CHAPTER VII

PAM RATIO ANALYSIS

The primary objective of constructing a Policy Analysis Matrix is to derive some important policy parameters for policy analysis. Standard ratios reflecting the degree of price divergences or distortions are normally calculated to compare profitability and efficiency of different crops. These ratios facilitate comparisons among activities, particularly when the production process and outputs are dissimilar. A number of protection coefficients could be calculated in a standard PAM. In order to compare the extent of policy transfer, relative efficiency or comparative advantage, the profitability and efficiency of agricultural systems, PAM ratios have been calculated for all the three locations and the results discussed.

7.1 Comparative and competitive advantage

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 a shift in the competitiveness that occurs over time because of changes in three categories of economic parameters. These parameters are: long run world price of tradable outputs and inputs, social opportunity cost of domestic factors of production, and the production technologies used in farming.

Comparative advantage of an agricultural system, in the PAM table, is indicated by the value of the Domestic Resources Cost Ratio (DRCR or DCR), defined as G/(E-F), serves as a proxy measure for social profits. It can be calculated as shown on the following page.

$$\text{Domestic Resources Cost Ratio} = \frac{\text{Social Domestic Factor Costs}}{\text{Social Revenue} - \text{Social Tradable Inputs}}$$

The Domestic Resource Cost (DRC) ratio should be less than one to be privately and socially profitable. Minimizing the DRC is equivalent to maximizing the social profits. If it exceeds one then it would indicate that the value of domestic resources used to produce the commodity exceeds its value added in social prices and as such would not represent an efficient use of the country's resources. It would show comparative advantage if the value of DRC is less than one. Comparative advantage is an indicator of potential advantage and if a commodity has comparative advantage, its production is economically efficient. Table 7.1 Shows the DRC of the three locations.

Table 7.1. Domestic resources cost by location

Parameters	Location		
	Samtse	Lobesa	Paro
Social Domestic factors (Nu/ha)	21,499	31,871	33,489
Social revenue of output (Nu/ha)	25,168	58,095	55,951
Social tradable input cost (Nu/ha)	3,000	4,982	2,301
Domestic Resources Cost	0.97	0.60	0.62
Profitability	Socially profitable	Socially profitable	Socially profitable

It should be noted that the situation of comparative advantage being discussed here is totally based on the import parity price and not on the scenario of export. Using the import parity prices for the output and the tradable inputs, the DRC of rice production under the present state of technology in all the three locations were below unity. This indicates that as compared to the import parity price, these locations have comparative advantage in the production of rice and its production is competitive. It also confirms that social profits are being maximized from the cultivation of rice. Lobesa with DRC value of 0.60 had a clear comparative advantage in rice production over Samtse (0.97) and Paro (0.62). The situation of comparative advantage in Samtse was due to the support from the government in terms of transportation subsidy while the situation of DRC in Lobesa and Paro resulted from the higher yield achieved, higher private price of the product and the provision of transportation subsidy for the inputs required. The DRC of Samtse as compared to the other two locations was rather weak and a slight decrease in the yield or increase in the price of the inputs could further weaken its situation of comparative advantage. The presence of stronger comparative advantage in Lobesa and Paro could be because of the higher yield brought about by the adoption of modern varieties that are higher yielding.

The determination of profit actually received by the farmers is straight forward and an important result of the PAM approach. The result indicates the competitiveness of the farmers by the different locations. In the PAM table, the Private Profitability or the Private Cost Ratio (PCR) measures the competitiveness of a system. This can be calculated as follows:

$$\text{Private Cost Ratio} = \frac{\text{Private Domestic Factor Costs}}{\text{Private Revenue} - \text{Private Tradable Input Costs}}$$

Table 7.2 shows the value of the PCR to compare the competitiveness of rice systems among the three different locations.

Table 7.2. Private cost ratio of rice systems by location

Parameters	Location		
	Samtse	Lobesa	Paro
Private Revenue of output (Nu/ha)	22,880	64,550	62,725
Private Domestic Factor Costs (Nu/ha)	17,799	31,71	33,489
Private Tradable Input Costs (Nu/ha)	2,740	4,415	2,122
Private Cost Ratio (PCR)	0.88	0.53	0.55
Private competitiveness	Competitive	Competitive	Competitive

The results show that the Private Cost Ratio (PCR) was below one for all the three locations. This indicates that rice systems in all the three locations were profitable and thus competitive. The lower value of PCR for Lobesa suggests that rice system is more competitive in this location as compared to the other two locations. However, not much difference in the value of PCR was observed between Lobesa and Paro.

7.2 Transfers and impacts of government policies

In the Policy Analysis Matrix (PAM), impacts of government policies can be identified by the divergences identity. 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. 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 formed to measure output transfers is called the Nominal Protection Coefficient on Output (NPCO). This ratio shows how much domestic prices differ from social prices. If NPCO exceeds one, the domestic price is higher than the import (or export) price and thus the system is receiving protection. If NPCO is less than one, the domestic price is lower than the comparable world price and the system is unprotected by policy. In the absence of policy transfers, the domestic and world prices would not differ and the NPCO would equal one. Based on the PAM table NPCO can be calculated as:

Nominal Protection Coefficient on Output (NPCO) = A/E

Where:

A = Revenue in private prices

E = Revenue in social prices

Table 7.3 shows the Nominal Protection Coefficient on Output for the three different locations. Based on the results of the analysis, the Nominal Protection Coefficient on Output (NPCO) was below one for Samtse and above one in Lobesa and Paro. This indicates that rice farmers in Samtse received lower prices than they would have received facing world prices or that rice system in Samtse was not receiving any protection from the government. However, rice farmers in Lobesa and Paro received a slightly higher prices than they would have received without government policy or that the system received some protection from the government. Even when the import parity prices for output are considerably high by the time it reaches Bhutan, it still remained lower than the private prices in these two locations. The higher private prices for the output in these two places can be attributed to its close proximity to urban centers where the demand for locally grown rice is high from the non-farming communities.

Table 7.3. Nominal protection coefficient on output of rice systems by location

Parameters	Location		
	Samtse	Lobesa	Paro
Revenue in private prices (Nu/ha)	22,880	64,550	62,725
Revenue in social prices (Nu/ha)	25,168	58,095	55,951
Nominal Protection Coefficient on Output	0.91	1.11	1.12
Nominal output protection by policies	Not protected	Protected	Protected

Moreover, it could also be due to the difference in the living standards of the people in this area. The NPCO value of 1.11 and 1.12 indicates that policies are increasing the private revenue or the private market price by as much as 11 and 12 percent of the world price. This confirms that domestic producers in Lobesa and Paro are enjoying subsidies from the society though it may not be to a large extent. At the same time it indicates that the consumers would be better off by purchasing imported rice rather than buying locally produced rice.

On the input side the ratio formed to measure tradable input transfers is called the Nominal Protection Coefficient on Inputs (NPCI). This ratio shows how much domestic prices of tradable inputs differ from their social prices. If NPCI exceeds one, the domestic input cost is higher than the input cost at world prices and the system is taxed by policy. If NPCI is less than one, the domestic price is lower than the comparable world price and the system is subsidized by policy. In the absence of policy transfers the domestic and world prices of tradable inputs would not differ and the NPCI would equal one. It can be calculated from the PAM table as:

Nominal Protection Coefficient for Input (NPCI) = B/F

Where:

B = Cost of tradable input in private prices

F = Cost of tradable input in social prices

The Nominal Protection Coefficient on Input (NPCI) in the rice system for the three different locations is as shown in Table 7.4.

Table 7.4. Nominal protection coefficient on inputs of rice systems by location

Parameters	Location		
	Samtse	Lobesa	Paro
Cost of tradable input in private prices (Nu/ha)	2,740	4,415	2,122
Cost of tradable input in social prices (Nu/ha)	3,000	4,982	2,301
Nominal Protection Coefficient on Input	0.91	0.89	0.92
Nominal input protection by policies	Protected	Protected	Protected

As discussed earlier, the policy of the government is not to provide subsidy but to provide for the transportation costs and the commission to be paid to the CAs. The policy is to have a uniform cost for the inputs through out the country and it to make it affordable for all farmers. The Nominal Protection Coefficient for Inputs was below one for all the three places proving a provision of subsidy in the tradable inputs or a positive transfer (input costs lowered by policy). It differed slightly among the three places due to the difference in the transportation costs involved from the border town to the different locations and also in the quantity of the tradable inputs used. The positive policy transfer benefited the farmers such that the costs of tradable inputs were 91, 89 and 92 per cent of what they would have been at the world (social) price for Samtse, Lobesa and Paro respectively. Lobesa therefore benefited the highest subsidy.

The Effective Protection Coefficient (EPC) shows the joint effect of policy transfers affecting both tradable inputs and tradable outputs. It is another measure of incentives to farmers. This ratio compares valued added in domestic prices with value added in world prices. The EPC is a useful indicator that measures the whole structure of incentives/dis-incentives which may exist with respect to a given production process. An EPC less than one indicates negative effects of policy (a tax), whereas an EPC greater than one indicates positive effects of policy (a subsidy). Based on the PAM table the EPC can be calculated as:

Effective Protection Coefficient (EPC) = (A-B)/(E-F)

Where:

A= Revenue in private prices

B= Cost of tradable inputs in private prices

E = Revenue in social prices

F = Cost of tradable input in social prices

Table 7.5 shows the Effective Protection Coefficient (EPC) of rice systems in the three different locations. EPC for Lobesa and Paro was greater than one indicating that private profits are higher than they would be without commodity policies and that the system is slightly protected by the government. The value of EPC was less than one in Samtse indicating that the private profits are lower with the commodity policies and that the farmers do not have the benefit of enjoying protection on the tradable inputs.

The effective coefficient ratio for Samtse was lower than one indicating that the net effect of policies that alter prices in product market is to reduce private profits, and the combined transfer effect is thus negative. Therefore, rice farmers in Samtse did not have the opportunity of being protected by the government in terms of its output price. The rice systems in Lobesa and Paro showed EPC value of greater than indicating that the net impact of the government policy influencing product markets. This means that the output price policy and tradable input price policy allowed rice systems in both Lobesa and Paro to have a value added in private prices 13 percent greater than the value added without policy transfers (as measured in social prices).

Table 7.5. Effective protection coefficient of rice systems by location

Parameters	Location		
	Samtse	Lobesa	Paro
Revenue in private prices (Nu/ha)	22,880	64,550	62,725
Cost of tradable inputs in private prices (Nu/ha)	2,740	4,415	2,122
Revenue in social prices (Nu/ha)	25,168	58,095	55,951
Cost of tradable input in social prices (Nu/ha)	3,000	4,982	2,301
Effective Protection Coefficient	0.91	1.13	1.13
Effective protection by policies	Not protected	Protected	Protected

The measure of net transfer is a principal result of the PAM approach. A ratio indicator relating to the net transfer is the Profitability Coefficient (PC). This ratio measures the impact of all transfers on private profits. It is also an expansion of EPC to include domestic factor costs. It can be calculated from the PAM table as:

Profitability Coefficient = H/D

Where:

H = Social profit

D = Private profit

From Table 7.6 it can be seen the net transfers caused an increment in the private profits of rice system in all the three locations. This means that the government's policy has caused the private profits of rice in Samtse to be about 3.6 times greater than what it would have been without policy transfer. It also permitted the profitability of rice systems in both Lobesa and Paro to be 1.3 times greater than the social profits than without policy transfers. Hence, it can be said that the government's policy did have a positive impact on the rice farming systems in all the three locations. Though the profitability ratio is highest for Samtse, it however does not mean that rice system in Samtse is the most competitive. In fact Lobesa has the most profitable rice systems with the highest private as well as social profit per hectare and closely followed by Paro. Though Samtse has the highest profitability coefficient ratio, the social profit indicates that the profit farmers would make from rice systems without policy transfers from the government would be minimal and perhaps Samtse should start finding alternative crops that are more profitable unless measures to improve the productivity are put in place.

Table 7.6. Profitability coefficient of rice systems by location

Parameters	Location		
	Samtse	Lobesa	Paro
Private Profit (Nu/ha)	2,341	28,264	27,115
Social Profit (Nu/ha)	669	21,242	20,161
Profitability Coefficient (PC)	3.5	1.3	1.3

The subsidy ratio to producers (SRP) is a single measure of all transfer effects. This ratio is a comparison of the net transfer to the value of the output in world prices. This ratio indicates the extent to which a system's revenues are increased or decreased due to transfers. If the ratio is positive, it indicates a subsidy case and if negative it would denote a case of tax. This ratio can be calculated from the PAM table as:

Subsidy Ratio to Producers (SRP) = L/E

Where:

L = Net transfer

E = Revenue in social prices

This ratio ranged from 0.07 in Samtse to 0.12 in Lobesa and Paro. These positive values mean that divergences, generally influenced by distorting policies have slightly increased the gross profit of rice farming system in all the three locations.

Table 7.7. Subsidy ratio to producers by location

Parameters	Location		
	Samtse	Lobesa	Paro
Net transfer (Nu/ha)	1,672	7,022	6,953
Revenue in social prices (Nu/ha)	25,168	58,095	55,951
Subsidy Ratio to Producers (SRP)	0.07	0.12	0.12

7.3 Policy implications

Even though the price of rice in the world market is lower than the cost at which Bhutan is producing, the import of rice from the world market would be expensive due to the higher ocean freight and land transportation cost. Rice systems in all of the study locations representing three different rice growing agro-ecological zones were socially profitable when evaluated at the import parity price. This indicated that rice could be produced even without policy support of the government. Even if the output divergences were reduced to zero, the private profits would still be positive. Looking at the PAM ratios, rice farmers in Samtse are being taxed indirectly in output prices (lower than social prices) indicating that the role of the government is still short of optimum and that rice farmers are not receiving any protection from the government. The rice farmers in Paro and Lobesa are receiving higher price for their outputs indicating some extent of protection from the government. Indirect subsidy on tradable inputs paid through transportation and as commission to the commission agents has helped farmers with positive private profitability. Even if this indirect subsidy was removed, the farmers would still earn positive profit. However, it was with the government's policy that rice farmers have been able to earn increased profitability than without policy transfers.

The study locations based on the import parity price are competitive in rice production. It is also socially profitable in all the three locations, though rice systems in Samtse was found to be the least efficient and least profitable among the three locations. However, if we look into the production cost, then the cost of production in all the three locations were higher than the average price (Nu. 10.6/kg of milled rice) in the world market. Even if only modern varieties were grown, the production cost would still be higher than the average world price. Therefore, it can be said that these three locations are competitive in rice production when compared to the import parity price but does not have comparative advantage. However, based on the positive profit rice can be promoted and research and extension can work together with the farmers to come out with higher yielding varieties that are in demand by the farmers.

Samtse has the highest area under paddy/wet land as compared to the other three locations. However, not all the available paddy land is cultivated. The area lacks higher yielding varieties, proper irrigation and standing crops are often plagued by wild life and the farmers have complained these repeatedly. The release of suitable higher yielding varieties, investment in irrigation facilities and better wild life management would further encourage the cultivation of paddy and thus achieve the goal of 60 percent self-sufficiency in rice. Internal marketing of domestic rice at the moment is weak. Improved extension and marketing services together with bringing all fallow wetland under paddy cultivation would help farmers to increase their benefits.

The present scenario shows competitiveness in rice production but then if the government decides to impose even a 10 percent tariff on the rice imports then farmers as well as consumers would feel unprotected. Rice being the staple cereal crop, any increase in the price of the output would not be beneficial to the consumers. The imposition of tariff on imported rice would decrease the competitiveness of rice systems and may not be worthwhile for the government to do so as increasing the tariff would create policy distortions and result in economic inefficiency especially in Samtse. Instead of tariff, the provision of higher yielding varieties and irrigation investments would strengthen the situation of competitiveness of rice systems in Samtse.

Rice production was more competitive in Lobesa and Paro where farmers have access to higher yielding modern varieties. The competitiveness is much lower in

Samtse where there is lack of higher yielding modern varieties. If the situation is not strengthened then only a few farmers in Samtse might continue to produce rice to guarantee household food security. Unless the situation of yield in Samtse is improved, further engagement in rice production would lead to inefficient use of resources. Many would shift to more profitable activities if the protection of rice were to be reduced in the future. Bhutan is a founding member of SARRC and an active signatory of the South Asian Free Trade Agreement (SAFTA) to create a free trade area in South Asia. If Bhutan were to reduce its protection on rice substantially, production in Samtse would become privately unprofitable. Free trade policies would also push the domestic prices to move closer to international price. International price on the other hand may remain at current levels. At the same time, a price increase in the agricultural inputs like fertilizers and weedicides can be expected as they are currently subsidized through the provision of transportation cost by the government. However, this component can be assumed to be negligible due its low budget share to the overall cost.