INTERACTION BETWEEN LIVESTOCK AND FEEDS POLICIES :
EVIDENCE FROM SOUTHEAST ASIA

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

Figure 1 shows this trend clearly in the cases of 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 levies 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).
Although they are at an earlier stage of development, the ASEAN
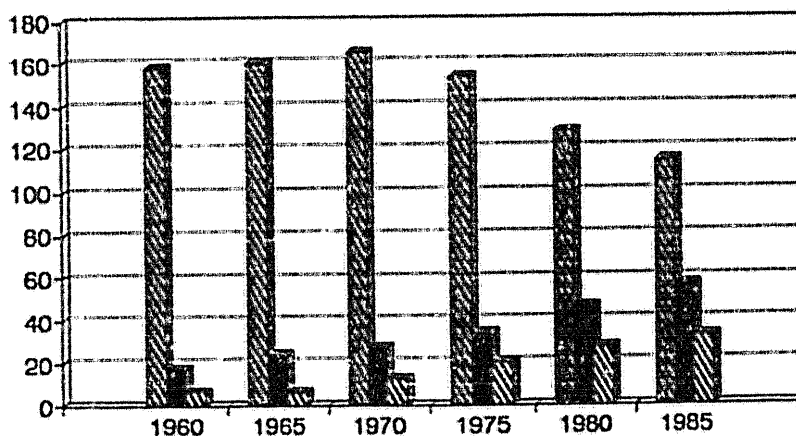nations of Malaysia, Indonesia, Thailand and the Philippines will

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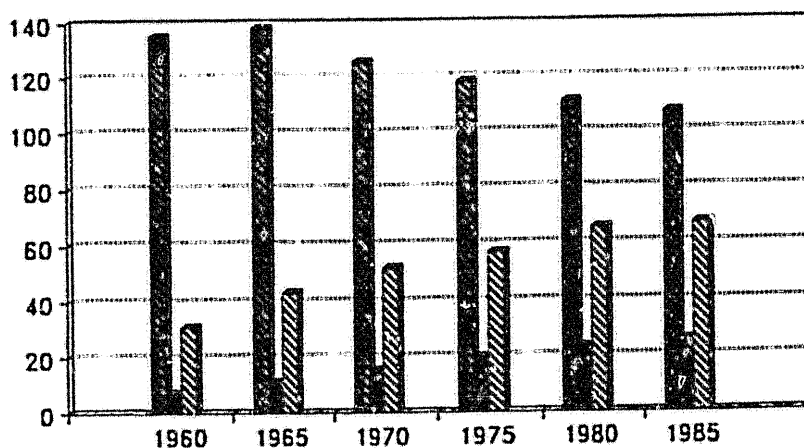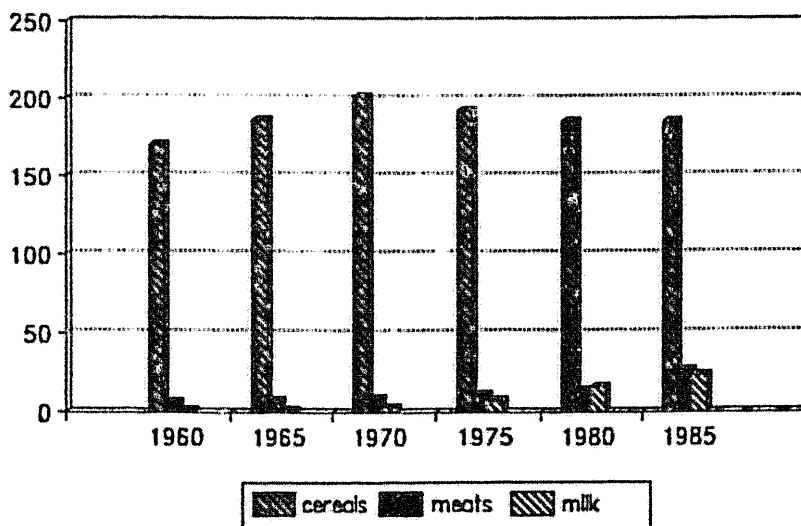
FIGURE 1.   Trends in Cereals and Meat Consumption

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 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 rapi⁺ 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 and soybeans) of these countries, input subsidies are commonly paid on fertiliser, pesticides and credit. Government agencies may be involved in the monopoly importation of feeds, 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

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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.

The net effect of intervention in product and input markets is analysed by Gardner (1987). Aggregating all inputs to the livestock production function into two categories, namely feeds and "all other inputs", an increase in the farm price of the livestock product by a deficiency payment, for example, would lead to increases in livestock product output, usage of the two input aggregates, and prices of both inputs. The exact extent of these changes will depend upon the elasticity of final product demand, the supply elasticities of the two inputs, the elasticity of substitution between the inputs and the factor shares of both inputs. Alternatively, a subsidy paid on the feed input would lead to an increase in livestock production, an increase in the use of feed and a decrease in its price to the livestock farmer, and a decrease in the livestock product price. The direction of price and quantity effects in the market for "other inputs" will depend on the relative size of the demand and substitution elasticities (Gardner, page 109).

This model may be extended through consideration of the markets for feed production inputs. Fertiliser subsidies, for example, will lead

to an increase in fertiliser usage and feeds output, a decline in the price of feeds, and an increase in livestock production but a decline in its price.

The above analysis does not allow imports or exports of livestock products or feeds. By adding these two features, policy interventions may impact on the volume of trade as well as domestic prices. Given a small country assumption, plus an importing scenario for final product and feeds, a deficiency payment scheme for the livestock product will lead to increases in livestock production and feeds usage, an increase in feed imports and a decline in livestock product imports. A tariff or quota on feed imports, on the other hand, would encourage increased domestic production of feeds and decreased feed imports, reductions in livestock production, feeds usage and an increase in imports of the final product.

Clearly, the net effect of government intervention in livestock and feeds markets on the welfare of livestock producers is not always clear cut. 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

Data is drawn from an Asian Development Bank study into incentives and comparative advantage in the livestock and feeds sectors of ASEAN (Rae and Lough). Aimed to provide planning agencies with data and analyses to support their policy formation processes, that research was

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undertaken by study teams in Indonesia, Malaysia, the Philippines and Thailand (Kasryno *et al*, Tan *et al*, Cabanilla and Setboonsarng *et al*). Policies that impacted directly or indirectly on the livestock and feeds sectors were described, and their influence on production and consumption incentives were measured. This involved surveys of farmers, processors and traders in each country during 1988, and the estimation of protection levels and private and social profitability for a number of livestock products and feeds. Analyses emphasised regional patterns ° 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.

In the present paper, interest 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. Gardner (p.112-114) presents formulae that allow these measurements to be made. Because the formulae are designed to take into account market adjustments to policy intervention, estimates of product demand elasticities, input supply elasticities and elasticities of substitution between feed and other inputs are required.

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For the countries under study, reliable estimates are unavailable particularly of the factor supply and substitution elasticities. Therefore the methodology adopted here does not allow for shifts along demand or supply curves, movement of these curves, or changes in the quantities of feed and non-feed inputs per unit of output in response to policy changes. Without knowledge of the required parameters, the nature of errors from using such cruder methods to measure effective rates of protection cannot be determined.

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

$$VA_j^d = p_j^d - \sum_{i=1}^{k} a_{ij}p_i^d - \sum_{i=l}^{m} a_{ij}p_i^d \qquad (1)$$

$$VA_j^b = p_j^b - \sum_{i=1}^{k} a_{ij}p_i^b - \sum_{i=l}^{m} a_{ij}p_i^b \qquad (2)$$

where VA_j^d = 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

$i=l,\ldots,m$ = other traded inputs

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_f):

$$NPR_j = (p_j^d - p_j^b)/p_j^b \tag{3}$$

$$IT_f = \sum_{i=1}^{k} a_{ij}(p_i^d - p_i^b)/\sum_{i=1}^{k} a_{ij}p_i^b \tag{4}$$

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

$$EPR_j = (VA_j^d - VA_j^b)/VA_j^b \tag{5}$$

Substituting (3) and (4) for p_j^d and $\sum_{i=1}^{k} a_{ij}p_i^d$ in (1) and then expanding (5) gives:

$$EPR_j = \frac{p_j^b + p_j^b NPR_j - \sum_{i=1}^{k} a_{ij}p_i^b - \sum_{i=1}^{k} a_{ij}p_i^b IT_f - \sum_{i=1}^{m} a_{ij}p_i^d}{p_j^b - \sum_{i=1}^{k} a_{ij}p_i^b - \sum_{i=1}^{m} a_{ij}p_i^b} \tag{6}$$

From (6) it can be seen that the price impacts of livestock and feeds policies will exactly offset each other if

$$p_j^b NPR_j = \sum_{i=1}^{k} a_{ij}p_i^b IT_f \tag{7}$$

and the effective rate of protection will depend solely on distortions in domestic prices of the non-feed traded inputs.

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Equation (7) can be rewritten as

$$NPR_j = K_f \cdot IT_f \qquad\qquad (8)$$

$$\text{where} \quad K_f = \sum_{i=1}^{k} a_{ij} P_i^b / P_j^b$$

Note that K_f is the share of feeds in the value of output at border prices.

Provided that both NPR_j and IT_f 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 (8) exceeds the RHS, product price support will over-compensate for the feeds tax, and vice versa. Should either NPR_j or IT_f 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_f both reduce livestock production incentives, and vice versa.

In the sections that follow, values of EPR_j, NPR_j, K_f and IT_f will be tabulated for selected livestock products and regions within each of the study countries.

Evidence on Livestock and Feeds Policy Interactions

It should be noted that 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.

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% to 40% at the same time as other policies have raised the price of feeds by 20% to 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, receive support from government policies which more than offsets the much smaller policy-induced increase in feeds prices.

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.

Table 1. Livestock and Feeds Policy Interaction : Indonesia

	Nominal protection rate on product	Implicit tax on feeds	Feeds factor share	$K_f \cdot IT_f$	Effective protection rate on product
	NPRj(%)	IT_f(%)	K_f	(%)	EPRj(%)
Broiler [a]	-42	20	0.28	6	-83
Eggs[b]	-23	20	0.45	9	-67
Eggs[c]	-30	20	0.65	13	-133
Pork[d]	-39	75	0.14	11	-63
Pork[e]	-38	31	0.10	3	-53
Beef[f]	-20	78	0.13	10	-43
Beef[g]	-20	75	0.27	10	-77
Dairy[f]	62	3	0.39	1	120
Dairy[h]	48	9	0.31	3	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)

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 average close to zero as the impacts of product and feeds policies largely offset each other. 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.

Table 2. Livestock and Feeds Policy Interactions : Peninsular Malaysia

	Nominal protection rate on product $NPRj(\%)$	Implicit tax on feeds $IT_f(\%)$	Feeds factor share K_f	$K_f \cdot IT_f$ $(\%)$	Effective protection rate on product $EPRj(\%)$
Broiler[a]	11	5	0.40	2	15
Broiler[b]	-6	5	0.38	2	-14
Eggs[a]	4	5	0.47	2	7
Pork[a]	-11	5	0.40	2	-23
Pork[b]	9	5	0.38	2	11
Dairy[b]	127	5	0.49	2	322

a.   Central region
b.   Southern region

The Thailand results are given in Table 3. Production of crops such

as rice, maize and cassava 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

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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 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 at or below the equivalent border values. Government controls in the pork market are aimed a⁺ 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.

For the Philippines, Cabanilla *et al* calculate implicit tariffs for broiler and layer rations of 37%, and for pig rations of 32%. Major contributing 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

Table 3. Livestock and Feeds Policy Interactions : Thailand

	Nominal protection rate on product	Implicit tax on feeds	Feeds factor share	$K_f \cdot IT_f$	Effective protection rate on product
	$NPR_j(\%)$	$IT_f(\%)$	K_f	$(\%)$	$EPR_j(\%)$
Broiler[a]	-9	1	0.26	0	-15
Egg[a]	-8	1	0.63	1	-27
Pork[b]	10	5	0.27	1	14
Dairy[c]	46	-3	0.28	-1	72
Beef[d]	78	27	0.13	4	93
Beef[e]	73	32	0.11	4	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, averageof two farm sizes (import substitution)

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 positive nominal protection rates and implicit feed taxes
given in Table 4 indicate that product protection more than offsets
the disincentives caused by feeds policies, assuming feed factor
shares similar to those in the other three study countries.

Table 4. Livestock and Feeds Policy Interaction : Philippines

	Nominal protection rate on product	Implicit tax on feeds	Feeds factor share	Effective protection rate on product
	$NPR_j(\%)$	$IT_f(\%)$	K_f	$EPR_j(\%)$
Broiler[a]	48	37	na	51
Eggs[a]	37	37	na	29
Pork[a]	19	32	na	13

a.   Mindoro region (interregional trade to Manila)
na   Not available

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

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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:

$$SP_{j_{i-1}} = p_j^b - \sum_{i-n}^{m} a_{ij}p_i^b - \sum^{N} a_{ij}v_i^b \qquad (9)$$

where SP_j = 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

i=n,...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

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

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

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 Thailand.

Concluding remarks

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 be formulated within a systems framework, and in 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 trade policies in favour of decoupled programmes of support.

Arzac and Wilkinson present an integrated feeds-livestock model for
the USA, with which some of the above issues could be addressed. No
doubt, before such models become feasible in developing countries like
those of Southeast Asia, a greater understanding of the relevant
parameters and elasticities is required. It may also be important to
include other related markets in these models. Rice policy, for
example, plays a major role in determining the level of feeds
production in many countries as it sets the opportunity cost of feed
crop farming.

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