



Tropentag 2007  
University of Kassel-Witzenhausen and  
University of Göttingen, October 9-11, 2007

Conference on International Agricultural Research for Development

---

**Resource Use Efficiency and Competitiveness of Vegetable Farming Systems in Upland Areas of Indonesia**

Idha Widi Arsanti<sup>a</sup>, Michael H. Böhme<sup>a</sup>, Hans E. Jahnke<sup>b</sup>

<sup>a</sup> Humboldt University Berlin, Horticultural Plant Systems, Lentzeallee 75, 14195 Berlin, Germany

<sup>b</sup> Humboldt-University Berlin, Development Planning and Project Management, Philippstr. 13, 10115 Berlin Germany

**Introduction**

Globalization and free trade are phenomena that have triggered a new set of challenges and opportunities for developing countries. Even, rapid population growth and increased incomes are raising the demand for vegetables; the developing countries should attempt to attain a competitive position in the global market place. For Indonesia in particular as one of the biggest vegetable producing country compare to the Asian vegetable producing countries (FAO, 2004), there is need to simplify production and marketing systems of vegetables in order to ensure optimal use of the scarce resource in their possession. Successful participation in this new dynamic world economy requires that obstacles to global economic integration like government intervention in both local and international market are minimized. To seize competitiveness in production and trade in key products like vegetables, farmers must operate efficiently so as to maintain production and export costs at the lower end.

Competitiveness is described in term of resource use efficiency (Krugman, 1994), while Josling and Babinard, 1999, try to explain the bases for competitive advantage and disadvantage. It is presumed that competitive advantage depends on cost competitiveness, product quality or a combination of both. Vegetable competitiveness can be analyzed according to: (1) foreign trade analysis, (2) ratios based and account standard and (3) productivity and efficiency measures.

Furthermore, the Vegetable Farming System (VFS) competitiveness should be sustained. Barney, 1991, shows that there are four characteristics of resource that lead to sustain VFS competitiveness, namely the resource must be valuable, must be rare, must be inimitable by competitors and can not be substitutes easily.

As have been known, vegetables remain one of the leading products in international commerce that is produced in many countries thorough the temperate and tropical regions. In Indonesia vegetable production constitutes one of the key economics sectors that receive a great deal of government intervention, mainly for reason such as self sufficiency and rural equity, although the efficiency implications are questionable. Vegetable farming systems differ significantly from one area to another as can be seen from: (1) different species of vegetable crops which are cultivated and (2) the different values of profitability, competitive and comparative advantages indicators (Arsanti and Böhme, 2007). However as of recent, vegetables in Indonesia face many problems such as low growth in production and high fluctuation in import volume, export volume and price. In order to overcome these problems, it is necessary to analyze resource use and

competitiveness of VFS using accounting standards based-on domestic resource cost and Policy Analysis Matrix (PAM) including private cost ratio (PCR) and coefficient of domestic resource cost (CDRC).

## **Material and Methods**

The information and data from the literature were not sufficient to get answers to all the questions. Therefore it was necessary to collect primary data in the investigated regions. This data collection was conducted in three vegetable production centers in upland areas, namely (1) Pangalengan, West Java Province, (2) Keajar, Central Java Province and (3) Berastagi-Simpang Empat, North Sumatra Province. These three provinces were the top three producers of main vegetables in Indonesia, altogether contributing over 65% of the national production (MOA, 2004). Moreover, these main cultivation areas were supported by natural resources, intense farming system programs and government policies.

To have a standardized physical condition of agro-ecology, the study purposively focussed on 2 selected fields in each area within the same watershed area. Then it was applied to a respondent classification based on type of vegetables in each region. The respondents, based on stratified random sampling, selected from the fields, of 25 farmers in each fields, comprised 150 farmers.

Afterward, several attempts during the data analysing process were conducted, including the descriptive analysis and PAM methods. Steps during the analytical phase are as follows:

- (1) Identifying social and economic conditions.
- (2) Accomplishing tradable inputs (e.g. fertilizer, fungicide) and non tradable inputs or domestic factors (e.g. labour, land rent) allocation.
- (3) Estimating and determining the estimated cost of input, output and exchange rate.
- (4) Applying competitive and comparative advantage analysis by counting the value of the PCR and CDRC based on PAM methods.

## **Results and Discussion**

In general, to have competitive and comparative advantages in the VFS, the PCR and CDRC values should be below 1. It means that a country saves scarce resources, especially foreign exchange, if it expands the production of vegetables. The reverse is true in a situation where the PCR and CDRC ratio is greater than one. The PCR is a measure of competitive advantage and the CDRC indicates comparative advantage (Monke and Pearson, 1995).

Results suggest that VFS in upland areas of Indonesia is the important income activity of the farmers and that they use resources efficiently and are conscious of the competitiveness of the vegetable crops. It can be seen in Table 1, where most of the PCR and CDRC values are lower than 1. It indicates that VFS in upland areas have competitive and comparative advantages and also means that the domestic resource value of production is lower than the output level measured in the world market prices. Furthermore, domestic production for most vegetable products is either efficient or internationally competitive because the opportunity costs of domestic resources are lower than the net income exchange value.

The PCR value for all of the activities investigated are below 1. This indicates the competitive advantages or private profits for the farmers as they produce more value added of vegetables than domestic resource costs. It also means that they can cover tradable input costs. However, in Berastagi-Simpang Empat, headed cabbages do not have comparative advantage ( $CDRC > 1$ ) which means these products are not socially efficient for domestic resources. This can be explained as: (1) market values of lands for headed cabbages' cultivation, which are due to price and other policy distortion, which depresses their rental values; (2) farmers use some chemical

input which is much higher level than that recommended one; (3) cost per unit is high; (4) productivity is low and (5) farmers' accessibility to the headed cabbages' market prices is limited. These conditions bring about poor competition in the international market. Although it is socially unprofitable for domestic farmers to remain in headed cabbage production, it is still considered profitable to the economy as a whole to continue producing and even to expand domestic headed cabbage production in Berastagi-Simpang Empat as long as the government policy makes possible to improve efficiency in the use of resources.

Table 1. Competitive and Comparative Advantages Indicators of Vegetable Farming Systems, 2005

Area/Product	PCR	CDRC
<i>Pangalengan</i>		
Potatoes	0.50	0.48
Headed cabbages	0.89	0.48
Tomatoes	0.80	0.27
<i>Kejajar</i>		
Potatoes	0.61	0.64
Headed cabbages	0.64	0.67
<i>Berastagi-Simpang Empat</i>		
Potatoes	0.30	0.84
Headed cabbages	0.75	1.16
Carrots	0.77	0.70

The competition that emerged from liberalization undermines the efficiency and the positive private profit of headed cabbage production in Berastagi-Simpang Empat on the one hand, but it improves the social profitability and narrowing down the gap between domestic prices and world prices. This is in line with most policy reform objectives in eliminating distortions within domestic markets and bringing domestic prices closer to world prices. Liefert (1994) states that policy reform should be able to eliminate all support to producers and consumers and accept world prices as the single determinant of domestic price.

As concerns production system, it can be said that VFS in upland areas of Indonesia have been intensively applied, as supported by their characteristics are as follows: (1) small scale farmers; (2) often rain fed; (3) dispersed cropping; (4) high input system (5) monoculture, (6) relatively young farmers, 31-40 years old, with proper educational background and an open mind to technology innovation and (7) the use of human resource of mainly hired labour. From the marketing view, vegetable products are distributed and marketed towards a complex network system of wholesalers and retailers. The vegetable products sometimes would travel a long way resulting in less efficient distribution.

From Table 2, it can be seen that public policy and market conditions provide incentive to expand VFS in Java (Pangalengan and Kejajar). Here, all vegetables offer positive and high private and social profits. However, private profits are much higher than social profits for potatoes and headed cabbages in Sumatra (Berastagi-Simpang Empat). This indicates that the protective policies seem to be more conducive for the expansion of vegetable productions. On the other hand, this condition shows a higher degree of imperfection in the market.

Furthermore, potatoes are the high value vegetable crops, because potatoes are cultivated in the three research areas and in general the profitability of potatoes is greater than of other vegetables. In Berastagi-Simpang Empat potatoes are much more profitable than in other areas. The

revenues differ among the three investigated regions. In Pangalengan and Berastagi-Simpang Empat potato farmers are in a better condition, they earn above the normal rate of return.

Most of all social prices for vegetables are higher than private prices except potatoes and carrots in Berastagi-Simpang Empat. As far as output prices are concerned, Indonesia would be an important potential vegetable producing country instead of being an importer. Unfortunately, world market prices for potatoes and carrots from Berastagi-Simpang Empat are lower than the domestic production costs. From development world market competitiveness as well as from the negative social profit for headed cabbages in Berastagi-Simpang Empat points of view, it is suggested that this area would better be abandoned for production.

Table 2. Policy Analysis Matrix of Vegetable Farming Systems, 2005

Area/Product/Item	Revenues	Tradable Inputs	Domestic Factors	Profits
<i>Pangalengan</i>				
<i>Potatoes</i>				
Private	171,475,651.1	25,329,721.1	73,129,038.9	73,016,891.1
Social	264,744,405.1	44,490,693.5	105,084,848.5	149,575,541.9
Divergences	-93,268,754	-19,160,972.4	-31,955,809.6	-76,558,650.8
<i>Headed cabbages</i>				
Private	57,109,566.3	12,530,416.5	39,624,202.7	4,954,947.2
Social	121,790,200.6	19,579,335.3	19,579,335.3	53,036,420.2
Divergences	-64,680,634.3	-7,048,918.8	20,044,867.4	-48,081,473
<i>Tomatoes</i>				
Private	114,280,092.6	25,539,918.9	71,202,355.4	50,557,217.3
Social	422,263,048.7	44,700,891.3	103,033,998.3	292,233,768.1
Divergences	-307,982,956.1	-19,160,972.4	-31,831,642.9	-241,676,550.8
<i>Kejajar</i>				
<i>Potatoes</i>				
Private	92,582,053.3	15,211,976.1	47,673,530.5	29,696,546.7
Social	166,439,427.2	19,922,462.1	94,050,984.4	52,465,980.7
Divergences	-73,857,373.9	-4,710,485.9	-46,377,454	-22,769,434
<i>Headed cabbages</i>				
Private	30,280,000	1,880,295.9	18,209,031.1	10,190,673
Social	96,841,205.9	4,957,645.8	61,404,358.7	30,479,201.5
Divergences	-66,561,205.9	-3,077,349.9	-43,195,327.6	-20,288,528.5
<i>Berastagi-Simpang Empat</i>				
<i>Potatoes</i>				
Private	231,604,761.9	25,159,425.2	60,862,186.6	141,583,150.2
Social	145,205,196	26,730,838.1	99,406,336.1	19,068,021.8
Divergences	86,399,565.9	-1,571,412.9	-38,544,149.5	122,515,128.4
<i>Headed cabbages</i>				
Private	50,656,335.2	8,834,872.5	31,355,925.35	75,136,369
Social	10,465,537.4	9,822,017.1	76,165,019.1	-10,850,667.1
Divergences	40,190,797.8	-987,144.6	-44,809,093.7	85,987,036.1
<i>Carrots</i>				
Private	52,540,309.31	7,514,801.2	34,509,361.7	10,516,146.4
Social	137,619,980.7	14,636,704.5	86,429,241.9	36,554,034.3
Divergences	-85,079,631.4	-7,121,903.2	-51,919,880.3	-26,037,887.9

While farmers are getting higher prices for the outputs, at the same time they are also paying higher prices for the inputs than the world price. The reason for higher prices of tradable inputs is due to the policy distortion resulting from import duties imposed on them. Thus, instead of providing subsidies, the government imposes import duties on tradable inputs causing an increase in domestic market prices. This policy creates a positive transfer shown by the negative divergences between private and social values of tradable inputs. Since world market prices for tradable inputs are higher than the domestic prices, Indonesia would benefit more from domestic tradable inputs. By taking advantage of lower prices of domestic tradable inputs, actually Indonesia's vegetables could penetrate the liberalized world's market.

The reasons for higher output prices in the domestic market may be due to greater demand growth in addition to protective policy. However, sufficiently higher level of private and social profits from all vegetable commodities in Java (Pangalengan and Kejajar) and the profits from potatoes and carrots in Berastagi-Simpang Empat indicate that without any protection these VFS would still remain profitable.

Domestic factors or non tradable inputs, such as organic fertilizer, labour, land rent, discharge and holding, are slightly cheaper in Kejajar. Private price is higher in Pangalengan for headed cabbages. In this case, the divergence is positive. This implies that headed cabbage farmers in Pangalengan are subsidized due to market factors and protective public policy. In case of tradable inputs, relative divergences are higher for potatoes and headed cabbages in Berastagi-Simpang Empat. It means that implicit input taxes for these two vegetables are higher in Berastagi-Simpang Empat.

### **Conclusions and Outlook**

Based on these results, it can be concluded that most of the VFS activities use resources efficiently, competitive and have comparative advantages, even though they are connected with inefficient distribution system. The farming system of potatoes and tomatoes has the highest competitiveness in Pangalengan and Berastagi-Simpang Empat. However, the category with no competitiveness is VFS of headed cabbages in Berastagi-Simpang Empat translated as less advantageous products. This is explained by: (1) low market values of land for the cultivation, resulting from price and policy distortion, depressing further the rental rate, (2) extensive usage of chemical input, much higher than the recommended level, (3) high cost per unit; (4) low productivity level and (5) limited farmers' accessibility to the market prices.

Moreover, most of the social prices for vegetables are higher than private prices with an exception for potatoes and carrots in Berastagi-Simpang Empat. This is mainly due to higher growth of demand in addition to the protective policy. As far as output prices are concerned, Indonesia has a potential as a producing country rather than being an importer.

Some of programs are necessary to be created by the government in order to support the development of VFS in upland areas, especially for potato and cabbage based on the agro ecosystem or infra structural in each region. The results of the research are of general importance for economically evaluation of VFS in upland areas of South-East-Asia.

## References

- ARSANTI, I.W. AND BÖHME, M.H. (2007). Evaluation of Profitability and Competitiveness of Vegetable Farming Systems in Upland Areas of Indonesia, Proceeding of the International Symposium on Improving the Performance of Supply Chains in the Transitional Economies, Acta Horticulturae.
- BARNEY, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management* 17:1.
- FOOD AGRICULTURE ORGANIZATION. (2004). Statistical Database. New York, USA.
- JOSLING, T. AND BABINARD, J. (1999). The Future of the CAP and Prospects for Change: The policy Environment for Agro-food Competitiveness in the European Agro-food System and the challenge of Global Competitive, Roma, Ismea.
- KRUGMAN, P. (1994). Competitiveness a Dangerous Obsession. *Foreign Affairs*, 73:2.
- LIEFERT, M.W. (1994). Economic Reform and Comparative Advantage in Agriculture in the Newly Independent States. *American Journal of Agricultural Economics*, 76: 636-640.
- MINISTRY OF AGRICULTURE. (2004). Agriculture Statistic. Statistic Centre, Jakarta, Indonesia.
- MONKE, E.A. AND SCOTT R.P. (1995). The Policy Analysis Matrix for Agricultural Development. Cornell University Press, Ithaca, USA.