Evaluation of Vegetable Farming Systems for Competitiveness in Upland Areas of Java and Sumatra, Indonesia

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Abstract

Vegetable productions in Indonesia are concentrated in upland areas. Main products such as cabbage, potato, carrot, and chilli, have important roles as source of farmer's income, job opportunity, poverty alleviation and improvement of food security. The big potential of vegetable production is based on the current consumption rate, increasing domestic population especially in urban areas and exporting to abroad markets as well. These phenomenons attract these commodities to be developed and extended.

However, the facts of vegetable markets in Indonesia generally were that export and import volume high fluctuate, especially since Indonesia was attacked by multidimensional crisis in 1997 and 1998. This study was focused on to find out the appropriate vegetables regarding profitability, sustainability and competitiveness of vegetable farming systems.

After seeking the literature, it was necessary to collect primary data in the investigated regions. This data collection was carried out in three upland areas in Pangalengan, Kejajar and Berastagi by analyzing two villages in each with main vegetable producer in order to characterize the typical physical condition of agro ecology. It is then applied a respondent classification based on commodity on these two villages in each region. In each village 25 respondents were interviewed. The number of all respondents in all regions is 150 farmers. The Private Cost Ratio (PCR) for competitive advantage, Domestic Resource Cost (DRC) for comparative advantage, and Analytical Hierarchy Process (AHP) for highest priority product were used in this study, especially for calculation of economical value.

This research shows that vegetable farming system (VFS) in upland areas of Indonesia is profitable, especially for potato in Pangalengan and in Berastagi, cabbage, tomato, broccoli, chilli, leek and carrot, but not for potato in Kejajar. Most of vegetable products have also comparative and competitive advantages, except potato in Kejajar. Social and economic analysis of all vegetable farming systems can be sustainable. In sustainability perspective, there is a big problem of erosion especially in Kejajar. It can be solved by the government intervention. Based on profitability aspect and sustainability perspective, the highest priority product to be cultivated in upland area is potato especially if it is combined by other commodities.

Therefore it can be concluded that potato represented most valuable commodity, because it was planted in three regions and their competitiveness based on economical, social, environmental profitability, competitive and comparative advantages. The results were not so good for growing of potato in Kejajar. It can be caused from the high level of erosion.

Some tools are necessary to be developed by the government which makes the decision in order to solve the problem and to support the development of vegetables farming system in upland areas, e.g. technical assistance, improving the quality and safety standards of products, developing competitive agribusiness areas, especially for potato and cabbage as export and import substitution products based on the agro ecosystem advantage or infra structural in each region.

2. Background and Aims of the Study

In a huge and fertile country like Indonesia, there is a widespread agricultural sector in each region. Indonesia is a big growth and production centre for vegetable. Vegetables are one of the important agricultural products in Indonesia for the reason that their high potential productions, beside its increasing demand that reflected in its consumption rate, for example in Singapore one

of exporting country, the average of vegetables consumption rate 82.4 kg/capita/year and have a tendency to raise which is correlated with increasing income (Siew Moi, 2002). Increasing demands in international and national markets attract these commodities to be developed and extended. Consumption of vegetable in Indonesia was 6.067.004 metric ton in 2002 (FAO, 2004). This number was constant relatively in period 1996-2002. On the average approximately 25,8 number calorie, 1,2 gram protein and 0,2 gram fat of vegetable were consumed per person per day in 2002 (FAO, 2004). However, quantities and types of vegetable consumed very considerably among rural and urban consumers, ethnic groups and income groups.

Although Indonesia has a surplus in trade, but in the last 15 years the vegetable imports are growing slightly faster than exports. The consequence is that the vegetable import-export ratio has grown from 0.32 between years 1985-1990 in comparison to 1996-1999, which has a ratio of 0.75. In other words, the trade balance of this commodity tends to lead to a deficit, whether in quantity or in trade value. This shows that the market chances that have grown because of the strong free trade nowadays, has not been used optimally.

However, the fact of vegetable markets in Indonesia generally were that import and export volume high fluctuate, especially since Indonesia was attacked by multidimension crisis including agricultural economic crisis in 1997 and 1998. The inudating of the vegetable product import and export are caused by the competitiveness decreasing of domestic products since import products have better quality and competitive price. Therefore, something needs to be done to return the competitiveness of vegetable productions in the international market.

Analyzed secondary data shows the price stability in general negatively links up with the products spatial concentration (Saptana, 2004). In comparison to other commodities, vegetable production tends to concentrate in one certain area. West Java, Central Java, and North Sumatera are the top three in Indonesia in category in producing main vegetables, that are the commodity of vegetables contributed the production proportion of more than 65% (Deptan, 2004). One of the vegetable production centres in West Java is Pangalengan regency, in North Sumatra is Brastagi and Simpang Empat regency, and Central Java is Wonosobo regency. Based on this consideration, these three areas are chosen as research areas. The ability of those regency to produce vegetable are influenced by the natural resource support, the farm operation intensification, and the government policy. But nowadays, phenomenon of productivity decreasing happens also in these three research areas as the result of the farm operation which tends to be exploitative without considering the continuous aspect of the resources used. This type of production structure is not beneficial for the price stability, because the production anomaly that occur around one production centre can give a significant effect to the short-term price balance. Furthermore, the trade arrangement costs in the producer's area for consumers are relatively high.

Based on the above explanation, the objectives of the study are to analyse:

1. Private and social profitabilities and competitiveness of the main vegetable commodity farming system in upland area of Java and Sumatra.
2. Sustainability aspect of vegetable farming system.
3. The most priority commodity to be done in upland area of Java and Sumatra.

3. Methods

3.1. Basic Method and Data Collecting

This research is started by collecting data, confirming relevant data which is then continued by classifying and describing the fact for the analysis so that the result is a based–on theory explanation. Primary data collecting is accomplished by using sampling method in which the research carried out focuses on the actual problem-solving by taking data in actual way. Secondary data is collected from country, province, sub district, district level and it is gained from Statistic Central Committee of the related institution.

3.2. Sampling Method

This research was carried out for 8 months in the catchment area in Pangalengan, Kejajar, and Berastagi-Simpang Empat by using two fields of main vegetable commodities producer located in each region in order to uniform the physical condition of agroecology. The idea of the chosen field decision was done in purposive way by considering that these two fields have unaminty of vegetable commodities potency and business; resource potency; employee; and accessibility, and also they can grow as commodity centre of certain business. Besides, both of the fields in each region are related to the current issues of conservation. On these two fields in each region then, it is applied respondent classification based on commodity. After the class is formed, the writer was choosen the respondent randomly with proportional number at each class. In each field of region, the writer took 25 respondent, so that the total amount are 50 respondent. The whole number of respondent in all regions was 150 farmers.

3.3. Analytical Phase

The analysis is done in several steps. They are :

1. Identifying all the inputs used and the outputs got from the farm operation of main vegetable.
2. Accomplishing sustainable analysis.
3. Accomplishing tradable and non tradable input allocation.
4. Accomplishing domestic and foreign input allocation.
5. Estimating and determining the estimated cost of the input, the output, and the exchange rate value.
6. Applying profitabilities analysis by counting private and social revenue toward the cost ratio (R/C).
7. Applying competitive advantage and comparative advantage analysis by counting the value of PCR and DRC.
8. Determining sustainability aspect based on erosion level area through map overlay analysis and calculation of erosion number with universal soil loss equation (USLE) method.
9. Determining the most priority vegetable commodity by using AHP method.

4. Results

4.1. Financial Analysis, Economic Analysis and Environmental Cost

From table 1, it can be seen that vegetable farming system in Pangalengan, especially for that of potato, headed cabbage and tomato are very profitable, financially and economically. The R/C values, based on the financial analysis of each commodity, are as the following: 1.20, 1.25, and 1.59 for potato, headed cabbage, and tomato. While, the R/C values based on the economic analysis for the three commodities increase, that are 1.23 for potato, 3.32 for headed cabbage and 3.74 for tomato. This happened because the increasing intake value as the result of the border price of both free on board (FOB) and cost in freight (CIF), which is higher compared to the producer price in the research areas.

Meanwhile, the analysis of vegetable farming for potato, headed cabbage, and red chilli in Kejajar can be seen in table 2. Headed cabbage and red chilli are profitable financially and economically, but they are not like potato that does not give any other profit to farmers. The R/C values for potato, headed cabbage, and red chilli are as the followings: 0.92, 2.63, and 2.07. The R/C values for the economic analysis for headed cabbage and red chilli also increase because of the increase intake value as the result of the border price of both FOB and CIF, which are 8.16 for headed cabbage and 6.48 for red chilli. On the other hand, the R/C value for potato economically decreases, that is 0.91.

Table 1. Profitability Analysis of Vegetables Farming System, Pangalengan, 2005

COMMODITY/ITEM	Financial Value	Economical Value	Economical Value and Environmental Externality
Potato			
A. Revenue	176,002,574.20	157,028,423.8	157,028,423.8
B. Cost	146,397,198.61	127.945.639.91	131,058,834.78
C. Profit	29.605.375.57	29.082.783.87	25,969,589.01
D. R/C	**1.20**	**1.23**	**1.20**
Headed cabbage			
A. Revenue	54,519,288.55	278,245,337.5	278,245,337.5
B. Cost	46.286.405.46	83,786,016	86,899,210.96
C. Profit	11.647.588.36	194,459,321	191.346.127
D. R/C	**1.25**	**3.32**	**3.20**
Tomato			
A. Revenue	149,624,537.04	362,724,153.32	362,724,153.32
B. Cost	94,367,958.87	97,096,782.49	100.209.977.36
Environmental Cost			3,113,194.87
D. R/C	**1.59**	**3.74**	**3.62**

Source: Primary Data, analyzed

Table 2. Profitability Analysis of Vegetables Farming System, Kejajar, 2005

COMMODITY/ITEM	Financial Value	Economical Value	Economical Value and Environmental Externality
Potato			
A. Revenue	92,582,053.3	88,240,573.02	88,240,573.02
B. Cost	100,080,950.3	96,813,346.81	102,743,001
C. Profit	-7,498,896.96	-8,572,773.787	-14,502,428.47
D. R/C	**0.92**	**0.91**	**0.86**
Headed cabbage			
A. Revenue	24,066,666.67	146,864,945	146,864,945
B. Cost	9,150,180.28	17,987,490.08	23,917,145
C. Profit	14,916,486.39	128,877,454.9	122,947,800.26
D. R/C	**2.63**	**8.16**	**6.14**
Red Chilli			
A. Revenue	124,031,250		376,812,401
B. Cost	59,841,000	58,112,887.27	64,042,542
Environmental Cost	64,190,250	318,699,513.7	312,769,859.02
D. R/C	**2.07**	**6.48**	**5.88**

Source: Primary Data, analyzed

The analysis of vegetable farming system for headed cabbage, leek and cauliflower in the Berastagi and Simpang Empat areas are in table 3. Headed cabbage, leek and cauliflower are profitable financially and economically, and this can be seen from the R/C values for the three commodities which are 1.78, 2.20, 2.53 (financial value) and 2.23, 1.51 and 2.32 (economical value) for headed cabbage, leek and cauliflower. The R/C value for the economic analysis for potato increases because of the export price of potato (FOB). However, this is not the case with leek and cauliflower, as the economic R/C values decrease. Financial, economical and environmental externality values between three research areas are different. It is caused by the

difference of market price of inputs and outputs, accessibility, infrastructure, marketing system, social condition of the farmers and erosion level in each region.

Table 3. Profitability Analysis of Vegetables Farming System, Berastagi Simpang Empat, 2005

COMMODITY/ITEM	Financial Value	Economical Value	Economical Value and Environmental Externality
Headed cabbage			
A. Revenue	168,173,280.4	278485698.9	278,485,699
B. Cost	94,536,629.26	122872638.2	125,340,398
C. Profit	73,636,651.17	155613060.7	153,145,300.94
D. R/C	**1.78**	**2.23**	**2.22**
Leek			
A. Revenue	137,907,618.3	110.336.271	104,371,902
B. Cost	62,579,002.1	72.839.431.78	**47,460,048**
C. Profit	75,328,616.17	37.496.839.26	**35,029,079.47**
D. R/C	**2.20**	**1.51**	**1.47**
Cauliflower			
A. Revenue	98.106.000	104.371.901.7	104,371,902
B. Cost	38.795.149.64	44.992.288.4	**47,460,048**
Environmental Cost	59.310.850.36	59.379.613.32	**56,911,853.53**
D. R/C	**2.53**	**2.32**	**2.20**

Source: Primary data, analyzed

4.2. Competitive and Comparative Advantages Analysis of Vegetable Farming System in Upland Areas

To have comparative and competitive advantages, PCR and CDRC values should be below 1. Table 4 shows that most of the vegetable farming systems in the upland areas have competitive and comparative advantage, which can be seen from the PCR and CDRC values which are below 1.

Tabel 4. *PCR* Value of Vegetables Commodity, Three Research Locations, 2005

No	Area	Commodity	PCR Value	CDRC Value	Meaning
1	Pangalengan	Potatoes	0.78	0.77	Have competitive advantage
2	Pangalengan	Headed cabbages	0.74	0.16	Have competitive advantage
3	Pangalengan	Tomatoes	0.54	0.18	Have competitive advantage
4	Kejajar	Potatoes	1.15	1.19	Lack of competitive advantage
5	Kejajar	Headed cabbages	0.27	0.09	Have competitive advantage
6	Kejajar	Red chillies	0.45	0.13	Have competitive advantage
7	Berastagi	Headed cabbages	0.46	0.27	Have competitive advantage
8	Berastagi	Leeks	0.41	0.47	Have competitive advantage
9	Berastagi	Cauliflowers	0.32	0.33	Have competitive advantage

Source: Primary data, analyzed

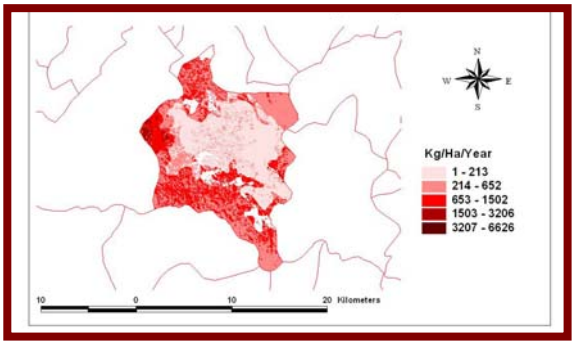
However, in Kejajar area, potato as a commodity does not have competitive and comparative advantages, which means this commodity is not efficient financially and economically in the use of domestic resources. The explanations of this condition are: (1) there is serious erosion problem in Kejajar, (2) farmers use some chemical inputs which are much higher than its recommendation and (3) farmer's accessibility to the potatoes market price is limited. In

table 4 can be seen that headed cabbage is cultivated in the three research areas. Even potato in Kejajar has no competitiveness, but headed cabbage in this area is competitive. It is caused by better climate condition and time rotation in Kejajar.

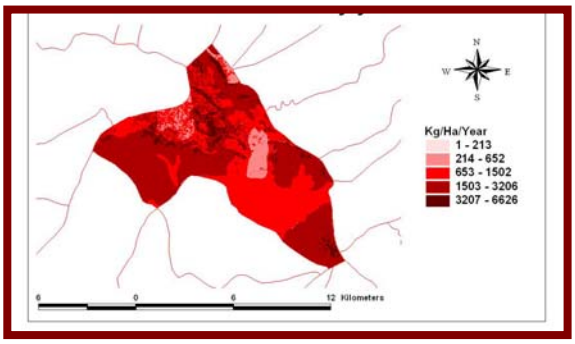
4.3. Determining Erosion Level Area through Map Overlay Analysis and Calculation of Erosion Number with USLE Method

In Pangalengan area, erosion occurrences are unlike those in Berastagi and Kejajar Wonosobo that are very severe. Most parts in Pangalengan area indeed experience erosions with low volume, which is < 213 ton/ha (figure 1). Most parts in Kejajar area experience erosion more than 500 ton/ha/year, even certain locations experience erosions with volume reaching 3000-6000 ton/ha/year. This condition is caused by people who cut trees in the forest area in order to get more fertile lands to cultivate vegetable. They did it without government permission and good management. This surely requires yearly attention. In figure 2, the condition shows how serious the erosions are, that if no intensive actions are taken, the economic activities, especially vegetable farming, will not last. This will also result in negative externalities to the community along the streams of Serayu River.

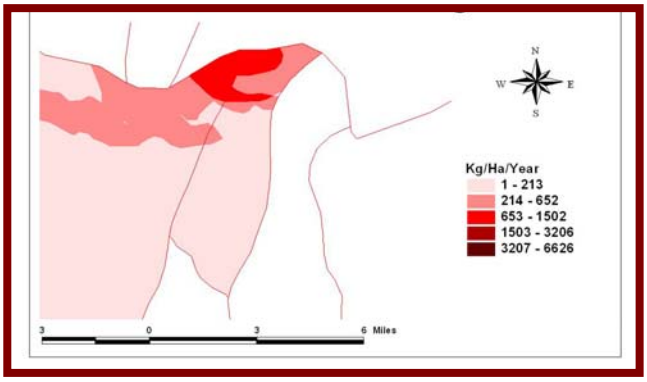
In Berastagi and Simpang Empat (figure 3), the highest erosion value is in the northern part of the region. The erosion value in this area reaches 1503-3206 ton/ha/year. But, the picture above also shows that most parts of the research area experience erosion that are less severe with the volume around <652 ton/ha/year.



Source: Primary Data, analyzed
Figure 1. Erosion Value in Pangalengan, 2005



Source: Primary Data, analysed
Figure 2. Erosion Value in Kejajar Wonosobo, 2005.



Source: Primary Data, analysed

Figure 3. Erosion Value in Berastagi and Simpang Empat, 2005

5. Conclusion and Recommendations

Vegetable farming systems in the three investigated regions are extremely different. It can be seen from:

1.The variety of vegetable crops which are planted.
2.The different value of profitability, competitive and comparative advantages for potato and head cabbage.
3.The different value of erosion, whereas Kejajar has the highest erosion level.

Therefore it can be concluded that potato and headed cabbage represented most valuable commodity, because potato was planted in two regions, headed cabbage was planted in three regions and their competitiveness based on economical, social, environmental profitability, competitive and comparative advantages. The results were not so good for growing of potatoes in Kejajar. It can be caused from the high level of erosion.

Some tools are necessary to increase competitiveness of potato and to overcome the erosion problem in Kejajar. Government should develop regulations, such as technical assistance, developing recovery land system in the erosion areas, developing vegetable cultivation in the middle-land areas, developing competitive agribusiness areas, especially for potato in Pangalengan and headed cabbage in Kejajar as export and import substitution products based on the agro ecosystem advantage or infra structural in each region.

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