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Competitiveness of poultry and pig production in Vietnam: an application of policy analysis matrix

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Abstract

Policy analysis matrix (PAM) was applied to assess the competitiveness of local, crossbred and exotic breeds of poultry and pig production in North and South Vietnam using data from a stratified sample of 2,213 farms collected in 1999. Results show that poultry meat and egg production is generally competitive except meat and egg production with local breeds, and egg production with crossbreeds in the North, and egg production with local breeds in the South, due to low productivity and high per unit cost. There are economies of scale in the North but it is not so clear in the South. Domestic prices of both outputs and inputs are higher than the world prices. If output prices fall moderately due to withdrawal of protective policies and domestic demand slows down from the current high levels, poultry breeds that are profitable under the existing situation would still remain competitive. Pig production under existing technologies and market conditions is highly competitive, especially with local and crossbreeds in the North and exotic breeds in the South. Currently the producers in the South are apparently benefiting more due to market conditions and policy that make input cost higher and output price lower in the North. There are economies of scale in pig production. Medium farms are more cost effective, and small farms are least competitive. Unless targeted support is provided to small farms, they are likely to be pushed out of business in a more liberalized economic environment.

Keywords: poultry, pig, competitiveness, policy analysis matrix, Vietnam

1. Introduction

The government of Vietnam has recently adopted an agricultural diversification programme in which development of the livestock sector has been given substantial priority because of two main reasons: after experiencing rapid economic growth during the 1980s and 1990s through increased rice production and export as a result of economic renewal programme (*doi moi*), a slowdown in recent years has indicated the limited prospect for growth through rice alone; and rapid income growth coupled with population growth and urbanization led to increased domestic demand for food of diversified origin, especially of animal origin, as elsewhere in the developing world, thus creating an opportunity to use livestock as a source of higher stable income for smallholders and better nutrition for rural people (UNDP, 1998; WORLD BANK, 2000).

Until 1999 the economic liberalization process was very slow and the protective policies such as high tariff on some items related to livestock production, wider tariff lines, restricted enterprise laws, regulatory and supervisory institutional framework and multilateral quota restrictions under the *doi moi* were still continuing. It is expected that the pace of economic liberalization will increase rapidly in line with economic reform globally consequently domestic market will be vulnerable to open competition (WORLD BANK, 2000). Given that domestic livestock production is highly dependent on imported feed or feed ingredients and cheaper import of poultry and pig meat may enter the market with increased liberalization, the questions are whether livestock production will remain competitive with the outside world in order to play a significant role in rural income diversification, whether smallholders will remain competitive to stay in business and reap the benefits of the rapid demand growth for livestock products, what policy, institutional and technology options might be needed to facilitate diversification through livestock and help smallholders participate in the process (DELGADO et al., 1999).

In this study, farm level policy analysis matrix was used for assessing the competitiveness of different breeds of poultry and pig production, which represent about 15% and 75% of total meat production in the country, respectively.

2. Methodology and data

Policy analysis matrix (PAM) approach was used to evaluate the competitiveness of poultry and pig production in Vietnam compared to imports from an open global market. The competitiveness of poultry and pig compared to domestic production of other agricultural commodities is not the subject of this paper. The approach is employed due to its simple and understandable nature, particularly to policy makers

(MONKE and PEARSON, 1989; GOTSCH, 1989; FOX et al., 1990; STAAL, 1995). It evaluates the competitiveness of commodities concerned by comparing data from the private and social budgets. While private profits are estimated based on market prices, social profits are estimated on the basis of social prices. The standard PAM structure is given in table 1.

Table 1. The Policy Analysis Matrix (PAM)

	Revenues	Costs		Profits
		Tradable inputs	Domestic factors	
Private prices	A	B	C	D
Social prices	E	F	G	H
Effects of divergences and efficient policy	I	J	K	L

Where: $D = A - B - C$ = Private profits $H = E - F - G$ = Social profits
 $I = A - E$ = Output divergences $J = B - F$ = Input divergences
 $K = C - G$ = Factor divergences $L = D - H = I - J - K$ = Net divergences.

Source: MONKE and PEARSON, 1989

Theoretically, social prices are those that would exist in perfect market situation. Practically, such prices are estimated using different methods such as identification of quantifiable market interventions that make the differences in the observed and free market price, calculation of border equivalent or parity prices, and estimation of shadow prices (GITTINGER, 1982; MONKE and PEARSON, 1989; STAAL, 1995; YAO, 1997). In this study we used import parity prices for the items that have domestic prices above the range of non-tradability and export parity prices for the items that have domestic prices below the range of non-tradability area¹. The shadow prices of domestic non-tradable factors are based on their value under the most common alternative activity. Following standard PAM procedure, the following indicators of comparative advantage, protection and policy impacts were calculated: private cost ratio (PCR), domestic resource cost ratio (DRC), nominal protection coefficient on tradable outputs (NPCO), nominal protection coefficient on tradable inputs (NPCI), effective protection coefficient (EPC).

The primary data were derived from a nationwide stratified sample survey of 1,118 poultry and 1,962 pig farms during August 1999 to January 2000 through a single visit survey. Because of observed differences in agricultural production, prices and income between the South and the North, region (north and south), farm size (small, medium,

¹ The price range from export parity price to import parity price for a commodity is defined as a range within which the commodity is a non-traded or home good (DORNBUSCH, 1980; STAAL, 1995).

large) and breed (local, crossbred and exotic) were used as stratification criteria for sampling both pig and poultry farms (for details see, IFPRI, 2001). Separate analyses were done for different breeds in each region. Data on parity prices of inputs and outputs were derived from FAO (1999) and other secondary sources.

3. Competitiveness of chicken meat and egg production

3.1 Analysis of enterprise budgets

Considering the costs of all family resources at market prices, it appears that some production enterprises are highly profitable but others are not (table 2). In general, public policy and market conditions provide incentive to expand poultry production in the South. Here, except for local egg, all breeds and commodities offer positive and high private and social profits. Private profits are much higher for local meat, crossbred meat and exotic egg production. Until 1999, the implementation of the policies directed towards liberalization was very slow. Thus, the protective policy seems to be more conducive for the expansion of poultry production in the South as indicated by higher private profits than social profits. Social profits are higher for crossbred egg and exotic meat production. So the policy seems less favourable for the adoption of high yielding exotic poultry for meat production in the South, but it was more supportive for exotic egg production. About 95% of the egg produced in the South came from exotic poultry compared to 65% in the North. Existing policy may be persuasive to switch to the production of exotic egg particularly in the South, most probably through curtailing local and crossbred egg production.

Local breed meat production in the North, local breed egg production in both regions and crossbred egg production in the North are much less competitive than other options. The producers in the North earn a subnormal rate of return in producing local breed meat, local breed egg and crossbred egg. For these enterprises, private and social returns are negative and the net effect of policy is positive except for crossbred meat. This indicates that net subsidization for local breed poultry is not sufficient to make it privately profitable. The outcome differs between the North and the South. In the South local and crossbred producers are in a better condition, they earn supernormal rate of return except for local egg production. Theoretically, we would expect farmers to exit from local breed poultry production (except for meat production in the South) and switch to activities where private returns are high, but the reality is different. Farmers have non-efficiency objectives in production, e.g., utilizing low opportunity cost family resources and are constrained by many factors. Also, local breeds do not require high fixed costs, which is an advantage for poor farmers. Moreover, some of the home supplied feed items that we valued at market prices, would become waste if not used for feed for local poultry.

Table 2. Farm-level policy analysis matrix (000'D/MT), chicken, Vietnam, 1999

Breed and commodity	North				South			
	Revenues	Tradables	Factors	Profit	Revenues	Tradables	Factors	Profit
Local Meat								
Private	15274	5260	11616	-1602	19650	4337	2891	12422
Social	10910	5010	11690	-5790	10870	3679	2214	4977
Divergences	4364	250	-74	4188	8780	658	677	7445
% Divergences	40.00	4.98	-0.63	-72.34	80.77	17.88	30.59	149.59
Local egg								
Private	16922	27229	20385	-30693	14109	25888	12739	-24518
Social	12082	26580	17346	-31844	11898	22178	9827	-20107
Divergences	4839	649	3040	1151	2211	3710	2912	-4411
% Divergences	40.05	2.44	17.53	-3.61	18.58	16.73	29.63	21.94
Crossbred meat								
Private	11932	9955	1380	598	15646	2009	851	12785
Social	10910	8313	1092	1506	10870	1666	652	8552
Divergences	1022	1642	288	-908	4776	343	200	4233
% Divergences	9.37	19.75	26.37	-60.28	43.93	20.60	30.62	49.49
Crossbred egg								
Private	15547	18397	5387	-8237	14043	6700	4128	3215
Social	12799	15853	4285	-7340	12603	5599	3145	3858
Divergences	2748	2544	1102	-897	1440	1101	983	-644
% Divergences	21.47	16.05	25.71	12.22	11.43	19.67	31.25	-16.68
Exotic meat								
Private	11949	4967	921	6062	11671	7728	1039	2904
Social	10910	4115	1168	5627	10870	6448	824	3598
Divergences	1039	852	-247	434	801	1280	215	-694
% Divergences	9.53	20.71	-21.18	7.72	7.37	19.85	26.09	-19.28
Exotic egg								
Private	10875	6735	1692	2448	14674	4326	742	9605
Social	10875	5700	1292	3883	12168	3684	599	7885
Divergences	0	1035	400	-1435	2505	642	143	1721
% Divergences	0.00	18.15	31.00	-36.96	20.59	17.43	23.81	21.82

Source:?

The performance of local breed in the South is better than in the North because of using a higher proportion of concentrates, crude materials that have higher edible energy and purchased feed materials. However, local breed egg production is still

highly inefficient in both the regions, only local breed meat production is efficient in the South. Exotic breed meat and egg production is highly profitable. In general, the profitability of meat production is greater than egg production except for exotic breeds in the South.

All private prices for output are higher than import parity price except for exotic egg in the South that falls within the non-tradable area. This implies that the country would benefit more from import instead of producing chicken domestically, as far as output prices are concerned. However, except for crossbred egg, world prices are higher than the cost of production for improved poultry production. This implies that Vietnam is in a position to export improved poultry meat at the existing world prices. On the other hand, the negative social profits for local meat and egg in the North and local egg in the South suggest that the country would be better off in terms of national growth by not producing them. Private profits for some enterprises in the South are markedly larger than social profit. This indicates a higher degree of imperfection in the market and scope for increasing production through taking measures that can expand competition.

While producers 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 the policy distortion resulting from import duties on feed items. The government does not provide any subsidy but levies import duties on tradable feed materials causing an increase in domestic price. This policy creates a negative transfer shown by the positive divergences between private and social values of tradables (table 2). Since world prices for tradable inputs are lower than the domestic prices, the country would benefit more from import of feed. Generally, market failures and policy distortions are higher in the South, although they are also high for some production enterprises in the North. Thus, Vietnam may be a good example of a country that could enter the world market by producing more output by using imported inputs in a liberalized market. What is likely to happen in reality requires further investigation, which is beyond the scope of this analysis.

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 profit in the South and the profit from exotic poultry meat in the North indicate that without any protection and with a modest reduction in the demand growth these enterprises would still remain competitive. If import levies from feed materials are withdrawn, there may be a possibility of switching from local to improved breeds to a greater extent. If so, large farmers may gain more as higher proportion of them generally adopt improved breeds.

Divergences are provided in relative terms for the ease of comparison. Transport/handling costs are slightly lower in the South. Private prices are higher in the South for local and crossbred meat and exotic egg. So in these cases, relative output divergences are higher. This implies that the producers here obtain higher implicit subsidy due to market factors and protective public policy. In case of tradable inputs, relative divergences are higher for local and crossbred poultry in the South. That means implicit input taxes for local and crossbred poultry are higher in the South. Private profits are higher than social profits for the most profitable enterprises. Thus producers gain from existing policy and market factors.

3.2 Economies of scale in exotic poultry

About 96% and 68% of local and crossbred poultry producers were small having annual flock size up to 500 birds. So it was assumed that the general characteristics of local and crossbred producers reflected primarily small farm behaviour, and therefore it may not be worthwhile to investigate the scale economies for these activities. However, about 28% of the exotic poultry producers were small (annual flock size up to 500 birds) in both regions, about 39% and 34% were medium (>500 to 2,000 birds) in the North and South respectively, and the remainder were large producers (more than 2,000 birds). So for exotic poultry, we examined the scale economy.

The analysis shows that scale economies exist in the North but not so clearly in the South (table 3). This is mainly because of the economy in feed purchases that occupy the largest share in the total cost. In the North, medium producers spend more on home supplied feed, veterinary medicine and service, and parent stock purchase but economize on labor and purchased feed. In the South, the diseconomy of the large farmers may have resulted from higher cost of concentrate feed, veterinary cost and parent stock purchase, though labor cost was lower. Moreover, the diseconomy may have resulted from the inefficient use of the quantity of feed and parent stock, not from prices. The feed prices were the same for all groups and the large farmers in the South bought parent stocks at lower unit prices than the small and medium producers. This implies that the use and composition of feed is very important to derive economies of scale in production. The medium farms in the South are most efficient. Under the rapid expansion of liberalization policy there is a possibility of these farms to grow bigger with cheaper feed in the open market but if current trends continue, they may become less efficient after growing big.

The opportunity for small producers to benefit from commercialization seems limited, especially in the North. This indicates that if not adequately protected, small farms may not be in a position to compete with the large farms and survive in the competitive international market due to higher per unit cost of production. Economic

liberalization may push them out of business and aggravate unemployment problem within the poorer section of the economy.

Table 3. Farm-level input costs for production of exotic chicken meat by flock size, Vietnam, 1999

Description of inputs	North			South		
	Small	Medium	Large	Small	Medium	Large
Total cost (000 D/ton)	12789	10084	5124	9518	8011	8594
Feeds as % of total cost	58	63	65	63	78	61
Labor as % of total cost	31	14	8	25	9	4

Source:?

3.3 Policy and comparative advantage indicators for poultry

Private prices for both outputs and inputs were higher than social prices in most of the cases. The private cost ratio (PCR) is a measure of private profitability. Among the 12 activities investigated, eight are highly profitable for the farmers as they are producing more value added than domestic resource costs (table 4). However, local egg production failed to cover tradable input costs and therefore its PCR is negative. The values of the domestic resource cost ratio (DRC) indicate that among the 12 activities, eight including exotic poultry and some crossbred and local poultry have comparative advantage. However, the country has a comparative advantage in poultry production as a whole if local egg is produced only for domestic consumption. In general, exotic breeds have comparative advantage over local and crossbred poultry production, and the South has a comparative advantage over the North. In fact, some activities in the South have very strong comparative advantage indicating lack of competition in the domestic market.

The values of nominal protection coefficients (NPCO and NPCI) show that the producers are protected for the output ($NPCO > 1$) at the expense of the tax they are paying for the inputs ($NPCI > 1$). The policy distortion and market conditions have permitted the private price of output to be 40% and 80% higher in the North and the South, respectively, than that would be under free trade. Thus, for local meat production implicit subsidy is much higher in the South. If the same level of subsidy were provided in the North, local breed meat would be privately profitable there. On the other hand, if the producers of local breed meat in the South were paid a subsidy at the level of the producers in the North, they would still earn a supernormal profit. This would benefit more producers with the same amount of social cost.

Table 4. Summary of comparative advantage indicators, chicken, Vietnam, 1999

Commodity, breed, region	PCR	DRC	NPCO	NPCI	EPC
Meat					
Local, North	1.16	1.98	1.40	1.05	1.70
Local, South	0.19	0.31	1.81	1.18	2.13
Crossbred, North	0.70	0.42	1.09	1.20	0.76
Crossbred, South	0.06	0.07	1.44	1.21	1.48
Exotic, North	0.13	0.17	1.10	1.21	1.03
Exotic, South	0.26	0.19	1.07	1.20	0.89
Egg					
Local, North	-1.98	-1.20	1.40	1.02	0.71
Local, South	-1.08	-0.96	1.19	1.17	1.15
Crossbred, North	-1.89	-1.40	1.21	1.16	0.93
Crossbred, South	0.56	0.45	1.11	1.20	1.05
Exotic, North	0.41	0.25	1.00	1.18	0.80
Exotic, South	0.07	0.07	1.21	1.17	1.22

Source:?

Based on EPC values, producers of most of the categories, especially in the South, are rewarded by market conditions and policy ($EPC > 1$). In the cases where producers are taxed more for the tradable inputs than outputs, there is a net tax on their value added ($EPC < 1$) except the case of local chicken egg in the North, where the cost of production from tradable inputs was higher than output prices and therefore value added was negative. Here, EPC of 0.71 implies that more protection leads to reduced negative value added. Protection was generally lower for exotic poultry than for other breeds.

Sensitivity analysis was conducted by changing a number of price, cost and policy parameters. Results show that exotic egg and meat production remain highly profitable, both in the South and in the North. They also remain highly competitive in the world market. With a moderate dumping in the world market or changes in the government policy instruments such as interest rate, import duties, tax and subsidy, exotic poultry would still be competitive for both meat and egg production.

4. Competitiveness in pig production

4.1 Analysis of enterprise budgets

At market prices all breeds are profitable except for exotic breeds in the North (table 5). Private profit is the highest for exotic breeds in the South followed by crossbred and local breeds in the North. In general pig production is competitive from a financial point of view.

The analysis of tradable inputs reveals that producers are paying higher than the social price. In relative term the differences ranges from about 8.7% for local breed in the South to 21% for exotic breed in the North. Thus, the producers in the North are paying taxes both for output and input. In particular, higher implicit taxes on input preclude producers of exotic breed in the North from making profit.

**Table 5. Farm-level policy analysis matrix
(000'D/MT live weight), pig, Vietnam, 1999**

	North				South			
	Local	Crossbred	Exotic	All	Local	Crossbred	Exotic	All
Private values								
Revenue	8425	8057	9655	8269	10063	11499	13747	12470
Tradables	5156	4894	8835	5644	5565	9442	8637	8400
Factors	1234	988	1208	1086	3191	1867	971	1114
Profit	2035	2175	-388	1539	1307	189	4139	2956
Social values								
Revenue	8710	8710	9655	8810	9890	9890	9890	9890
Tradables	4324	4139	7290	4707	5121	8020	7256	7187
Factors	1016	838	979	903	2602	1542	795	951
Profit	3370	3733	1386	3200	2168	328	1838	1752
Divergences								
Revenue	-285	-653	0	-541	173	1609	3857	2580
Tradables	832	755	1545	937	444	1422	1381	1212
Factors	218	150	228	183	589	326	175	163
Profit	-1335	-1557	-1774	-1662	-860	-139	2301	1205
% Divergences								
Revenue	-3.27	-7.50	0.00	-6.14	1.75	16.27	39.00	26.08
Tradables	19.24	18.23	21.20	19.92	8.67	17.73	19.03	16.87
Factors	21.49	17.86	23.33	20.30	22.64	21.12	22.04	17.09
Profit	-39.62	-41.73	-127.98	-51.92	-39.69	-42.36	125.17	68.77

Source:?

Social profits are generally higher than private profits but producers are not protected except for exotic breeds in the South. Market conditions are such that domestic consumers in the South are paying higher prices, implying existence of implicit subsidy in the production of exotic breeds in the South. The producers in the North are not protected for any of the breeds. The consumers in the North are paying lower than the international price. The social profits are all positive suggesting that the country is better off by producing pig. The country as a whole is not subsidizing the industry. The government policy and market condition are supportive towards the adoption of exotic pig in the South, but not in the North. Although the domestic market in the North fails to offer the social price to the producers, yet the production of local and crossbred pig is privately profitable.

4.2 Economies of scale in pig production

In the North, 71% of the producers were small (annual herd size up to 50 animals), 18% were medium (>50 to 100 animals) and 12% were large (>100 animals); in the South, the proportions were respectively 46%, 26% and 29%. Average annual live weight sales of the large producers were about 12 times higher than small producers for local, about 18 times higher for crossbred and about 25 times for exotic breeds.

On average, scale economies exist for crossbred pig in the North and exotic pig in the South. In general, medium farms had lowest per unit cost while small farms had the highest. In fact medium farms for all breeds were earning super normal profits. In the North large local pig farmers were merely breaking even and small farms producing exotic breeds were making losses.

Comparison of cost components by size of operation show that cost economies were derived from labor in all cases and from feed in some cases. Stock purchases and veterinary cost increased with the herd size. However, lower veterinary expenses by small farms may not be a reflection of cost economy rather their inability due to lack of cash or lack of information to spend enough in this important area to enhance productivity.

4.3 Comparative advantage indicators for pig

The private profitability is high for all breeds ($PCR < 1$), except for exotic pigs in the North. Return to factors is the highest for exotic breeds in the South (table 6). Thus, the same breed is performing differently in the two regions. Feed conversion rate for exotic breed was higher in the North, indicating that the market condition and policy are responsible for private losses from exotic breeds. Import tariff on feed items make feed prices higher but the output price is lower than the international price. The

performance of local pigs in the South was poor because of lower feed conversion and survival rates. However, the differences in these characteristics are negligible for crossbreds.

Table 6. Summary of comparative advantage indicators for pig production, Vietnam, 1999

Ratio indicators	North				South				All regions
	Local	Crossbred	Exotic	All	Local	Crossbred	Exotic	All	
PCR	0.38	0.31	1.47	0.41	0.71	0.91	0.19	0.27	0.60
DRC	0.23	0.18	0.41	0.22	0.55	0.82	0.30	0.35	0.32
NPCO	0.97	0.93	1.00	0.94	1.02	1.16	1.39	1.26	1.00
NPCI	1.19	1.18	1.21	1.20	1.09	1.18	1.19	1.17	1.18
EPC	0.75	0.69	0.35	0.64	0.94	1.10	1.94	1.51	0.61

Source:?

Under existing technologies and market conditions, both regions of Vietnam show strong comparative advantage in pig production ($DRC < 1$). The North has more comparative advantage in local and crossbred and the South in exotic breeds. Thus, existing government policy is supportive of expanded production but the North and the South are deriving benefits through different breeds and disproportionately. The producers in the South are benefiting more through exotic breeds, which are more productive than local and crossbreds.

Examination of DRC by size indicated that in most cases DRC for small farms was higher than medium and large farms but in all cases it was less than one. Thus, small farms were less competitive but they still had comparative advantage in the international perspective.

The values of nominal protection coefficients reveal that producers in the South are protected by policy and market conditions for output ($NPCO > 1$) but producers in the North are not (table 6). In general producers in the North are taxed more than the producers in the South ($NPCI > 1$) and higher in the North except for crossbred. The policy distortion and market condition have permitted the private price of exotic pig in the South to be 39% higher. Producers of exotic pig in the North would have made profit if output prices were the same as in the South. On the whole, implicit subsidy due to policy and market conditions is much higher in the South than in the North.

Sensitivity analysis using several cost, price and policy parameter changes indicated that the magnitude of different ratios changed but overall, relative comparative advantage measured by DRC remained unchanged because most of the cost items were tradable.

5. Summary and implications of results

Poultry production is generally competitive except meat and egg production with local breeds, and egg production with crossbreeds in the North, and egg production with local breeds in the South, for which productivity is low and therefore per unit cost is high. Domestic prices of both outputs and inputs are higher than the world prices. If output prices fall moderately due to withdrawal of protective policies and domestic demand slows down from the current high levels, the breeds that are profitable under the existing situation would still remain competitive. Especially exotic breeds in South, both for meat and egg production, would still be competitive with changes in the government policy instruments such as interest rate, import duties, tax and subsidy and with a moderate fall in the output price and a moderate rise in the feed price in the world market. The domestic demand is actually increasing due to continuing income growth and urbanization, so even socially unprofitable enterprises may continue to be produced for local consumption to a limited extent depending on the consumer preference.

Differences in technical performance of different breeds between the two regions indicate that exchanging and sharing technical and management knowledge across the regions can improve overall productivity of these breeds. The North can benefit by acquiring knowledge with respect to exotic breeds while the South may benefit by acquiring knowledge with respect to local and also crossbreeds.

Chicken production exhibits economies of scale in the North but not so clearly in the South, so liberalization policy may improve efficiency and competitiveness in the North, because flock sizes may expand due to lower input prices. However, it may cause inefficiency in the South if the same argument is used for output expansion and farms in the South become too large and lose the cost advantage due to lower technical performance. Further, private profits for some enterprises in the South are much higher than social profits, indicating higher degree of imperfection in the market and scope for increasing production through taking measures that can enhance competition. On the other hand, small farmers may not be in a position to compete in a more liberalized economic environment with low productive local breeds and higher per unit cost, so they may fail to reap the benefit of an expanded demand led market. Indeed they may be pushed out of the market aggravating poverty and unemployment. So to avoid such a situation, active policy support in favor of small farmers may be provided so they can stay in business and grow sufficiently in size to derive cost economy and be competitive. Such a policy may be the key to alleviate poverty of smallholders and let them participate in the market driven rural development process.

Pig production under existing technologies and market conditions is highly competitive, especially with local and crossbreeds in the North and exotic breeds in the South. Pig prices are less distorted than chicken. With a relatively low level of protection, private profitability is sufficiently high, except for exotic breeds in the North. Profitability is the highest for exotic breeds in the South. Although the existing policy and market condition are supportive of expanded production throughout the country, the producers in the South are apparently benefiting more. Performance of the same breed differs between regions indicating the potential for improvement through changes in the market conditions, policy and input management. The performance of local pigs in the South may be improved through better feed conversion and survival rates, which are lower compared to the North. Producers of exotic pigs in the North make losses in spite of higher feed conversion rate because import tariff on feed items make feed prices higher than the international prices while output price remain low. Thus, exotic pig producers in the North are paying for policy and market induced distortions.

Under a more liberalized policy regime, pig production may expand further in Vietnam though small farmers, being less competitive, may not be able to reap the fruit. As small farmers are often unable to increase their herd size without any support, and they continue to raise local breeds using labor-intensive technology, it would be justified both on economic and efficiency grounds to extend adequate support for them so that they increase farm size, adopt improved breeds, improve productivity, and economic efficiency.

Available information did not permit inclusion of costs or benefits of environmental externalities created by production enterprises. It was observed during the survey that smaller pig and poultry farmers were effectively recycling manure through crop and vegetable production, some larger production units were selling manure but most had difficulty in appropriate disposal and were perhaps creating environmental pollution (water contamination, public health problem). It is not clear if scale economy and competitiveness would significantly change if these differential externalities could be accounted for.

The PAM is basically based on the performance of the average farm, though scale analysis done in a semi-aggregated manner show existence of some cost economies across sizes of operation. In reality, differences in technical and economic efficiency may be much wider across individual farms and this may also vary for different breeds. Thus, at the individual farm level, the ability to compete within a liberalized economic environment may vary widely-some may be highly competitive while others may not be so. A detailed farm-specific efficiency analysis may therefore shed more light on the production and profit frontiers of poultry and pig farms in the country.

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