Chapter 7

The Comparative Advantage of Soybean Production in Vietnam: A Policy Analysis Matrix Approach

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Additional information is available at the end of the chapter

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1. Introduction

Vietnam is a country with a long agricultural tradition in which highly-skilled farmers make up 68% of the population. Annually, Vietnam has been exporting a lot of agricultural products, which contributes a large amount of foreign currency to the governmental budget. Recently, Vietnam has become the second largest exporter of rice after Thailand, of cashew after Indonesia and of coffee after Brazil. Moreover, Vietnam is one of the top-leading exporters for rubber, and black pepper.

Although the contribution of farmers is very important for agriculture as well as for the economy of Vietnam, farmers' earnings are much lower than the rest of the population. This fact has created an income gap between rural and urban people. To solve this problem, the government has applied a variety of policies to increase the farmers' income, for instance, policies related to import, export, agricultural outputs and inputs etc. However, studies on the effectiveness and impacts of such policies are still limited. How have the policies undertaken by the government had an impact on farmers? Are farmers receiving any benefits from policies provided by the government? These are the questions that the study partly seeks to answer. In this study, the method of policy analysis matrix (PAM) was used to analyze the effect of policies on soybean production in Vietnam. Moreover, the analysis of PAM also answers whether the development of soybean production has potential in Vietnam, in other words, whether soybean cultivation has a comparative advantage in Vietnam compared to the other soybean producers in the world. The results of the study are useful to policy-makers, and also help us better understand the effects of the current policies undertaken by the government.

The first section of the study discusses data collection, the theoretical framework and some useful policy parameters of PAM. The second section reviews the current situation of soybean pro-

duction in the study area by doing the cost - benefit analysis (CBA) of soybean production. The third section presents the establishment of, results of, some sensitivity analyses of PAM, and policy simulations to help determine likely changes on PAM's parameters. This will be followed with some conclusions.

2. Data

The primary data of this study was collected in a field survey in two agro-ecological areas of the Mekong Delta of Vietnam in 2004. In the Mekong Delta, rice is the main crop. Farmers often apply mixed farming systems such as one-rice and one-fish crop, or two-rice and one-vegetable crop to improve income and soil conditions. Consequently, farmers grow soybean once a year. The soybean crop is usually cultivated in January and February after the Winter-Spring rice crop and harvested in March and April. In this study, farmers who grow two-rice and one-soybean crop were selected for interviews.

The interviews were conducted in Can Tho Province, representing the lower reaches of the Mekong Delta, and An Giang Province, representing the upper one. The total sample of 113 farmers, of which 58 farmers were in Can Tho and 55 farmers in An Giang, was interviewed following a stratified random sampling procedure. The survey was conducted by the staffs of Can Tho University, Vietnam.

3. Methodology

The approach of Policy Analysis Matrix (PAM) is applied to estimate the comparative advantage of soybean production. The PAM is a tool to create policy indicators for which values can be estimated, notable among which are the nominal protection coefficient, effective protection coefficient, private cost ratio and domestic resource cost ratio.

Regarding practical issues addressed by the PAM, Monke and Pearson (1989, p.17) proposed that the application of PAM approach is suitable for three areas of economic analysis:

- The impact of policies on the competitiveness of commodity systems;

- The impact of investment policy on economic efficiency and comparative advantage;

- The effects of agricultural research policy on steering the processes of technological change in desirable directions.

The PAM is built through double entry book-keeping, with the purpose of ensuring complete and consistent coverage of all policy influences on the returns to, and costs of, agricultural production or marketing. Indicators of the economic consequences of policies could be derived from the parameters in the matrix. The main empirical task is to construct accounting matrices of revenues, costs and profits. A PAM is constructed for each commodity sys-

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tem to be analyzed. Thus, the impact of commodity and macroeconomic policies is measured by comparing results in the presence and the absence of policy.

The PAM is comprised of revenues, costs and profits, at private and social (often called 'shadow') prices (Table 1). The top row of the matrix is a budget showing costs of production and marketing at market prices, the only unusual aspect being the division of cost elements into two categories: tradable and non-tradable inputs (usually defined as domestic resources – the immovable domestic factors of production).

The second row in the matrix shows the same cost elements expressed at social prices, i.e. social opportunity cost. For tradable products, adjusted world prices are normally taken as social prices, applying import or export parity measures as appropriate. The social price of domestic resources is taken as their opportunity cost, in other words the return at the margin in the best available alternative.

	Revenues	**Tradable input costs**	**Domestic factor costs**	**Profits**
Private accounts	A	B	C	D
Social accounts	E	F	G	H
Divergences	I	J	K	L

Note: Private Profits: D = A – B – C; Social Profits: H = E – F – G; Output Transfers: I = A – E; Input Transfers: J = B – F; Factor Transfers: K = C – G; Net Transfers: L = D – H *Source: Monke and Pearson 1989.*

Table 1. The Policy Analysis Matrix (PAM)

An important general point about the PAM is that the opportunity costs of domestic resources will be a function of current policy. Thus, strictly, these opportunity costs are only relevant under a particular set of policy constraints, i.e. they are constrained second best equilibrium values. If policy was to change, so would opportunity costs. For this reason, the PAM is not completely satisfactory in terms of economic theory, being based on a partial equilibrium rather than general equilibrium approach. It is a practical, indicative approach to policy, which recognizes that practitioners of policy analysis will only rarely have the data or the time to construct a fully specified general equilibrium model capable of generating useful estimates of opportunity costs under different policy scenarios.

The third row of the PAM is simply the first row minus the second. It shows the net impact of: market failure; distorting policies; and efficient policies (those which correct market failure). The signs of the revue and cost terms in the third row indicate whether the net effects of policy and market imperfections for these categories amount to an implicit subsidy or tax. If for example, I letter were positive, the net effect of policy or market failure is that the market price paid to the system is in excess of the social opportunity cost, i.e. output prices are subsidized. The right-hand entry in the third row, L, summarizes the net effect of polices or market failures on the profitability of the system, known as 'net transfers'. If D > H, then the net effect of policy is to subsidize the system. In this case, policy reforms to bring about

greater economic efficiency will reduce the gap between D and H, and this will induce adjustments in the commodity system in question, which may involve changes in the proportions in which resources are used and, at least in the short term, some contraction in the scale of operation.

Regarding indicators in the PAM, the basis PAM permits twelve indicators of economic efficiency, six of which are non-ratio indicators and six are ratio-indicators. Ratio measures are more useful for comparison of commodity systems which are dissimilar in the relative proportions in which they use inputs.

The primary objective of constructing a PAM is to derive a few important policy parameters for policy analysis. Seven of the most commonly used parameters are private cost ratio (PCR), domestic resource cost (DRC), nominal protection coefficient output (NPCO), nominal protection coefficient input (NPCI), effective protection coefficient (EPC),Profitability Coefficient (PC) and Subsidy Ratio to Producers (SRP) explained as followings:

- PCR is the ratio of factors costs (C) to value added in private prices (A-B). In Table 1, PCR = C/(A-B). This ratio measures the competitiveness of a commodity system. This system is competitive if PCR is less than 1.

- DRC is the ratio of domestic factor cost valued at social prices to the value-added created by the same resources at social prices. In Table 1, DRC = G/(E-F). It is, in fact, a social cost-benefit ratio which helps determine the desirability of certain domestic production systems relative to the international market in terms of economic efficiency. The social cost is the opportunity cost of domestic resources involved in the production process. The social benefit is the value-added generated by the resources measured at social prices. If the cost is greater than the benefit (DRC>1), the production of the product is not desirable from the social point of view. On the other hand, if the cost is less than the benefit (DRC<1), the production of that product is socially desirable. If the cost is equal to the benefit (DRC=1), it is just worthwhile to produce the commodity. It also implies that in regard to the commodity in question, the allocation of productive resources is such that domestic resources are being used in a way that reduces the country's welfare.

- NPCO is the ratio of domestic market price of a product to its parity price at the farm-gate. In Table 1, NCPO=A/E. If NPCO>1, it indicates that the private price of output is greater than its parity price and hence producers are positively protected for the product. If NPCO<1, it indicates that producers are implicitly taxed on the product. If NCPO=1, it indicates a neutral situation.

- NPCI is the ratio of the private to the social values of all the tradable inputs (or input components). In Table 1, NPCI=B/F. If NPCI>1, it indicates that producers are taxed when they buy tradable inputs. If NPCI<1, it indicates that they are subsidized. NPCI=1 represents a neutral situation.

- NPCO and NPCI consider the distortion of government policy in the product and tradable input markets respectively in isolation. EPC measures the total effects of intervention in both markets. It is defined as the ratio of value-added measured at private prices to that at

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social prices, or EPC=(A-B)/(E-F). If EPC>1, it implies that the overall impact of the existing policy results in a net positive incentive to produce the commodity. EPC<1 represents a net disincentive. EPC=1 implies either no intervention or impact of various distortions in both the input and product markets results in a neutral effect on value-added.

- PC measures the impact of all transfers on the private profits. It equals the ratio of private profits to social profits or PC = D/H.

- SRP is a single measure of all transfer effects. In Table 1, SRP = L/E = (D-H)/E. It indicates the extent to which the system revenues are increased or decreased because of transfers. If the market failures are insignificant, the SRP shows the net impact of distorting policies on the system revenues.

5. Results and discussion

5.1. Cost and benefit analysis of soybean production

The income is estimated by multiplying yield with price and the profit is calculated by using income minus the total cost of soybean production presented in Table 2.

	Can Tho	An Giang	Overall
Yield (kg/10a)	277.01	259.04	267.79
Price (VND/kg)	4,974.55	5,333.62	5,158.85
Income (VND/10a)	1,378,006.98	1,381,598.04	1,381,462.72
Total costs (VND/10a)	936,978.29	800,466.64	860,258.04
Profit (VND/10a)	441,028.69	581,131.40	521,204.68
Family labor (days/10a)	4.87	4.89	4.88
Profit-income ratio	0.3	0.4	0.4
Profit-cost ratio	0.5	0.7	0.6
Income-cost ratio	1.5	1.7	1.6
Profit-family labor ratio	90,544.25	118,730.95	106,738.45

Note: 10a (are) = 1,000m2. *Source: computed from the survey data*

Table 2. Yield, income and profit of soybean production

Table 2 shows that harvesting the average yield of soybean production of 268kg per 10a, soybean farmers sell their product with the price of 5,200VND per kg. However, there is a big variation in soybean price among farmers in the sample. The minimum price is only 1,000VND per kg, while the maximum is 7,000VND per kg. The reasons for this may come from the differences in output quality, the time of selling and unstable markets. Normally,

the soybean price is fixed by purchasers while it is sometimes formed by the negotiation between buyers and sellers. At harvesting time, the buyers come to the farm to buy soybean at the farm-gate. Very few farmers could sell their product at the market price because of the lack of market information. They even sell their soybean at a low price compared to the market price due to poor storage facilities and the lack of savings for daily living.

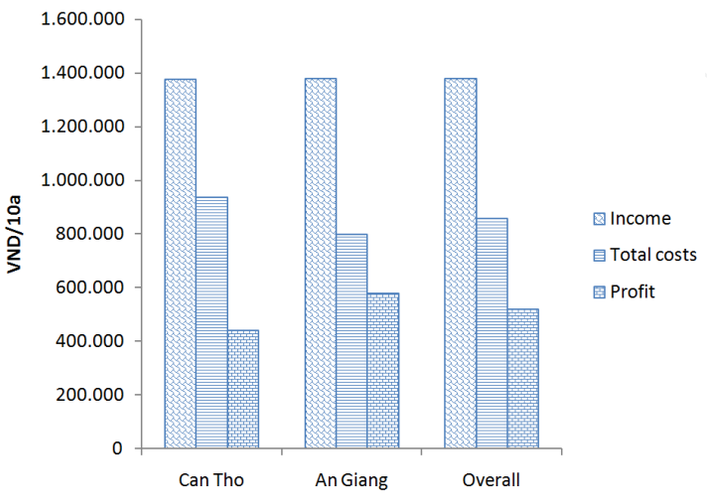

Figure 1. Yield, income and profit of soybean production

With an average soybean income of around 1,400,000VND per 10a, farmers could receive a profit of 521,000VND per 10a from their soybean cultivation. There is a big difference in profit among the surveyed sample. Some farmers could obtain the maximum profit of around 1,767,000VND per 10a while 20 percent of farmers had negative profits from soybean cultivation.

In rural areas in Vietnam, family labor is considered as the source of income. The ratio of profit to family labor means the earning of farmers received in their own land. This ratio of 106,000VND per day is three times higher than the hired labor price of 35,000VND per day, indicating that it is more profitable to do their own farming compared to working for other farmers as hired laborers.

The income-cost ratio of 1.6 indicates that farmers spent 1VND on soybean production costs and received an income of 1.6VND resulting in a profit of 0.6VND for soybean production performed by the profit to cost ratio. Although these ratios are rather high, the absolute amount of cash profit received by farmers is relatively low because of their small-scale production of soybean (the average soybean area of 0.68ha). In addition, the poor farming techniques and lack of market information result in unstable yields and prices that may not ensure sustainable income for soybean farmers.

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5.2. Establishing the Policy Analysis Matrix

The basic information needed for compiling a PAM are yields, input requirements, the actual market prices and social prices of inputs and outputs. The major sources of data used for the private account in the PAM are from the data of the soybean farm household survey.

The first step is to establish a table of physical input-output relationships for soybean production. This numerical description of the soybean production function summarizes the technology used in this system. In this illustrative system, the inputs used by the representative farmers are about 18kg Urea, 18kg NPK and 3.3 labor days for crop care per 10 a. The average yield of soybean is around 268kg per 10a. These input-output coefficients are drawn from the synthetic budgets and the farm interviews presented in Table 3.

I-O	Quantities	An Giang	Can Tho	Overall
Tradable	Fertilizer			
	Urea (kg/10a)	18.5	17.0	17.8
	NPK (kg/10a)	16.4	19.4	17.9
	DAP (kg/10a)	12.8	13.3	13.1
	Other fertilizer (VND)	13,461.8	4,205.1	8,710.6
	Pesticide (VND/10a)			
	Herbicide	45,664.8	22,230.9	33,636.8
	Fungicide	17,754.4	6,887.3	12,176.6
	Insecticide	151,777.7	122,718.5	136,862.4
	Other pesticide	17,425.5	14,860.3	16,108.8
	Seed (kg/10a)	13.9	9.6	11.7
	Fuel of Irrigation (liters/10a)	4.7	2.7	3.6
Factors	Labor (days/10a)			
	Hired labor	4.8	1.9	3.3
	Machinery (days/10a)			
	Land preparation	1.1	3.0	2.1
	Irrigation	-	2.4	1.2
	Harvest	4.6	4.2	4.4
	Other machinery (VND/10a)	363.6	8,298.2	4,401.8
Output	(kg/10a)	277.0	259.0	267.8

Source: Own estimates, 2006; data appendix available from authors

Table 3. Physical Input-Output of soybean

The second step is to compile a table of private (actual market) prices for each of the inputs used and output produced in the system. These prices should be representative of the base year of the study. The private prices for the soybean system are presented in Table 4.

P-Price	Quantities	An Giang	Can Tho	Overall
Tradable	Fertilizer			
	Urea (VND/kg)	3,302	3,401	3,352
	NPK (VND/kg)	3,573	3,601	3,588
	DAP (VND/kg)	3,990	4,101	4,049
	Other fertilizer (VND)	-	-	-
	Pesticide (VND)			
	Herbicide	-	-	-
	Fungicide	-	-	-
	Insecticide	-	-	-
	Other pesticide	-	-	-
	Seed (VND/kg)	6,463	6,562	6,514
	Fuel of Irrigation (VND/liters)	5,190	5,624	5,373
Factors	Labor (VND/day)			
	Hired labor	37,368	29,628	34,159
	Machinery (VND/day)			
	Land preparation	24,000	27,179	25,272
	Irrigation	-	26,277	26,277
	Harvest	43,784	38,783	41,012
	Other machinery (VND)	-	-	-
Output	(VND/kg)	4,975	5,334	5,159

Source: Own estimates, 2006; data appendix available from authors

Table 4. Private Prices of soybean

The most difficult task for constructing a PAM is the estimation of social prices and the separation of inputs into their tradable and non-tradable components. We use the world price as a reference price. In the study, the social price of soybean is the respective import parity price of soybean equivalents at the farm gate as an imported commodity. The CIF import price of soybean is listed on the website of the Ministry of Agriculture and Rural Development. The CIF price is adjusted at the farm gate by adding to it the transportation cost from the port of Ho Chi Minh City, one of the biggest ports in Vietnam. The value of transporta-

http://dx.doi.org/10.5772/51000

tion is assumed to be equal to 1 percent of the CIF price of soybean. The social price of soybean at the farm gate is then calculated by subtracting the distribution costs to farm.

As for tradable inputs, Vietnam has been importing chemical fertilizer, pesticides, fuel and other major farm inputs from international markets. Thus, the tradable inputs for fertilizer, fuel, etc. are the respective import parity prices at the farm gate and the social price of soybean seed is assumed to be equal to 20 percent of the social soybean price. However, because of complications for pesticide price, the social price of pesticides was not calculated in the study. Regarding domestic factors, since these factors are not tradable internationally and thus do not have world price, their social opportunity costs are estimated through observations of rural factor markets. The domestic inputs in the study are hired labor, machinery etc. They are assumed to be equal to the maximum prices in the sample.

When the parity prices of soybean and inputs are estimated, the shadow exchange rate instead of the official exchange rate is used to convert the international prices in US$ into VND. In the study, shadow exchange is assumed to be 16,000VND/US$ for calculating the social prices of soybean and its inputs. The social prices of soybean is calculated by adjusting form the international price to farm-gate level presented in Table 5. Similarly, the social price of tradable inputs such as fertilizers and diesel are also estimated in Table 6 and Table 7.

Import parity prices	**Soybean**
CIF Vietnam (US$/ton) *	366.3
Exchange rate (VND/US$)	16,000.0
Exchange rate premium (%)	0.10%
Equilibrium exchange rate (VND/US$)	16,016.0
CIF Vietnam in domestic currency (VND/ton)	5,866,700.0
Weight conversion factor (kg/ton)	1,000.0
CIF Vietnam in domestic currency (VND/kg)	5,866.7
Transportation and handing costs (VND/kg)	58.7
Value before processing (VND/kg)	5,925.4
Processing conversion factor (%)	1
Import parity value (VND/kg)	5,925.4
Distribution costs to farm (VND/kg)	200.0
Import parity value at farm gate (VND/kg)	5,725.4

* The source from the website of Ministry of Agriculture and Rural Development, 6/4/2006 *Source: Own estimates, 2006; data appendix available from authors*

Table 5. Adjustment of International Price of soybean to Farm-gate Level

Import Parity Prices	Urea	NPK	DAP
CIF HCM port (US$/ton) *	147.19	161.77	199.33
Exchange rate (VND/US$)	16,000	16,000	16,000
Exchange rate premium (%)	0.10%	0.10%	0.10%
Equilibrium exchange rate (VND/US$)	16,016	16,016	16,016
CIF in domestic currency (VND/ton)	2,357,352.0	2,590,913.3	3,192,442.8
Weight conversion factor (kg/ton)	1,000	1,000	1,000
CIF in dom.currency and weigh units (VND/kg)	2,357.35	2,590.91	3,192.44
VAT	5%	5%	5%
CIF and VAT in domestic currency (VND/kg)	2,475.22	2,720.46	3,352.06
Transportation and handing costs (VND/kg)	230.0	230.0	230.0
Value before processing (VND/kg)	2,705.2	2,950.5	3,582.1
Processing conversion factor	1	1	1
Import parity value at wholesale (VND/kg)	2,705.2	2,950.5	3,582.1
Distribution costs to farm (VND/kg)	200.0	200.0	200.0
Import parity value at farm gate (VND/kg)	2,505.2	2,750.5	3,382.1

* The source from the website of Ministry of Agriculture and Rural Development, 6/4/2006
Source: Own estimates, 2006; data appendix available from authors

Table 6. Adjustment of International Prices of fertilizers to Farm-gate Level

Import Parity Prices	Diesel
CIF HCM port (US$/ton) *	359
Exchange rate (VND/USD)	16,000
Exchange rate premium (%)	0.10%
Equilibrium exchange rate (VND/US$)	16,016
CIF in domestic currency (VND/ton)	5,749,744.00
Weight conversion factor (kg/ton)	1000
CIF in domestic currency and weigh units (VND/kg)	5,749.74
Luxury tax and transportation	10%
CIF including luxury tax	6,324.72
VAT	10%
CIF and VAT in domestic currency (VND/kg)	6,957.19
Transportation and handing costs (VND/kg) **	500

http://dx.doi.org/10.5772/51000

Import Parity Prices	Diesel
Value before processing (VND/kg)	7,457.19
Processing conversion factor	1
Import parity value at wholesale (VND/kg)	7,457.19
Distribution costs to farm (VND/kg)	200
Import parity value at farm gate (VND/kg)	7,257.19

* The source from the website of Labor newspaper, 19/10/2006**The source from the website of Viet Nam trade promotion Agency, 21/4/2006 *Source: Own estimates, 2006; data appendix available from authors*

Table 7. Adjustment of International Prices of Diesel to Farm-gate Level

S-Price	Quantities	An Giang	Can Tho	Overall
Tradable	Fertilizer			
	Urea (VND/kg)	2,505.22	2,505.22	2,505.22
	NPK (VND/kg)	2,750.46	2,750.46	2,750.46
	DAP (VND/kg)	3,382.06	3,382.06	3,382.06
	Other fertilizer (VND)	-	-	-
	Pesticide (VND)			
	Herbicide	-	-	-
	Fungicide	-	-	-
	Insecticide	-	-	-
	Other pesticide	-	-	-
	Seed (VND/kg)	6,870.44	6,870.44	6,870.44
	Fuel of Irrigation (VND/liters)	7,257.19	7,257.19	7,257.19
Factors	Labor (VND/day)			
	Hired labor	73,000.00	73,000.00	73,000.00
	Machinery (VND/day)			
	Land preparation	35,000.00	35,000.00	35,000.00
	Irrigation	-	83,000.00	83,000.00
	Harvest	80,000.00	80,000.00	80,000.00
	Other machinery (VND)	-	-	-
Output	(VND/kg)	5,725.37	5,725.37	5,725.37

Source: Own estimates, 2006; data appendix available from authors

Table 8. Social prices of soybean

Unit: VND/10a

Quantities	Private values			Social values		
	An Giang	Can Tho	Overall	An Giang	Can Tho	Overall
Tradable factors						
Fertilizer						
Urea	61,188	57,957	59,543	46,425	42,690	44,508
NPK	58,730	69,740	64,373	45,213	53,264	49,346
DAP	51,210	54,472	52,898	43,410	44,923	44,187
Other fertilizer	13,462	4,205	8,711	13,462	4,205	8,711
Pesticide						
Herbicide	45,665	22,231	33,637	45,665	22,231	33,637
Fungicide	17,754	6,887	12,177	17,754	6,887	12,177
Insecticide	151,778	122,718	136,862	151,778	122,718	136,862
Other pesticide	17,426	14,860	16,109	17,426	14,860	16,109
Seed	89,970	62,821	76,018	95,643	65,773	80,175
Fuel of Irrigation	24,327	14,944	19,589	34,018	19,285	26,456
Domestic factors						
Labor						
Hired labor	179,692	56,251	113,236	351,033	138,596	241,994
Machinery						
Land preparation	26,142	80,851	51,996	38,124	104,116	72,012
Irrigation	-	62,748	32,207	-	198,198	101,730
Harvest	199,272	161,483	178,500	364,102	333,103	348,191
Other machinery	364	8,298	4,402	364	8,298	4,402
Output						
Total Revenue	1,378,007	1,381,598	1,381,463	1,585,993	1,483,074	1,533,168
Total costs (excluding land)	936,978	800,467	860,258	1,264,416	1,179,150	1,220,495
Profit (excluding land)	441,029	581,131	521,205	321,578	303,925	312,672

Source: Own estimates; data appendix available from authors.

Table 9. Private and social revenues, costs and profits of soybean.

http://dx.doi.org/10.5772/51000

Getting the results from these above tables (Table 5, 6, 7), the full set of social prices for the illustrative soybean system is presented in the following Table 8.

After the calculation of private and social prices for tradable, non-tradable inputs and soybean, Table 9 shows a farm budget. The table is divided into two blocks. The first block records private prices, calculates the costs of inputs, and separates these costs into their tradable and non-tradable components. The second block is similar to the first block but all the values are calculated in social prices.

Unit: VND/10a

	Revenues	Costs		Profits
		Tradable	Factors	
An Giang				
Private	1,378,006.98	531,508.89	405,469.40	441,028.69
Social	1,585,993.28	510,793.46	753,622.20	321,577.62
Divergences	-207,986.30	20,715.43	-348,152.80	119,451.06
		DRC = 0.70; PCR = 0.48		
Can Tho				
Private	1,381,598.04	430,835.33	369,631.31	581,131.40
Social	1,483,074.31	396,837.71	782,311.92	303,924.67
Divergences	-101,476.27	33,997.61	-412,680.61	277,206.73
		DRC = 0.72; PCR = 0.39		
Overall				
Private	1,381,462.72	479,916.49	380,341.55	521,204.68
Social	1,533,167.61	452,166.02	768,329.20	312,672.40
Divergences	-151,704.89	27,750.48	-387,987.65	208,532.28
		DRC = 0.71; PCR = 0.42		

Source: Own estimates; data appendix available from authors.

Table 10. Results of the PAM analyses of soybean

The summary information from Table 9 is extracted to form a PAM of soybean production as shown in Table 10.

The principal determinant of transfers to farm production activity is the difference between world and domestic prices. The study shows that farmers received the private soybean price of 5,159VND per kilogram. The CIF price of soybean is 5,725VND per kilogram equivalent to a farm-gate social price (after converting to social costs and subtracting the social value of

transport costs). For 10a of soybean, the private profit is 521,205VND, while the social profit is only 312,672VND.

5.3. Comparative and competitive advantage of the soybean farming system

The ability of an agricultural system to compete without distorting government policies can be strengthened or eroded by changes in economic conditions. Dynamic comparative advantage refers to shifts in competitiveness that occur over time because of changes in three categories of economic parameters – long-run world prices of tradable outputs and inputs, social opportunity costs of domestics factors of production (labor, capital and land), and production technologies used in farming or marketing. Collectively, these three parameters determine comparative advantage.

	Total Revenue	NPCO
An Giang		
Private	1,378,006.98	0.87
Social	1,585,993.28	
Divergences	-207,986.30	
Can Tho		
Private	1,381,598.04	0.93
Social	1,483,074.31	
Divergences	-101,476.27	
Overall		
Private	1,381,462.72	0.90
Social	1,533,167.61	
Divergences	-151,704.89	

Table 11. Output transfer of soybean farming system

Comparative advantage of an agricultural system, in the PAM table, is indicated by the value of the Domestic Resources Cost Ratio (DRC). The DRC serves as a proxy measure for social profits. Minimizing the DRC is equivalent to maximizing social profits. Comparative advantage is an indicator of potential advantage and will be fully received if there is no policy distortion in the system. If a commodity has comparative advantage, its production is economically efficient.

Based on information provided in Table 10, the DRC of soybean-farming system is 0.71. This result indicates that the soybean system has a comparative advantage. Growing Soybean in Can Tho is as efficient as that in An Giang because DRC of the two provinces are nearly the same. In other words, soybean production in An Giang has the same comparative advantage to that in Can Tho.

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The determination of profit actually received by farmers is a straightforward and important initial result of the PAM approach. The results indicate which farmers are currently competitive. In the PAM table, the competitiveness of a system is measured by the private profitability (D) or Private Cost Ratio (PCR). Based on information given in Table 10, the PCR of soybean production is 0.42. This result indicates that soybean cultivation is profitable and thus competitive.

5.4. Transfers and impacts of government policies

In the Policy Analysis Matrix (PAM), impacts of government policies can be identified by the divergences identity in the third row of the PAM table. Divergences cause private prices to differ from their social counterparts. A divergence arises either because a distorting policy intervenes to cause a private market price to diverge from an efficient price or because underlying market forces have failed to provide an efficient price. Divergences in PAM can also be indicated by the ratio between the values in the first row (private prices) and the values in the second row (social prices). The ratio's indicators are more frequently used because of their ability to compare different systems producing unlike outputs.

	Tradable input costs							
	Urea	**NPK**	**DAP**	**Other fer.**	**Pes.**	**Seed**	**Fuel**	**Total**
An Giang								
Private	61,188	58,730	51,210	13,462	232,622	89,970	24,327	531,509
Social	46,425	45,213	43,410	13,462	232,622	95,626	34,018	510,777
Divergences	14,763	13,516	7,800	0	0	-5,656	-9,691	20,732
	NPCI = 1.04							
Can Tho								
Private	57,957	69,740	54,472	4,205	166,697	62,821	14,944	430,835
Social	42,690	53,264	44,923	4,205	166,697	65,762	19,285	396,826
Divergences	15,267	16,476	9,549	0	0	-2,941	-4,341	34,009
	NPCI = 1.09							
Overall								
Private	59,543	64,373	52,898	8,711	198,785	76,018	19,589	479,916
Social	44,508	49,346	44,187	8,711	198,785	80,161	26,456	452,152
Divergences	15,035	15,028	8,712	0	0	-4,142	-6,868	27,764
	NPCI = 1.06							

Table 12. Tradable input transfers of soybean farming system

Table 11 shows output transfers of soybean production. The ratio formed to measure output transfers is called the Nominal Protection Coefficient on Output (NPCO). The NPCOs of soybean in Can Tho and An Giang are slightly different. The NPCOs of Can Tho and An Giang are 0.93 and 0.87, respectively. Both values of NPCO are less than 1. This result indicates that soybean farmers received slightly lower prices than they would have received facing world prices or that systems are receiving very slight protection. The positive output transfers are caused mainly by indirect quantitative restriction (quotas) on soybean imports.

Moreover, the value of NPCI is 1.06. This result indicates that soybean farmers are taxed when they buy tradable inputs. Details of tradable input transfers of soybean production are presented in Table 12.

	Revenues	Tradable input costs	EPC
An Giang			
Private	1,378,006.98	531,508.89	0.79
Social	1,585,993.28	510,793.46	
Divergences	-207,986.30	20,715.43	
Can Tho			
Private	1,381,598.04	430,835.33	0.88
Social	1,483,074.31	396,837.71	
Divergences	-101,476.27	33,997.61	
Overall			
Private	1,381,462.72	479,916.49	0.83
Social	1,533,167.61	452,166.02	
Divergences	-151,704.89	27,750.48	

Source: Own estimates; data appendix available from authors.

Table 13. Effective Protection Coefficients for soybean farming system

The EPCs of the soybean farming systems are depicted in Table 13. Regarding the total effects of government intervention in the output of soybean and tradable input markets, the study estimates the value of EPC=0.83. It indicates that there is no subsidy of soybean production in the soybean output and tradable input markets from government policies. The costs or profits of soybean producers are 17 percent less than they would have been in the absence of policy on output and tradable inputs.

5.5. Sensitivity analysis of soybean production

The aim of sensitivity analysis in this section is to examine whether soybean production will have comparative advantage or not when the key factors vary and change in the future. The

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expected results will help answer the question "How sensitively are ratios of a PAM subject to the changes of the key factors?" In the study, based on the unstable market of inputs, and the changes of government policy, three possible scenarios are assumed as: the reduction of soybean tariff from 15 percent to 5 percent, an increase of 10 percent in fertilizer prices and in exchange rate of VND/US$ of 10 percent. The results of sensitivity analysis of a PAM are performed in Table 14.

- *The decrease of the soybean tariff:* Vietnam officially jointed the WTO in November 2006. In compliance with WTO rules, the import tariff for soybean has to decrease from 15 percent to 5 percent. Table 14 shows that when the soybean tariff is reduced from 15 percent to 5 percent, soybean production in Vietnam still has a comparative advantage since the DRC becomes 0.83 less than 1. Moreover, the NPCO = 1.01, indicating a neutral situation, meaning that there is almost no intervention of the Government in the soybean market.

	DRC	NPCI	NPCO	EPC
Basic scenario	0.71	1.06	0.9	0.83
A decrease from 15% to 5% in the soybean tariff	0.83	1.08	1.01	0.97
An increase of 10% in the fertilizer prices	0.72	1.07	0.9	0.83
An increase of 10% in the exchange rate	0.72	1.02	0.9	0.85

Source: Own estimates; data appendix available from authors.

Table 14. Sensitivity analysis of a PAM

- *The increase of fertilizer prices:* According to the annual statistics, the prices of fertilizer have been increasing steadily and it is likely that the upward trend will continue in the future. Thus, we assume that the price of fertilizers will go up about 10 percent in the future and then we investigate how the change of the PAM ratios is. The result shows that soybean farmers in Vietnam still have comparative ability when the prices of fertilizer increase 10 percent.

- *An increase in the exchange rate:* Recently, since the Vietnamese currency gradually has been losing value compared with the US$ currency, the study assumes the US$ currency increases about 10 percent compared with the currency of VND and considers what happens to the PAM ratios. The analysis indicates that there are no big changes for Vietnamese soybean in terms of competitiveness and soybean cultivation and that Vietnam would still have a comparative advantage when the exchange rate increases 10 percent.

6. Conclusion

Calculating the costs, income and profit of soybean production, we described and estimated briefly the current situation of soybean production in Vietnam. It revealed that with the aver-

age soybean yield of 268kg per 10a, farmers obtained income of 1.38 million VND. After excluding input costs such as fertilizers, pesticides, hired labors, machinery service etc., the soybean farm could receive a profit of 521,000VND. The financial ratios of soybean production showed if the farmer invested 1VND into soybean production, they could earn 1.6VND for income, thus receive a profit of 0.6VND. In addition, the ratio of profit to family labor indicated it was more profitable for Vietnamese soybean farmers to do their own farming than to work as hired laborers for other farmers. In other words, they could obtain the much higher amount of opportunity cost of around 107,000VND per day from soybean cultivation in comparison with the average hired labor of 35,000VND per day in the Vietnamese rural areas.

By applying the approach of policy analysis matrix (PAM) to analyze the competitiveness of soybean production in Vietnam, the study showed that soybean production had a comparative advantage since DRC was less than 1. Moreover, we determined that government policy had almost no positive impacts on the soybean farmers. It even reduced the competitiveness of Vietnamese soybean. Because PAM analysis could not capture the potential changes in prices and productivity, the results of scenarios in Table 14 are subject to changes in market conditions. Some sensitivity analyses were estimated to catch some potential changes. The simulation results showed that if any of the following forecasts became true, soybean production still had a comparative advantage: the decrease of soybean tariff from 15 percent to 5 percent, the increase of fertilizer prices of 10 percent, an increase of 10 percent in the exchange rate.

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