64,3	22,1
2.	Weeding	37,0	15,7	3	16,8
3.	Spraying	3,0	1,2	48,9	0,0
4.	Tapping	171,4	72,9	1	56,2
5.	SlabMaking	10,74	4,6	0,0	4,9
				163,66	
				14,40	
Total		234,98	100,00	100,0	
				291,30	

Materials processed rubber produced by rubber farmers in the study area is in the form of a thick slab (slabs) with an average thickness of 35 cm with different dry rubber content. The freezing process of slab used a coagulant in the form of vinegar because the vinegar is easy to get, quick clumping and relatively cheap. Heavy slab was produced by farmers of about 50 to 100 kg in one chunk slab. Farmers undertake the processing of latex in the garden. After that the production of slab was taken to the farmhouse for a week in order to be sold later on. Some farmers even put the slab in the area and immediately sold to middlemen who come to the village of their area.

TABLE III
PRODUCTION, REVENUE, COST AND INCOME OF CONVENTIONAL AND ORGANIC RUBBER FARMING

Component	Conventional		Organic	
	Cult./yr	Ha/yr	Cult./yr	Ha/yr
1. Production (kg)	5,640	2,146	6,028	2,300
2. Price (IDR/kg)	8,000	8,000	8,000	8,000
3. Revenue(IDR000)	45,120	17,168	48,29	18,402
4. Cost(IDR000)	1,510	611	447	175
Income (IDR 000)	43,609	16,558	47.782	18,228

Table 3 above, it can also be seen that the organic rubber farm productivity is higher than that of conventional rubber farming. This difference is due to the organic rubber farming used organic fertilizers such as MOL. The use of MOL could increase the availability of nutrients and soil microbial survival and improve the physical structure of the soil. Organic materials provide a complete nutrient both macro and micro nutrients. Moreover, organic materials provide the materials needed soil microbes so as to maintain the viability of soil microbes that are beneficial to plant rubber, one of which is microbial decomposing organic matter. Thus the production of organic rubber increased compared to conventional rubber

farming using chemical-based fertilizers. Then by using organic fertilizers, stems become tender when tapped and the color of its leaves are green.

Furthermore, the highest costs are on the conventional farming fertilizer costs. On organic rubber farming, fertilizer cost is small since it was made by themselves with the materials which were already available in the environment so that farmers do not have to buy. Pesticides in organic farming theory is not used anymore. Overall organic rubber farming costs lower than conventional farming.

The selling price of rubber from organic farming is no different from conventional rubber, so that the revenue is higher in organic farming compared to the conventional farming just because of the difference in production rates. Moreover, organic rubber production costs are lower than on conventional. Therefore, the organic rubber farm income becomes significantly higher, Rp.1.670.119 / year or 10.09%. The overall revenue of rubber farmers remains low because at the time of conducting this research, the rubber prices went further down, Rp 8,000 / kg whereas it is usually priced 12,000 - 15,000/kg.

Besides, household expenditure analyzed in this study consisted of consumption of food, non-food consumption and savings. Food consumption expenditure consists of all spending of farmers to meet the needs of families eating and drinking include rice, fish, meat, chicken, vegetables, spices, fruit, sugar, gas, coffee, tea and cigarettes. Based on the results of the study, the most contributed food consumption was of tobacco (cigarettes) .It is in accordance with the facts on the ground because all the farmers sampled in the study area are active smokers

TABLE IV
TOTAL EXPENDITURE OF HOUSEHOLD FARMERS

No	Kind of Expenditure	Conventional		Organic	
		IDR000/year	%	IDR000/year	%
1.	Food consumption	12,336	28.3	13.497	28,3
2.	Non food consm.	22,755	52.2	22.850	47,8
3.	Saving	8,498	19.5	11.436	23,9
Total		43,609	100.0	47,782	100.0

Non-food consumption expenditure is expenditure incurred farmers for consumption other than food, such as clothing, personal care, communication, vehicle (motorcycle / car), petrol, education, health, and lighting. The results showed that the largest non-food consumption farmer is issued for the vehicle. Based on Table 4 it can be seen that the consumption expenditure of farmers predominantly for non-food consumption. Results occurred because many farmers are still having to pay a two-wheeler loan repayments each month. This research shows that spending patterns of conventional rubber farmers to organic unchanged.

Household saving is expenditure that farmers set aside for unexpected purposes. The form of savings in the form of cash deposited in the bank account itself is not because there are no banking facilities in the study area. Farm household savings in the area of research is the difference between total revenue and

total expenditure of households, because farmers typically do not have specific standards that must be set the money aside each month for savings. Although there are some farmers who earn high incomes but little savings for the farmer households have pretty much number of household members and the number of school age children.

With increasing farmers' income and savings switching to organic rubber farming increases the quality of their consumption of both food and non-food. The household consumption expenditure of rubber farmers when doing rubber farming organically is greater than the farm household consumption patterns while still doing conventional rubber farming.

V. CONCLUSION

The allocation of working time of rubber farmers in response to technological change to organic cultivation of conventional rubber is higher than farmers who undertake conventional rubber farming. The productivity of organic rubber farming is higher than conventional rubber farming. This difference is due to the organic rubber farming using organic fertilizer in the form of MOL to increase production. The level of organic rubber farm incomes greater than conventional rubber farming. The pattern of household consumption of rubber farmers relatively unchanged after they make organic rubber cultivation technology.

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