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Interaction between livestock and feeds policies: evidence from Southeast Asia

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ABSTRACT

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Consumption of livestock products in Southeast Asia could continue to increase rapidly, as has been the case in Northeast Asia. The extent to which domestic producers may respond to these demand developments will be influenced by government interventions in both livestock product and feeds markets. The paper analyses the net contribution of livestock product and feed price distortions on the effective rate of protection, and whether intervention in the commodity market is augmented or offset by intervention in the feeds market. While policy-induced distortions were found to exist in the livestock sectors of Thailand and Malaysia, especially in beef and dairy production, the contribution of feeds policies to these distortions was minimal. In contrast implicit taxes on feeds were high in Indonesia and the Philippines. In the latter, support on product prices was sufficient to more than offset the tax on feeds so that effective protection remained positive. But in Indonesia both livestock and feeds policies worked to provide disincentives to livestock production. It is concluded that livestock and feeds policies should be formulated with regard to objectives and priorities within both sectors. This could require that greater emphasis be placed on feeds sector assistance policies that do not affect the price of feeds.

TRENDS IN DEVELOPING COUNTRY LIVESTOCK-FEED SECTORS

The demand for livestock products is usually income elastic in developing countries. When these countries are experiencing rapid income growth, as is the case in Southeast Asia, consumption patterns undergo marked changes. The demand for cereals for human consumption is generally very inelastic with respect to income and rapid income growth leads to a switch

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from foodgrains and other staples to livestock products in human consumption.

The situation that will develop in Southeast Asia is indicated by past consumption changes in Japan, Taiwan and South Korea. In Japan, per capita consumption of meat (pork, chicken and beef) rose 5.5% per year, while that of cereals declined by 1.0% per year, comparing average consumption levels in 1985–86 with those in 1960–64. In South Korea, per capita consumption of meats rose 8.3% compared with an annual 0.6% fall in cereals consumption between 1970–74 and 1985. Similar trends exist for Taiwan (Huang and Coyle, 1990). Although they are at an earlier stage of development, the ASEAN nations of Malaysia, Indonesia, Thailand and the Philippines will undergo similar trends in food consumption. In 1987, per capita consumption of pork, chicken and beef ranged from 3.7 kg in Indonesia to over 26 kg in Malaysia, and has been increasing by 4–6% per annum in recent years. The consumption of milk in the region showed similar rates of increase (Setboonsarng, 1989).

These demand-side developments, coupled with technological improvements in domestic livestock production, can lead to a considerable supply response, often further augmented by government intervention. Although the total production of pork, chicken and beef declined in the Philippines between 1984 and 1987, supplies increased 6–9% per year in Indonesia, Malaysia and Thailand with the production of chicken meat showing the most rapid growth. Milk production has shown a similar growth rate.

Especially in the case of pork and chicken, production systems that were initially based on domestic feed sources and smallholder units have been replaced by large-scale commercial units incorporating intensive grain feeding. Thus the expansion in meat and milk production in the ASEAN region of around 8% per year, coupled with an increasing input of feedgrains per unit output has resulted in a much faster increase in demand for grains as livestock feed than for human consumption. Sarma (1986) has projected that the ratio of foodgrain consumption to total food and feedgrain use in the ASEAN region will range between 50% and 74% by the year 2000, compared with ratios between 66% and 91% in 1980.

The rapid increase in demand for grains, especially for livestock feed, in developing countries often exceeds the ability of such countries to expand domestic feeds production. Hence grain imports expand. Imports of livestock products into these countries typically also increase as demand growth outstrips the expansion of the local livestock industry.

INTERVENTION IN LIVESTOCK AND FEEDS MARKETS

In the ASEAN region, governments have responded to these developments by introducing policies designed to encourage domestic production

of feeds and/or livestock products. These policies may lead to import substitution and foreign exchange savings, and other objectives include smallholder income enhancement, rural labour absorption, diversification and improvement in human nutrition. In the feeds sectors (principally maize, cassava, rice and soybeans) of these countries, input subsidies are commonly paid on fertiliser, pesticides, irrigation investment and credit. Government agencies may be involved in the monopoly importation of feeds or other controls over imports and exports, and price regulation through procurement and storage. Domestic feed producers may be assisted through tariffs and quantitative restrictions on feed imports. Governments may also fund R&D (especially variety improvement) and encourage investment in feed processing.

Turning to livestock production, subsidies may be paid on credit, breeding stock and slaughter services, and in some ASEAN countries production units must be licensed, and environmental regulations may exist. Tariffs may be levied on imported inputs such as medicines, baby chicks and feeds, both tariffs and quantitative controls may restrict the importation of livestock products, and government may directly control the export of livestock products. Government assistance is also commonly provided through R&D (especially breed improvement), extension and training programmes, animal inspection, vaccination and artificial insemination. The profitability of livestock slaughter and processing activities is also affected by policies to encourage such investment, or regulations on the licensing and taxing of slaughterhouses.

Interest here is on the impact of government policies on prices of livestock products and livestock feeds, on whether distortions in feeds prices are offset or augmented by intervention in livestock product markets, and the resulting level of effective protection.

The net effect of government intervention in livestock and feeds markets on the welfare of livestock producers is not always clear cut, and nor is it obvious whether intervention in the livestock product market augments or offsets the impacts of feeds policies. Following sections will address these issues.

METHODOLOGY AND DATA

Aggregating all traded inputs to the livestock production function into two categories, namely feeds and 'all other inputs', value-added in livestock production, in either domestic (market) or border (social) prices, is measured as the difference between the output price and the costs of feed and other traded inputs, all measured per unit of output.

The livestock products under study were valued at the wholesale level in the region of consumption. Each product was defined according to the processing and marketing services that had been added to the raw material, including by-products, by the time it reached wholesale markets. Therefore costs include those of the farm production, processing and distribution stages.

The extent to which livestock product and feeds prices are distorted due to policy intervention is measured by the nominal rate of protection of the product (NPR_j), and the implicit tariff paid on the total feed ration (IT_{fj}). These measure the percentage by which the domestic price of the product or the feed ration exceeds the border price of the product or the feed ration costed at border prices, respectively.

The effective rate of protection of livestock production (EPR_j) expresses the net effect of both output and input price distortions, and can be expressed in terms of the nominal protection rate and implicit tariff (see Annex).

The change in the effective rate of livestock industry protection due to the introduction of livestock product and feed policies is:

$$\Delta\ \text{EPR}_j = \text{EPR}_j - \text{EPR}_j^* = \frac{p_j^b\ \text{NPR}_j - \sum_{i=1}^{k} a_{ij} p_i^b\ \text{IT}_{fj}}{\text{VA}_j^b} \tag{1}$$

where EPR_j^* is the effective rate of protection when $\text{NPR}_j = \text{IT}_{fj} = 0$. (All variables are defined in the Annex.)

From (1) it can be seen that the price impacts of livestock and feeds policies will exactly offset each other if:

$$p_j^b\ \text{NPR}_j = \sum_{i=1}^{k} a_{ij} p_i^b\ \text{IT}_{fj} \tag{2}$$

In this case the change in effective rate of protection due to livestock and feed policies as given by (1) will be zero and effective protection will depend solely on distortions in domestic prices of the non-feed traded inputs.

Equation (2) can be rewritten as:

$$\text{NPR}_j = K_{fj}\ \text{IT}_{fj} \tag{3}$$

where $K_{fj} = \sum_{i=1}^{k} a_{ij} p_i^b / p_j^b$. Note that K_{fj} is the share of feeds in the value of output at border prices.

Provided that both NPR_j and IT_{fj} are positive, then price support for the livestock product will offset to some extent the implicit tax on feed inputs. If the LHS of equation (3) exceeds the RHS, product price support will over-compensate for the feeds tax, and vice versa. If both NPR_j and IT_{fj} are negative, then the subsidised feed will tend to offset the tax on output. Should either one of NPR_j or IT_{fj} be negative, both livestock and feeds policies will augment one another in terms of livestock production incentives. Negative values for NPR_j and positive values for IT_{fj} both reduce livestock production incentives, and vice versa. In the sections that follow, values of EPR_j, $\Delta\ \text{EPR}_j$, NPR_j, K_{fj} and IT_{fj} will be tabulated for selected livestock products and regions within each of the study countries.

Data is drawn from a regional study into incentives and comparative advantage in the livestock and feeds sectors of ASEAN (Rae and Lough, 1989). Aimed to provide planning agencies with data and analyses to support their policy formation processes, that research was undertaken by study teams in Indonesia, Malaysia, the Philippines and Thailand (Kasryno et al., 1989; Tan et al., 1989, Cabanilla, 1989; Setboonsarng et al., 1989). Policies that impacted directly or indirectly on the livestock and feeds sectors were described, and their influence on production and consumption incentives were measured.

Surveys of farmers, processors and traders were conducted in each country during 1988, and average protection levels and private and social profitability for a number of livestock products and feeds were estimated. Depending on data availability in each study country, border prices were measured as the average cif or fob values (as appropriate) for 1986 or 1987, or as the average of the most recent three years of data. Although not reported here, sensitivity analyses were conducted to explore the impacts of changes in commodity prices that have occurred since then. Analyses emphasised regional patterns of production, consumption and costs, since transportation can be a major component of costs in countries like Indonesia and the Philippines. Separate analyses were conducted depending on whether the commodity was intended for export, import substitution, or interregional trade within national boundaries.

RESULTS AND DISCUSSION

Table 1 presents the evidence from the Indonesian study. For all livestock production except dairy, policies have forced domestic prices below border values by 20–40% at the same time as other policies have raised the price of feeds by 20–75% above border values. Obviously both sets of policies work in the same direction to provide disincentives to these livestock production sectors in Indonesia. Dairy product prices, however,

TABLE 1

Livestock and feeds policy interaction: Indonesia

	Nominal protection rate on product NPR_j (%)	Implicit tax on feeds IT_{fj} (%)	Feeds factor share K_{fj}	K_{fj} IT_{fj} (%)	Effective protection rate on product	
					EPR_j (%)	Δ EPR_j (%)
Broiler [a]	−42	20	0.28	6	−83	−84
Eggs [b]	−23	20	0.45	9	−67	−66
Eggs [c]	−30	20	0.65	13	−133	−133
Pork [d]	−39	75	0.14	11	−63	−60
Pork [e]	−38	31	0.10	3	−53	−48
Beef [f]	−20	78	0.13	10	−43	−38
Beef [g]	−20	75	0.27	20	−77	−66
Dairy [h]	62	3	0.39	1	120	121
Dairy [f]	48	9	0.31	3	84	84

[a] Bogor, Java (import substitution).
[b] Lampung, Sumatra (interregional trade to Jakarta).
[c] Bogor, Java (import substitution).[d] Bali, intensive feed system (import substitution).
[e] Bali, waste feed system (import substitution).
[f] Central Java, smallholder farms (interregional trade to Jakarta).
[g] West Java, corporate farms (interregional trade to Jakarta).
[h] Central Java, corporate farms (interregional trade to Jakarta).
Source: Kasryno et al., 1989.

receive support from government policies which more than offsets the much smaller policy-induced increase in feeds prices.

Consequently, effective protection is positive only for dairy production and negative for all other products studied. The changes in the effective rate of protection due to introduction of both the livestock and feeds policies indicate that in the absence of these policies, effective protection would be close to zero for all products.

These results are largely due to trade policies that impose government control over the export of chicken meat, pork, beef and eggs and provide assistance to domestic consumers through their export tax effect. The dairy industry receives protection through quantitative restrictions on imports of dairy products. Import quotas are allocated to milk processing companies in a fixed ratio to the procurement of domestic milk. Indonesia's international trade in most feedstuffs is controlled by government via monopoly import rights granted to a parastatal organisation.

Turning to the Malaysian situation (Table 2), product price support in the dairy industry heavily offsets minor distortion of feed prices while effective protection rates in poultry and pig production, when averaged

TABLE 2

Livestock and feeds policy interactions: Peninsular Malaysia

	Nominal protection rate on product NPR_j (%)	Implicit tax on feeds IT_{fj} (%)	Feeds factor share K_{fj}	K_{fj} IT_{fj} (%)	Effective protection rate on product	
					EPR_j (%)	Δ EPR_j (%)
Broiler [a]	11	5	0.40	2	15	15
Broiler [b]	−6	5	0.38	2	−14	−13
Eggs [a]	4	5	0.47	2	7	3
Pork [a]	−11	5	0.40	2	−23	−23
Pork [b]	9	5	0.38	2	11	12
Dairy [b]	127	5	0.49	2	322	329

[a] Central region.
[b] Southern region.
Source: Tan et al., 1989.

over regions, are close to zero as the impacts of product and feeds policies largely offset each other.

In the absence of the livestock and feed policy interventions, effective protection rates on all products would change to almost zero. Tariff rates on imported feed components have been progressively reduced, in some cases to zero. Of those items still subject to duty, only soybean meal (with a 13% tariff) is a major component of feed ratios. Thus Malaysian livestock raisers pay feed costs that are only marginally above border prices. In the livestock sector, government intervention is concentrated on ruminant animal production by smallholders. The government operates a price support system for milk, and quantitative restrictions are imposed on the import of some dairy products. Cattle purchases are also subsidised. The non-ruminant sector has traditionally operated on commercial lines with relatively little government assistance. Policies here include quantitative restrictions on imports of day-old chicks, live birds and live pigs for purposes other than breeding, and import duties on chicken parts and processed pork items.

The Thailand results are given in Table 3. Production of crops such as rice, maize and cassava in Thailand is oriented towards export. There is little government intervention in the production and marketing of the first two crops although cassava exports to non-EC markets are effectively subsidised due to the government's management of the EC quota system. The domestic soybean industry is supported through quantitative controls on imports of both beans and meal linked to crushers and importers usage of domestic production. As a result, feeds prices to poultry and pig raisers

TABLE 3

Livestock and feeds policy interactions: Thailand

	Nominal protection rate on product NPR_j (%)	Implicit tax on feeds IT_{fj} (%)	Feeds factor share K_{fj}	K_{fj} IT_{fj} (%)	Effective protection rate on product	
					EPR_j (%)	Δ EPR_j (%)
Broiler [a]	−9	1	0.26	0	−15	−15
Egg [a]	−8	1	0.63	1	−27	−28
Pork [b]	10	5	0.27	1	14	16
Dairy [c]	46	−3	0.28	−1	72	73
Beef [d]	78	27	0.13	4	93	93
Beef [e]	73	32	0.11	4	82	82

[a] Central region (production for export).
[b] Central region, average of three farm sizes (production for export).
[c] Central region, average of three farm sizes (import substitution).
[d] Northeast region, average of two farm sizes (import substitution).
[e] Central region, (import substitution).
Source: Setboonsarng et al., 1989.

were slightly above border prices of feedstuffs. Feed prices paid by dairy farmers are also close to border values, although feed costs in beef are around 30% above their border valuation, reflecting differences in the feed mixes. Multiplying these feed taxes by their factor shares indicates that distortions in feed prices in Thailand make only a minor contribution to the effective protection rates.

The poultry sector is relatively free of government intervention, and domestic prices of poultry products are only slightly below the equivalent border values. Government controls in the pork market are aimed at controlling domestic processing and trading, the most important control being government ownership of slaughterhouses. The beef industry received protection through tariffs on imports of beef and the dairy industry is assisted through quantitative import controls similar to the domestic-to-import ratios applied in the soybean sector. These latter interventions largely explain the enhancement of domestic beef and dairy prices above border levels, against which feed price distortions are insignificant. As in Indonesia and Malaysia, removal of policies that distort livestock product and feeds prices in Thailand would result in effective protection rates that were close to zero. Thus in each country distortions in prices of other traded inputs play a relatively minor role in influencing production incentives.

For the Philippines, Cabanilla (1989) calculates implicit tariffs for broiler and layer rations of 37%, and for pig rations of 32%. Major contributing

TABLE 4

Livestock and feeds policy interaction: Philippines

	Nominal protection rate on product NPR_j (%)	Implicit tax on feeds IT_{fj} (%)	Feeds factor share K_{fj}	K_{fj} IT_{fj} (%)	Effective protection rate on product	
					EPR_j (%)	Δ EPR_j (%)
Broiler [a]	48	37	0.14	5	51	57
Eggs [a]	37	37	0.11	4	29	43
Pork [a]	19	32	0.08	3	13	20

[a] Mindoro region (interregional trade to Manila)
Source: Cabanilla, 1989.

factors are policies that impact on domestic corn and soybean meal prices. In 1972, the National Grains Authority was given monopoly import rights on major feed ingredients. This monopoly was abolished in 1985 as part of the government's trade liberalisation programme. However, the import of maize has been banned since 1986 since when the nominal rate of protection afforded this feedstuff has been well over 50%. Coupled with strict controls on the import of maize feed substitutes, livestock farmers face feed prices well above border levels. Following deregulation of soybean imports, the extent to which soybean meal prices exceeded border values has narrowed somewhat, from 59% down to 43%. A substantial distortion in the price of this important feed ingredient remains therefore, due largely to the oligopolistic nature of the market with only a few firms granted import permits.

Trade in live animals and livestock products is mainly regulated by tariffs and export/import permits. These trade barriers have been much higher for imports of eggs and poultry meat than for other types of meat. Likewise, tariffs on imports of live poultry have been higher than those imposed on other live animals. Thus the results given in Table 4 indicate that product protection more than offsets the disincentives caused by feeds policies.

POLICY INCENTIVES AND IMPLICATIONS FOR ECONOMIC EFFICIENCY

While policy-induced distortions exist in the livestock sectors of Thailand and Malaysia, especially in beef and dairy production, the contribution of feeds policies to those distortions appears minimal except for Thai beef production. Even in the latter case, effective protection is the highest of all livestock products studied in that country despite the implicit tax on feeds

– in the absence of the feed price distortion, effective protection of beef production would be even higher.

A different situation exists in Indonesia and the Philippines, where implicit taxes on feeds vary up 78%. In the latter country, support on product prices is sufficient to more than offset the tax on feeds so that effective protection remains positive. But in Indonesia both livestock and feeds policies work to provide disincentives to production. While maize prices in Indonesia are close to world levels, soybean prices exceed border values by 35–90% which contributes to the relatively high implicit tax on feed mixes in that country. In addition, government export controls have reduced livestock product prices below world levels.

Policies that explicitly or implicitly discourage the expansion of livestock production would be understandable if the livestock sector employed resources that could be better deployed in some other sector. Social profitability indices were constructed to indicate whether or not this was the case:

$$SP_j = p_j^b - \sum_{i=1}^{m} a_{ij} p_i^b - \sum_{i=n}^{N} a_{ij} v_i^b \qquad (4)$$

where SP_j is the social profitability per unit of livestock commodity j; v_i^b = social valuation (net of taxes and subsidies) of the opportunity costs of non-traded inputs; and $i = n, \ldots, N$ = non-traded inputs. If $SP_j > 0$ production of that commodity, on average, produced a positive net return to the nation.

Results are summarised in Table 5. The commodities that receive negative protection due to the effects of both feeds and livestock policies in Indonesia are for the most part socially profitable. Of the commodities

TABLE 5

Livestock production in Southeast Asia: Socially profitable?

Product	Indonesia	Peninsular Malaysia	Philippines	Thailand
Broilers	Yes	Some regions	Some regions	Yes
Eggs	Some regions	Yes	Yes	Yes
Pork	Yes	Yes	Yes	Yes
Beef	Yes	No	Yes	Some regions
Dairy	No	No	Some regions	Some regions

Yes = $SP_j > 0$
No = $SP_j < 0$
Source: Rae and Lough, 1989.

studied in this country, only dairy production received positive assistance but is the only case where social profits are negative.

Provided these profitability measures are indicative of marginal returns, then livestock and feeds policies in Indonesia in particular appear to be driving the livestock sector towards a less efficient use of resources. To a lesser extent, a similar observation can be made regarding poultry and pork production in some regions of Malaysia and for poultry production in Thailand.

CONCLUSION

In many countries, livestock product and feedstuffs markets are closely related. Policies aimed at the achievement of feedstuffs sector objectives can make more difficult the task of meeting objectives in the livestock sector. Thus livestock and feeds policies should not be formulated independently of the other, and should have regard to objectives and priorities within both sectors. This observation is particularly relevant when responsibilities for livestock, and feeds, policy analyses and formulation reside in separate government departments.

When the 'pass-through' effects of feeds policies on livestock sector outcomes endanger the achievement of livestock objectives, feeds policy analysts need to design alternative approaches to reaching objectives within the feed crops sector with minimum disruption to the livestock sector. This is likely to involve less emphasis on feed price and feed trade policies in favour of assistance programmes that do not work through enhancement of prices.

Finally, a word of caution. Adjustments to livestock and feeds policies are likely to cause simultaneous shifts in the livestock supply function and the derived demand function for feeds, thus influencing quantities produced and feed inputs as well as prices. This analysis has ignored such quantity adjustments through unavailability of reliable estimates of the relevant elasticities (Arzac and Wilkinson, 1979; Gardner, 1987).

ANNEX

Value-added in livestock production, in either domestic (market) or border (social) prices, is estimated as:

$$VA_j^d = p_j^d - \sum_{i=1}^{k} a_{ij} p_i^d - \sum_{i=l}^{m} a_{ij} p_i^d \tag{5}$$

$$VA_j^b = p_j^b - \sum_{i=1}^{k} a_{ij} p_i^b - \sum_{i=l}^{m} a_{ij} p_i^b \tag{6}$$

where VA_j^d is value-added in product j at domestic prices; VA_j^b value-added in product j at border prices; p_j^d, p_j^b domestic and border prices, respectively, of livestock product j; p_i^d, p_i^b domestic and border prices, respectively, of traded input i; a_{ij} quantity of input i required per unit of livestock product j; $i = 1, \ldots, k$ feed inputs; and $i = l, \ldots, m$ other traded inputs.

The nominal rate of protection of the product (NPR_j), and the implicit tariff paid on the total feed ration (IT_{fj}) are estimated as:

$$NPR_j = \left(p_j^d - p_j^b\right)/p_j^b \tag{7}$$

$$IT_{fj} = \sum_{i=1}^{k} a_{ij}\left(p_i^d - p_i^b\right) / \sum_{i=1}^{k} a_{ij} p_i^b \tag{8}$$

The effective rate of protection of livestock production expresses the net effect of both output and input price distortions:

$$EPR_j = \left(VA_j^d - VA_j^b\right)/VA_j^b \tag{9}$$

Substituting (7) and (8) for p_j^d and $\Sigma_{i=1}^{k} a_{ij} p_i^d$ in (5) and then using (5) to expand (9) gives:

$$EPR_j = \frac{p_j^b\, NPR_j - \sum_{i=1}^{k} a_{ij} p_i^b\, IT_{fj} - \sum_{i=l}^{m} a_{ij}\left(p_i^d - p_i^b\right)}{p_j^b - \sum_{i=1}^{k} a_{ij} p_i^b - \sum_{i=l}^{m} a_{ij} p_i^b} \tag{10}$$

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