Analysis of comparative and competitive advantages of organic rice in Beringin Subdistrict of Deli Serdang Regency

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Abstract. Beringin Subdistrict is a region in Deli Serdang Regency with increasing organic rice cultivation area, hence this location was purposively selected as research location. This aim of this study was to analyze the comparative and competitive advantages besides analyzing the impact of government policy on organic rice in Beringin Subdistrict. The data used included primary and secondary data which were analyzed using the method of Policy Analysis Matrix (PAM). Results of the method of Policy Analysis Matrix (PAM) showed that organic rice farming performed by farmers had both comparative and competitive advantages as reflected by the less than one value of Domestic Resource Cost Ratio (DRCR) and Private Cost Ratio (PCR). Overall, government policy to input and output was found to be effectively implemented since the value of Effective Protection Coefficient (EPC) of organic rice was greater than one.

1. Introduction
Demand for rice in Indonesia continues to increase along with the rapid expansion of Indonesia population. Central Bureau of Statistics reported that rice consumption per capita of Indonesian was 111.58 kilogram per year [1]. This amount has decreased if compared to the previous year which 114.6 kg per year. Therefore, effort for increasing the production of food crops, particularly rice, still remains a priority in agricultural development because they are still the main source of food in Indonesia.

Various actions have been made to achieve maximum yield in order to meet the rising demand for foods. However, intensive effort to increase rice production is also accompanied by the tendency to use inorganic fertilizer and pesticide less-wisely, resulting in the disruption of ecological balance, thus adversely affects both environment and human. Therefore, farming technique which is safe and able to enhance the production by still maintaining the environmental quality is developed, known as organic farming technique or organic agriculture.

According to The World of Organic Agriculture Statistics and Emerging Trends that Indonesia had a total organic farming area of 130.384 Ha [2]. Market demand for organic agricultural product amounted to 72 billion USD, included the global demand for organic rice which reached 100 thousand ton per year, while Indonesia only had the capacity to export 9 thousand ton per planting season. This...
number was not even reached 10 percent of the world demand. As organic rice exporter, Indonesia is still far behind the neighboring countries, like Thailand and Vietnam. IFOAM has confirmed that Thailand and Vietnam are the world’s biggest organic rice exporter. It was observed that Thailand and Vietnam had already seen the market potential for organic agricultural products in the past, thus they have more advanced strategy for product development and regulations related to organic products.

This organic market opportunity is taken by farmers in Deli Serdang Regency which is one of organic rice production regencies in North Sumatera. Beringin Subdistrict has the largest planting area which produces the highest organic rice production in Deli Serdang Regency. Beringin Subdistrict had a planting area for organic rice of 43 Ha with production of 260.5 ton in 2013 [3]. The largest production was found in Karang Anyar Village with production of 134.2 ton and planting area of 22 ha. Organic rice production area in Karang Anyar Village increased during 2008-2015. Yet, this increase was not followed by good marketing, where the harvest was still sold on a local scale. The relatively low selling price of rice is Rp. 5,000 / kg and the high level of difficulty in managing organic rice farming causes the income of organic rice farmers to decrease. This might lead to the problem of unsustainable organic rice farming if the incentives received are relatively small.

Organic rice farming business will increase farmer’s income if it is appropriately managed and supported by effective policy. Public awareness of chemical-free food may potentially make organic rice as a main commodity if it has comparative and competitive advantages together with government policy support. For this reason, it is necessary to assess: 1) comparative and competitive advantages of organic rice farming and 2) government policy impact on organic rice farming.

2. Methodology

2.1. Location and method of sample determination
Research location in Beringin Subdistrict of Deli Serdang Regency was purposively selected. The area was chosen for its advantage as a certified organic rice production center in North Sumatera with increasing production.

Sample was determined through census where the technique involves all member within the population as sample. This technique is applied since the number of sample is relatively small, less than 30 peoples [4]. Total number of samples in this study was the same as total population of 20 peoples.

2.2. Types of data
The types of data were cross sectional data, while the data source was primary and secondary data. Primary data were obtained through direct interviews with respondents. Secondary data were obtained from the Bureau of Statistics Center (BPS) in Deli Serdang and Department of Agriculture, regency or subdistrict as well as the village, the results of the study, related publications and references.

2.3. Analysis methods
To assess the level of comparative and competitive advantages of strategic food commodity, approach to analyze domestic factor and tradable input use was applied. Analysis method used in this study was Policy Analysis Matrix (PAM). The model of Policy Analysis Matrix (PAM) is a matrix model that is able to assess comparative and competitive advantages besides measuring the government intervention and its impact on agribusiness system of a commodity, systematically and comprehensively [5].

The stage in PAM method applied in this study included: (1) Identify the input of organic rice farming thoroughly, (2) Determine the shadow price of input and output of organic rice farming, (3) Allocate costs to the group of tradable input and domestic factor, (4) Calculate revenue of organic rice farming, and (5) Measure and Analyze the indicators produced by PAM. The structure of PAM is systematically presented in Table 1.

The first row of PAM includes the calculation involving private price or the price received or paid by farmers. The second row is the calculation of cost and revenue at social price or efficiency price, in other words, social price is the price applied in a perfectly competitive market. The data of social price
were obtained from literatures, while secondary data were sourced from BPS.

Table 1. Policy analysis matrix [5].

| Description          | Revenue | Cost | Profit |
|----------------------|---------|------|--------|
|                      | Tradable Input | Non-Tradable Input |
| Private              | A       | B    | C      | D  |
| Social               | E       | F    | G      | H  |
| Policy Impact        | I       | J    | K      | L  |

Description:
A = private revenue, that is production quantity multiplied by market price (Rp)
B = tradable input multiplied by market price (Rp)
C = domestic factor (non-tradable input) multiplied by market price (Rp)
D = private profit = A-(B+C) (Rp)
E = social revenue, that is production quantity multiplied by social price (Rp)
F = tradable input multiplied by social price (Rp)
G = domestic factor (non-tradable input) multiplied by social price (Rp)
H = social profit = E-(F+G) (Rp)

Table 2. Formula of DRCR, PCR and other indicators in PAM.

| Criteria                                | Formula        |
|-----------------------------------------|----------------|
| Domestic Resource Cost Ratio            | DRCR = G/E-F   |
| Private Cost Ratio                      | PCR = C/A-B    |
| Output Transfer                         | OT = A-E       |
| Input Transfer                          | IT = B-F       |
| Net Transfer                            | NT = D-H       |
| Nominal Protection Coefficient Output   | NPCO = A/E     |
| Nominal Protection Coefficient Input    | NPCI = B/F     |
| Effective Protection Coefficient        | EPC = A-B/E-F  |
| Profitability Coefficient               | PC = D/H       |
| Subsidy Ratio to Producer               | SRP = L/E      |

Policy Analysis Matrix (PAM) was also applied to evaluate competitiveness of organic rice farming. Farming business analysis was done to determine the level of profit and return obtained by farmers on the input and output of rice farming. Data analysis using Policy Analysis Matrix (PAM) was conducted to evaluate comparative and competitive advantages of organic rice farming, measured at private and social prices.

DRCR is the indicator of comparative advantage which reflects the efficiency in using domestic...
factor to earn a unit of foreign exchange. Moreover, Private Cost Ratio (PCR) is the indicator of private profitability which shows the ability of a commodity system to pay domestic costs while remains competitive. A commodity has comparative and competitive advantages if DRCR<1 and PCR<1, respectively. The formula of DRCR, PCR, and other indicators is provided in Table 2.

Impact of government policy on output is determined from the value of government protection in output price. Nominal Protection Coefficient on Output is applied to measure the impact of government policy which causes the difference between output prices measured at private and social prices. If NPCO>1, there is government policy which hinders output export, such as tax[6–8].

Impact of government policy on tradable input is measured from the amount of government production on the price of tradable input. If NPCI>1, there is protection on input producer, thus input price is higher and will further disadvantage sectors using the input. If NPCI<1, there is barrier to export input, hence production is done using the domestic input or relying on the government incentive to producer [7,9].

Impact of government policy on input and output simultaneously observed from the higher value of government protection on the commodity as reflected by EPC. The value of Effective Protection Coefficient shows the direction of government policy, whether it protects or hinders the domestic production effectively. The value of EPC>1 indicates a high government protection in a production system of a commodity, while EPC value of less than one shows low government protection on the production system [6].

The value of Profitability Coefficient reflects the impact of government policy on profit gained by producers. If PC<1, the profit obtained by producer is lower compared to the situation where the government policy is not applied. Conversely, PC>1 means that government policy increases the profit obtained by producer.

Subsidy Ratio to Producer indicates the percentage of subsidy or net transfer on output revenue at shadow price. If SRP>1, government policy in the form of the existing subsidy has made producer to spend production cost lower than the opportunity cost to produce [7].

3. Results and discussion

3.1. Analysis of comparative and competitive advantages of organic rice

Table 3. Calculation result of PAM (Policy Analysis Matrix) of organic rice farming in Beringin Subdistrict of Deli Serdang Regency (in Rp).

| Description       | Revenue  | Tradable Input | Non-Tradable Input | Profit    |
|-------------------|----------|----------------|--------------------|-----------|
| **Private Price** | 14,345,000 | 547,625        | 3,289,250          | 10,508,125 |
| **Social Price**  | 14,481,880 | 4,203,489      | 2,822,600          | 7,455,791  |
| **Policy Impact** | -136,880  | -3,655,864     | 466,650            | 3,052,334  |

Organic rice farming in Beringin Subdistrict of Deli Serdang Regency obtained DRCR<1 of 0.27, showing that farming business had comparative advantage [5]. It also shows that opportunity cost of domestic resource of 27% is required to increase the value-added of output of domestic rice by 100%. Economically, fulfilling domestic demand by increasing domestic production is more profitable than importing products. The lower DRCR obtained, the more efficient resources used, thus organic rice farming was considered economically efficient and had comparative advantage. The results of these studies are the same as research from [2,6,7,10–12].
Organic rice farming in Beringin Subdistrict of Deli Serdang Regency had PCR<1 of 0.23, indicating that farming business had competitive advantage [10]. Furthermore, the value also depicts that farming business required cost of domestic factors of 23% to increase value-added of output by 100%. Lower PCR value means more efficient organic rice farming at private price and more competitive farming business. The results of these studies are the same as research from [6,7,10–13].

3.2. Analysis of policy impact

3.2.1. Government policy on output. Output Policy is applied on the commodity produced. The commodity investigated in this study was organic rice. Output policy in organic rice farming conducted in Beringin Subdistrict was analyzed through several indicators, such as:

1. Output transfer (OT)
   The value of output transfer obtained in organic rice farming in Beringin Subdistrict was negative Rp 136,880. The negative OT value indicates higher private revenue than social revenue due to lower domestic price of organic rice compared to its social price [5]. Simply put, domestic consumers paid a lower price than the price they should have paid for organic rice in the absence of market distortion and government policy. In fact, this policy was found to benefit domestic consumers for generating transfer (incentive) from farmers to consumer. Result of this study was similar to the research finding [6,7].

2. Nominal protection coefficient output (NPCO)
   Organic rice farming in Beringin Subdistrict had NPCO<1 of 0.99, showing that domestic revenue of organic rice was lower than its social revenue [6,7]. This indicates that government policy in protecting farmers was not yet effective, thus farmers obtained lower revenue. The low price of organic rice received by farmers was due to farmers’ lack of information about price and market network. The study result was similar to other study [6,7].

3.2.2. Government policy on input. Input policy is government policy on input of agricultural production such as subsidy or tax on agricultural raw materials. Input policy in organic rice farming in Beringin Subdistrict was analyzed through some indicators, those are:

1. Input transfer (IT)
   Input Transfer (IT) is the indicator to measure the extent of divergence (policy distortion) in tradable input. The value of IT in PAM table was Rp 3,655,864, portraying that farmers paid a lower price for tradable input, that was Rp 3,655,864, compared to its social price [5]. This situation was caused by government policy in the form of price subsidy applied on tradable input at farmer level, thus farmers paid lower price for tradable input. This result matched the result outcome [7,12].

2. Nominal protection coefficient input (NPCI)
   Nominal Protection Coefficient Input (NPCI) reveals the extent of incentive provided by the government on tradable input. Organic rice farming obtained NPCI<1, namely 0.13. This value indicated that import tariff and subsidy on tradable input has made farming business to only pay 13% of the cost supposedly paid in the absence of policy [5]. This finding was approaching the other study results [10,12,14].

3. Transfer factor (TF)
   Transfer Factor (TF) reflects divergences or differences between the cost of non-tradable input at private and social prices. The TF value obtained by organic rice farming in research site was Rp 466,650, indicating that farmers paid higher price for non-tradable input [5]. This result was similar to the study on rice commodity [12].

3.2.3. Government policy on input and output. Policy on input and output investigates the impact of the combination of all policies applied on the commodity and the tradable and non-tradable input. Input-output policy implemented in organic rice farming in Beringin Subdistrict was analyzed through several indicators, namely:

1. Net transfer (NT)
Net transfer (NT) shows accumulation of input transfer and output transfer. Net Transfer (NT) obtained in organic rice farming was positive or NT>0 of Rp. 3,052,334. This depicts producer surplus due to the existence of government policy on input and output [5]. This finding was the same as result of study on rice commodity [15].

2. Effective protection coefficient (EPC)
Effective Protection Coefficient (EPC) reflects the effectiveness of overall government policy. If EPC>1, government policy is considered effective to protect farming business, vice versa. The value of Effective Protection Coefficient of organic rice farming >1, that was 1.3. The greater than one value of EPC indicated that government policy on input-output for organic rice commodity in research location has been effectively applied [5]. This outcome was similar to the result of study on rice commodity [13].

3. Profitability coefficient (PC)
Profitability Coefficient (PC) is the ratio that measures the impact of transfers, both output transfer and input transfer, to the actual profit of farming business. The value of Profitability Coefficient of organic rice farming in Beringin Subdistrict >0, namely 1.4. This value shows that private profit of organic rice farming was 1.4 higher than the profit [5]. Hence, government policy resulted in greater amount of profit received by producer. This result was in accordance with the finding of study on rice commodity [12].

4. Subsidy Ratio to Producer (SRP)
Subsidy Ratio to Producer (SRP) is the comparison between net transfer and output value at social price (social revenue). The value of SRP indicates the increasing or decreasing revenue of a commodity due to government intervention. The value of Subsidy Ratio to Producer (SRP) in this study was positive 0.21. This finding shows that government policy applied in organic rice farming has made farmers to spend cost on production that was 21% lower than the opportunity cost. Result of this study was similar to the finding of study on rice commodity [14].

4. Conclusions
Organic rice farming was found to have both comparative and competitive advantages as shown by the value of DRCR<1 of 0.27 and PCR<1 of 0.23. Organic rice farming obtained NPCO<1 of 0.99, indicating that domestic revenue of organic rice was lower than its social revenue, thus government policy to protect farmers was not yet effective. Government policy related to input NPCI<1 of 0.13 was already able to protect organic rice farming. The value of EPC>1 of 1.3 reflects that government policy on input-output of organic rice commodity in research site has been effectively applied. The value of Profitability Coefficient (PC) of organic rice farming >0 of 1.4 reveals that private profit of organic rice farming was 1.4 higher than its social profit. The value of Subsidy Ratio to Producers (SRP) of organic rice farming in Beringin Subdistrict was 0.21, showing that government policy has made farmers to spend less on production cost.

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