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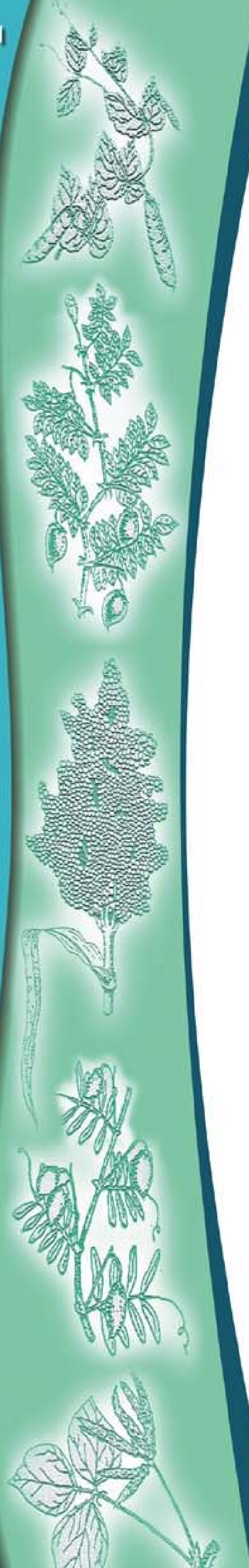

Tariff Reduction Formulae: Implications for Rural Poor Asia-Pacific Countries

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".....recommending "the free play of market forces" between unequal trading partners would only punish poorer commodity exporters at the same time as it brought advantages to the rich industrial core. Therefore, the agenda should attack the persistent trade imbalance and create the essential external conditions for accelerating the rate of growth including new modalities of participation for developing countries in the trading system......." (taken from Prebisch, R., 1964,quoted in Ricupero, R., 2003)

This article intends to clarify issues related to the current WTO trade negotiations in the framework of the Agreement on Agriculture. After presenting the general background for trade liberalization and the reason of the current negotiations, the paper introduces the different formulae for tariff reduction that are currently under debate and concludes with some implications for the rural poor sector in Asia and Pacific countries.

Background to tariff reduction

The importance of global free trade for the world population's welfare has been recognized for over two centuries.

In this ISSUE:

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This recognition stems from the work of David Ricardo who established that specialization led by their comparative advantage makes countries able to use their limited resources to produce more goods and services than what they would have achieved otherwise.

In addition, such behavior, according to Ricardo would also result in better general welfare on a global scale. However, one condition enabling country specialization to produce these expected effects was the possibility for the goods produced to be freely traded on the world market. This implies that global free trade is crucial for the improvement of the world population's welfare.

Despite this long-standing recognition, the world has not yet experienced such global free trade as Ricardo had envisioned in the early 19th century. Countries, no matter how developed they are, simply act to the contrary. Trade restrictions have been a worldwide phenomenon since a long time ago. The need for the protection of domestic interests has been the most common argument in justifying the imposition of trade barriers by countries. These interests are multi-dimensional including social, economic and political aspects.

Today, further and sometimes stronger reasons than the exploitation of comparative advantage are advanced to promote global free trade. First, the present size of the world's population together with its positive growth rate is making the world's resources become scarcer related to the growing population's needs, especially in developing countries. Efficient use of these resources therefore becomes increasingly crucial if degradation of the world population's welfare is to be avoided. According to the logic of efficiency behind the theory of comparative advantage, one can conclude that the existing trade restrictions are promoting sub-efficient activities. Secondly, the development of science and technology has the potential to improve the use of the increasingly scarcer resources to make them more efficient and to steadily improve the welfare of the growing world population. However, this development can be boosted only if efficiency is achieved in the marketing of the products. Only restriction-free markets can drive this efficiency to its maximum. Thirdly, economic growth is widely acknowledged as a necessary condition for the alleviation of poverty, a common condition in developing countries. Economic growth can be maximized only if inefficiency is eliminated from the market, and that in turn requires the elimination of limits to trade and the establishment of a free market.

In short, the gains from trade liberalization can be identified as coming from two sources: increasing the efficiency of use of domestic resources, and increasing access to other countries' markets (Stephenson 1994, from Oktaviani, 2004).

Since the beginning of the struggle for the liberalization of global trade from the imposed restrictions in 1947, marked with the establishment of the GATT (the General Agreement on Tariffs and Trade), the abolition of tariffs has become the key target for the global free-trade movement. Conversion of non-tariff barriers into tariffs was added at the Tokyo round in the mid-70s. Tariff barriers have been the most common means used for trade restriction among countries. In fact, the abuse of tariff policies by many countries for years has been condemned widely as a key contributor to the Great Depression that occurred prior to the onset of the second world-wide war in the 1930s. Such is the role of trade barriers that tariff reduction became the first single objective of the GATT for the 20 years after it was established soon after the war.

While there have been remarkable achievements in the era of the GATT, tariffs still, and especially agricultural trade tariffs, remain a crucial outstanding issue even in the present era of the WTO. Trade restrictions on agricultural products have only come on the negotiations table among the WTO members after the completion of the Uruguay Round in 1994. For various reasons, developed countries kept this crucial trade issue out of negotiation under the GATT. Only after the institution of the WTO, trade restrictions on agricultural products, including tariffs and non-tariffs, became an important object for table negotiations among the WTO members (Oktaviani, 2004). When the Agreement on Agriculture was put in place in January 1995, all member nations agreed to adopt a tariff scheme, which allows the displacement of non-tariff barriers to the tariff schemes.

Agricultural trade restrictions in developed countries are considered a real tragedy for developing countries. Most of these countries' labor force work in agriculture and often, the exports of agricultural products to western countries are the only source of foreign currencies for these countries. Limiting the access of these countries' agricultural products to the developed countries markets affects adversely their economic development, including the prospect of eliminating rural poverty. Furthermore, trade restrictions by importing countries tend to invite retaliation from the exporting countries, and this exasperates the problem. According to authors, lifting tariffs and other trade restrictions for agricultural trade will make both sides better off. Freeman, et al. (2004) for instance have estimated that the reduction of the current level of agricultural support by 50 per cent alone would contribute an additional sum of US$ 53 billion into the global GDP in 2010. Of this global gain, about US$ 14 billion would go into the pockets of developing countries. In the debate on trade liberalization, it is also brought to the front that tariff reduction is more effective than the reduction of subsidies. The effect of farm subsidies in redeveloped countries for instance aggravates global income inequality, but some authors point out that a cut in tariffs is more effective than a similar cut in domestic support in industrialized countries to reduce poverty (Bora, 2002).

However, it is also argued that the current trade liberalization measures and rules of international trade that have been implemented under GATT and WTO agreements have a unfavorable effect on many of the world's poor. Since all countries are not equal in terms of initial distribution of assets, competitiveness of their various productive sectors, and what the different types of producers produce, sell and buy, the impact of trade liberalization may vary greatly. Some countries that have unilaterally opened their economies have poor records in poverty reduction (Nepal) while others that have managed their exports and imports more carefully seem to gain great advantages from trade liberalization (Viet Nam, Bangladesh). In the agricultural sector, some analyses advocate now for the poorest countries in the world to be totally exempt from any commitment to liberalization and to receive specific support.

Due to this variety of opinions and analyses on this crucial issue, it is not surprising to see that WTO negotiations concerning agricultural trade restrictions have led to various proposals from different countries as far as the pace and intensity of liberalization are concerned. This has resulted, in particular, in several proposals or "formulae" for the calculation of the tariff reduction rate. While until recently only two basic proposals were on the table, today not less than four are under consideration for the coming negotiations. These formulae are presented in the next section, and their implications (pros and cons) are briefly discussed.

The formulae

While the elimination of agricultural tariffs will be beneficial for both the developed and the developing countries, the emerging question is how it will be implemented. Sudden elimination of all tariffs is certainly unfeasible not only from the perspective of developing countries, but also from that of developed countries. Elimination of tariff protection on agricultural products will make producers face a highly competitive environment unprepared. Because prolonged tariff protection has made agricultural producers unfamiliar with external market competition, an adjustment process is required, even if this process consumes not only time but also resources.

The needs of the countries differ widely and consequently, this adjustment process and the overall strategy for tariff reduction on agricultural products is a matter for negotiation by the WTO's members. Given the fact that a country may have imposed hundreds of different tariff lines for agricultural products, open option for every member is impossible to employ since it will not only make the cost of the negotiation process prohibitively expensive, but it will also raise the possibility for this negotiation process to end in disagreement. In order to ease the negotiation process for a tariff reduction strategy, several formulae for the tariff reduction commitment of developing countries have been proposed.

These formulae that will be applied to tariff reduction are still under hot debate because their application will have specific implications on the future of the agricultural sector in each country. Basically, there are four main formulae that will be further negotiated in the following meetings/sessions, namely, Uruguay Round, Swiss, banded, and blended formula/approach. The descriptions of the formulae below are essentially based on a WTO Document (WTO, 2004)

The first formula is called **Uruguay Round Approach.** It uses an average reduction rate over all products (Equation 1), allowing some variation for individual products provided a minimum reduction is met.

(1) Tn = (1-- a) To

where

Tn = tariff rate at the year n,

To = tariff at the base year (bound tariff),

a = average annual tariff reduction and or minimum tariff.

Every year the tariff has to be reduced by **a** unit (for example 0.25 or 25 per cent). This is a linear cut, implying the same percentage reductions no matter what the starting tariff rate is. This is the simplest formula to implement, although some variations are allowed for specific products as long as the simple average across all products meets the target. The rate would be negotiated along with reduction rates for export subsidies and domestic support, and other issues. Supporters of the formula say this approach is simple and flexible. However, it could produce insignificant improvements in market access and would not deal with tariff peaks (high tariff).

The second formula is ***the Swiss Formula***, which would produce much steeper cuts on higher tariffs (Equation 2).

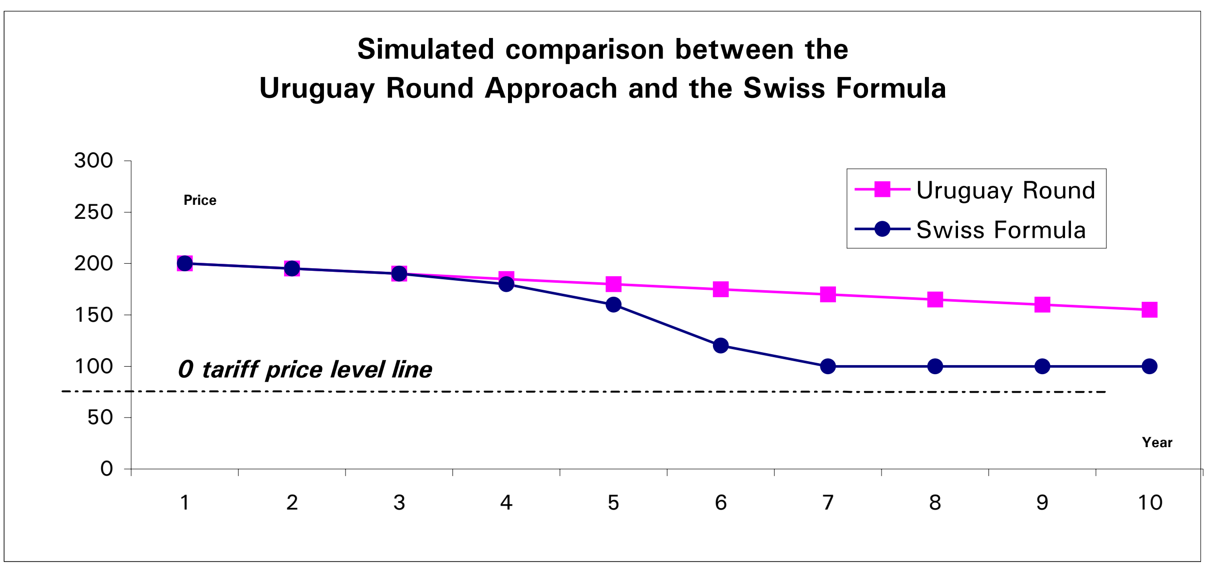
(2) Tn = (c To) /(c + To)

where

Tn and To as defined before,

c = coefficient between 0-1.

As seen in Equation 2, the formula is more progressive because it cuts the existing tariff twice. Basically, the higher the value of coefficient, the slower the tariff reduction. Critics say this would be too ambitious, requiring too much adjustment, and some say it would be inequitable because countries with lower tariffs would not have to do much. Some also argue that the Swiss Formula would be too complicated because it would require converting specific tariffs into ad valorem tariffs. Supporters say this formula or something similar is needed in order to deal with extra high tariffs or tariff peaks (WTO, 2004).



The graph above shows the difference between the two formulae in terms of impact on world prices taking the case of a commodity with a 0 tariff price at 100, subject to 100 per cent tariff at year 1. The Uruguay Round approach and the Swiss Formula effects are compared with a similar initial tariff reduction of 5 per cent at year 1.

Considering the advantages and disadvantages of the two formulae, an alternative approach, called **the Banded Approach**, was introduced. This approach has received the strongest support so far. It envisages a Uruguay Round approach that is applied in bands with steeper cuts at higher levels (Swiss formula), making it a kind of harmonizing formula, but with flexibility). As seen in Tables 1 and 2, the tariff cuts are more progressive for developed countries, both in terms of average cut and minimum cut. Actual cuts can vary around the average as long as they are above the minimums set for each product ("tariff line"). This approach is also intended to deal more appropriately with the questions of reducing tariff peaks and tariff escalation.

Table 1. Proposed banded formula for developed countries

No	Tariff bands (per cent)	Average reduction (per cent)	Minimum reduction (per cent)
1	> 90	40	30
2	15 – 90	35	25
3	0 – 15	30	20

Table 2. Proposed banded formula for developing countries

No	Tariff bands (per cent)	Average reduction (per cent)	Minimum reduction (per cent)
1	> 120	40	30
2	> 60 - 120	35	25
3	20 - 60	30	20
4	< 20	25	15
5	SP (sensitive products)	10	5

A similar approach that combines the idea of the Uruguay Round and the Swiss Formula, called ***the Blended Approach***, is proposed by the United States and the European Union. Under this formula, products are separated into three groups, the number of products in each group to be negotiated. One group of tariffs would be cut according to the Uruguay Round approach, with the average and minimum reductions to be negotiated, and tariff quotas used to provide market access if tariffs remain high. A second would use the Swiss formula, again leaving for negotiation the coefficient that determines the final maximum tariff level. A third group would be duty-free. If tariffs exceed an unspecified maximum, they would either have to be cut to that maximum or market access would have to be provided through negotiated tariff quotas. Developing countries would be allowed unspecified longer periods and smaller reductions. Several other countries follow this blended approach such as Norway and some developing countries, including East Asia, with some modifications.

These formulae are still under discussion. At the next "Agriculture Week" of the WTO negotiations scheduled for 13-17 December, members are expected to address the tariff reduction formulae and other issues they see as being linked to it, such as "sensitive" and "special" products. Actually, some products may indeed escape the liberalization process for being considered as sensitive for the economies of some countries. Rice for instance is very likely to become such a sensitive product for Asian countries.

Implications for rural poor countries in Asia

It should be noted first that though the basic concept of a round table negotiation is to save time and resources and provide non-discriminatory benefits of trade liberalization to member countries, there is an emerging trend in favor of Free Trade Agreements (FTA) to be established either bilaterally or among a limited number of countries. The ox-walk progress of current WTO negotiation seems to encourage this movement, because FTA negotiation is relatively easier than WTO, which seems to be the hot spot of conflict between developing and developed countries, rather than the place of constructive and productive discussion. Even though member countries are obliged to conclude their FTA under the umbrella of WTO rules, one should pay attention to the effect of this movement on the legitimacy of the WTO as a venue to formulate trade rule in the 21st century and the validity of the decisions made under its umbrella.

Nine countries in Asia and the Pacific can be considered as rural poor countries: Nepal, Lao People's Democratic Republic, Cambodia, Myanmar, Viet Nam, India, Timor-Leste, Bangladesh and Pakistan. They all have in common a GDP/cap, which was below 400 US dollars in 2002, and a rural population comprised of between 60 per cent (Pakistan) and 90 per cent

(Timor-Leste) of the total population.

From the time when the third session of the WTO Ministerial Conference was held in Seattle, a renewed effort has been made to address the concerns of developing countries. However, since the negotiations on agriculture started, no agreement among nations has been in place related to the modalities of member countries' participation to world trade. In the July 2004 package, the framework of the Agreement on Agriculture was adopted, giving flexibility to the countries' to adjust it domestically or regionally in line with the agreed framework.

In the Doha Ministerial Declaration adopted on November 14, 2001, the signatories state that: "International trade can play a major role in the promotion of economic development and the alleviation of poverty". Somehow the position of the rural poor developing countries can be summarized by the following statement extracted from the "Non-Paper" presented by India at the Special Session of the Committee on Agriculture Informal Meeting, in February 2002 and called "Special and Differential Treatment for Developing Countries in the Agreement on Agriculture":

> *"Poverty reduction and food security cannot be achieved in developing countries without enhancing the potential of their agricultural sector. Developing countries, therefore, require to maintain tariffs, which are consistent with their development, trade, and food security needs. It would also be observed that a number of developing countries have undertaken tariff reductions autonomously in the interests of trade liberalization, which should be taken note of as further reductions may not be consistent with their trade, food security and developmental needs.*
>
> *The precipitous fall in international commodity prices over the last few years should also serve as a useful guide for effecting reduction commitments. Developing countries should have the flexibility to rationalize and rebalance their tariff bindings on all agricultural products keeping in view their food security and livelihood requirements".*

Source:
http://agricoop.nic.in/spltreat.htm

Rural poor countries have an advantage in seeing the formula used on a basis related to the existing tariff rates, i.e. the higher the tariffs in the target-market countries the faster the reduction of the tariffs. However, given the already generally low-level of tariffs in their own markets, they have interests in promoting the Uruguay Round approach or asking for the application of specific measures in order to prevent disruption of their internal economies due to uncontrolled deregulation. One of the biggest challenges of the rural poor countries in Asia is to identify the impact of the different options on the situation of the rural poor. While there is still a certain homogeneity in the smallest less developed countries such as Lao People's Democratic Republic, Cambodia, Timor-Leste or Nepal, larger countries such as India, Pakistan, Bangladesh or Viet Nam show huge internal differences among producers of agricultural products, and a standard formula applied to one sector may adversely affect its sub-segments, among them a portion of resource-poor farmers who are the less prepared to face internal competition with opening markets whatever the formula selected.

To choose the best formula is one key issue for developing countries. To operate this selection with a focus on rural poverty alleviation requires relevant information. Despite the massive rural poverty in many developing Asian countries, good records of the economic activities of the Poor and especially the operation of their marginal farms are uncommon. Not only do public economic policies tend to be bias against the rural poor as is commonly acknowledged in the literature, but also the developing countries' governments implement improper poverty alleviation programs for the rural poor. Ill-designed programs are partly due to inadequate information about their socio-economic conditions. Evidence of the discrimination against powerless rural poor populations is slowly being brought to light by the limited, sometimes non-existent, always insufficient effort to collect and document information regarding this group's socio-economic condition, including their marginal farming activities. Free trade will not contribute to the alleviation of poverty in developing countries as expected in the Doha Ministerial Conference cited above if the present condition of collected socio-economic information to be used for the upcoming WTO trade negotiation is not improved. Hence, to ensure the benefits of free trade for rural poverty alleviation in developing countries, including Asian countries, where nearly one billion poor people live, one immediate task for the developing countries' governments is to improve the present information problem regarding the socio-economic conditions of their rural poor populations.

(**References available upon request**). ■

Potential and Opportunities of Feed Crops in Southeast Asia

Erna M. Lokollo[*]

Introduction

The demand for food consumption in Southeast Asia is changing as income, population and other socio-economic characters change. Virtually all of the population increases will take place in developing countries, and much of it in the urban areas. The rapid urbanization of developing Southeast Asia and associated changes in lifestyles will have profound effects on food preferences and hence on demand. An IFPRI-IMPACT study shows that a growing and urbanizing population with rising income will increase global demand for cereals by 35 per cent between 1997 and 2020 to 2,497 million tons and for meat by 57 per cent to 327 million tons (Andersen-Lorch, *The Unfinished Agenda*, 2001).

Almost all of the increases in demand will take place in developing countries. By 2020, developing countries as a group are forecast to demand twice as much cereals and meat as developed countries.

As meat demand increases, feed grain utilization also increases because feed grains are raw materials for feed. The development of these grains provides a new market opportunity for the crops, which can finally affect the farmers who plant them. Feed grain utilization per capita has been increasing rapidly at 3.4 per cent per year. Demand for feed grains (indirect demand) is increasing by around 5 per cent per year, and demand for direct consumption of cereals is increasing by around 2.3 per cent per year. Accordingly, total demand for these cereals, which are used for human consumption and feed, especially maize, sorghum, and millet, could increase by around 6 per cent per year. A large difference in the growth rates implies a rapid change in the demand structure of those crops toward more for feed and less for direct human consumption. In many Asian countries, maize is used mostly for feed (Hutabarat, 2003)

With the above background, UNESCAP-CAPSA implemented an 18-month research project entitled "Prospects of Feed Crops in Southeast Asian Countries" in June 2003. The project is funded by the Government of Japan. It is a continuation of the same project conducted in South Asian countries one and a half years prior. The participating countries are: Indonesia, Malaysia, the Philippines and Thailand. In this article, the focus is intended specifically on maize as the most significant feed crop among the four participating countries.

Objectives

The general objective is to elucidate and analyze potentials and opportunities for the development of feed crop farming with emphasis on secondary crops in Southeast Asian developing countries in balance with the rapid development of the livestock and fish culture industry in Southeast Asia. The specific objectives are: (i) to analyze the demand for feed crop products, (ii) to evaluate the potentials and opportunities of feed crop farming with emphasis placed on major CGPRT crops in participating countries.

Method

The model used to generate parameters of equation is based on a system of supply and demand relationships. The system is closed in equilibrium, where total supply equals total demand in a particular country. This is adopted and modified from the World Food Model (WFM) and IMPACT model proposed respectively by Yanagishima (2002), Rosegrant *et al*. (1995), and Rosegrant (1999).

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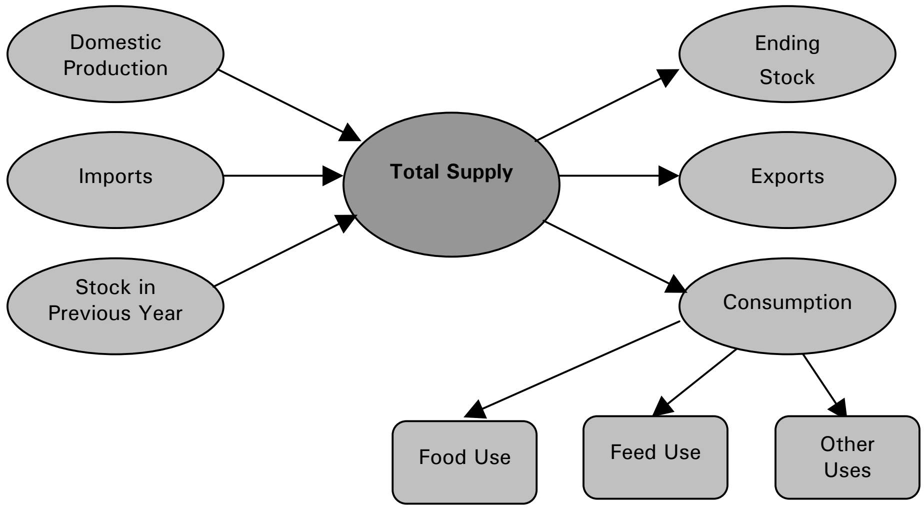
Figure1. Supply of and demand for feed crops



Future trends in production and consumption

The supply and demand models estimated previously produce elasticity estimates that may be employed to forecast changes in production and consumption in the future. By further investigating the general form of functions,

$$Y = f(X_1, X_2, X_3 \ldots\ldots\ldots, X_\eta) \quad (1)$$

Where
Y = dependent variable
X_i = explanatory or pre-determined variable;
i = 1, ..., n

Then it is possible to obtain changes in Y which are caused by changes in each of the explanatory variables and the elasticity with respect to each of these variables. This is shown through equation (2):

$$dY = \varepsilon_1 dX_1 + \varepsilon_2 dX_2 + \varepsilon_3 dX_3 + \ldots\ldots\ldots + \varepsilon_\eta dX_\eta \quad 2)$$

Where
ε_i = the elasticity of each of the independent variables with respect to Y in the equation being considered
dY = percentage change in Y
dX_i = percentage change in the exogenous variable i

By using the formula in (2), the change in supply and demand can be estimated by combining point elasticity estimates with a forecast of the change in the explanatory variables.

Results and discussion

Data analyzed in this article is restricted to maize as the main ingredient of feed. In Indonesia, variables that significantly determine the demand behavior of maize for the feed industry are: domestic price of maize, domestic price of soybean, lag demand for from feed industry, and dummy variable of economic crisis (Table 1). Feed production is determined by the price of feed, domestic price of imported feed components, demand for maize for feed, interest rates, and a dummy variable for the economic crisis (Table 2).

With a growth rate of 2.36 per cent per year, domestic maize production will increase from 9.54 million tons in 2002 to 12.92 million tons in 2015. The growth rate of domestic demand of maize is 5.39 per cent per year. The unbalanced demand and production will create a significant deficit and import dependency from other countries. However, at the same time, it creates an opportunity to develop and utilize hybrid seeds and to adopt post-harvest technology.

In Malaysia, variables that significantly determine the domestic demand of maize for feed are: price of imported grain maize, the price of prepared feeds, and the autoregressive variables lagged 1 and 2 years (Table 3). Malaysia has a unique case among participating countries in that it relies on imports for domestic feed consumption (non-ruminants), however Malaysia has plenty "potential substitutes" for ruminant (by-products from the oil palm industry). The consumption of feeding stuffs by non-ruminants is largely maize (50 per cent of the import value for animal feeds), and soybean meal (23 per cent). About 80 per cent of the feedstuffs used in non-ruminant feeds are imported. The consumption of feeding stuffs by ruminants is largely fresh forages (native grasses), concentrates and by-products of oil palm such as PKC, OPF and POME (*oil palm kernel cake, oil palm fibre, palm oil mill effluen*).

Table 1. Maize demand behavior for the feed industry in Indonesia

Variable	Variable name	Parameter estimate	Pr > |t|	Elasticity	
				Short-run	Long-run
Intercept	Intercept	3821.4592	0.0001		
Price of feed (Rp/kg)	PF_t	0.0556	0.7953	0.0003	0.0017
Domestic price of maize (Rp/kg)	PM_t	-812.6942	0.0737	-0.2157	-1.4764
Domestic price of soybean (Rp/kg)	PS_t	-391.4055	0.0013	-0.2395	-1.6389
Lag of maize demand for feed ('000 ton)	DF_{t-1}	0.8539	0.0001		
Dummy (0 = before; 1 = during and after crisis)	D_t	-791.2193	0.0414		
Pr > F < .0001; Adjusted R^2 = 0.8208; DW = 1.778					

Source: Swastika *et al*., 2004.

Table 2. The analysis of feed production model (FPR_t)

Variable	Variable name	Parameter estimate	Pr > |t|	Elasticity	
				Short-run	Long-run
Intercept	Intercept	1128.1662	0.4243		
Price of feed (Rp/kg)	PF_t	0.4994	0.1455	0.2093	0.2546
Domestic price of maize (Rp/kg)	PM_t	-728.81	0.1237	-1.8058	-2.1965
Demand for maize for feed ('000 ton)	DF_t	1.3407	0.0001	1.2513	1.5220
Domestic price of imported feed components (US$/kg)	$DPICF_t$	-0.0337	0.3297	-1.1054	-1.3445
Interest rate (per cent/year)	IR_t	-93.9463	0.0253	-0.2409	-0.2930
Lag of feed production ('000 ton)	FPR_{t-1}	0.1779	0.2882		
Dummy (before and after crisis)	D_t	-203.20	0.6919		
Pr > F < 0.0001; Adjusted R^2 = 0.9503; DW = 2..214					

Source: Swastika *et al*., 2004.

Table 3. Malaysian exports and imports of maize

Variable	Parameter estimate	t-statistic
Price of imported maize in year t (RM/ton)	0.1972	-4.478
Price of prepared feed in year (RM/ton)	0.1381	-0.2819
Autoregressive variables lagged one period	0.2812	0.7961
Autoregressive variables lagged two periods	0.5076	1.2859
R^2 = 0.7906; DW = 2.2607		

Source: Tunku Yahya bin Tunku Mahmud *et al*., 2004.

The forecast model result shows that the supply of maize in Malaysia in 2010 and 2015 will be 15,453 and 17,880 tons respectively. This will fall short of the forecasted demand in the same period. Since the majority of the feedstuffs used for non-ruminants are imported, Malaysia is now pursuing introducing initiatives to entice entrepreneurs into food crop production with the dual role of food and feed and to develop ruminant feeds using by-products of the oil palm industry. One possible commodity that can substitute maize is cassava. Research has shown that cassava may be incorporated at higher levels or even completely replace maize in the diets of swine and poultry provided it is properly balanced for essential amino acid content, especially methionine (Tunku Yahya *et al*., 2004). The other local feedstuffs are rice bran, broken rice, copra cake, cassava refuse, fish and bone meal. The crops are grown for food and the by-products or the end products are being used as animal feeds. In the case of ruminants, the by-product from the oil palm industry can play a significant role in the development of ruminant feeds. PKC is a good source of protein that is readily available in Malaysia. The use of OPF for ruminant feeds is another important breakthrough in the use of domestically available resources. Other by-products from the oil palm industry include oil palm trunks (OPT), palm press fibre (PPF), palm oil mill effluent (POME) and empty fruit bunches (EFB).

In the Philippines, the wholesale price of maize, the production of poultry and the production of pork/swine are variables that explained the domestic demand of maize for feed (Table 4). The major demand shifter was pork/swine production which had the highest consumption of total feed produced in the country. Results of the regression analysis show that an increase by 1 per cent of pork/swine production would raise maize for feed demand by 0.47 per cent. Likewise, poultry production also affected demand for maize as feed. In the Philippines, maize area has been decreasing over the past 15 years, from 3.7 M hectares in 1988 to 2.4 M hectares in 2002. Over the years, the country's maize production has remained low at an average annual level of 4.4 M tons. This production is insufficient to meet the demand, specifically from the livestock and poultry sectors. Aside from maize's traditional uses as food and as feed, the commodity is also utilized by the manufacturing sector to produce industrial products such as ethyl alcohol, dextrose and glucose (Cardenas *et al*., 2004). Increasing demand for poultry, pork/swine, and egg products creates more demand for maize as explained by the demand model previously.

Maize demanded as feed is projected to increase by 4 per cent annually up to the year 2015. In 2003, the estimated demand of maize for feed was 4 M tons and projected to double by 2015.

The existence of a "*National Corn Program*", and establishment of the "*Grains Highway Program*" provide opportunities for feed crop development in the Philippines.

In Thailand, factors affecting domestic demand for maize are the wholesale price of maize, the price of broken rice which is the maize substitute, price of eggs, price of broilers and number of hogs. The wholesale price of maize affects domestic maize demand the most (Table 5).

Almost all domestically produced maize is destined for feed as the Thai population is not in favor of eating corn as food (Rojanasaroj *et al*., 2004). The majority of maize utilization goes to broiler/poultry production. Thailand is self-sufficient in maize production for domestic consumption (Table 6).

Local maize production generally meets domestic demand with some years witnessing a surplus for export. Interestingly, in Thailand, the by-products of maize, such as stalks and leaves are usually used as fodder. Presently, Thailand is actively promoting and marketing its maize as a non-GMO (non *genetically modified organism*) crop. With globalization and liberalization regimes, Thailand expects to gain more market access from either bilateral or multilateral trade agreements.

As the livestock population increases, the demand of maize for feed increases as well. The projected demand of maize for feed will be 5,060 million tons in 2010 and 5,419 million tons in 2015.

Conclusion

In Indonesia, maize demand from the feed industry was negatively responsive to the price of soybean over the long-term and responsive to its own domestic price and significantly determined by its demand in the previous year. The Asian economic crisis of 1997-1998 had a highly negative impact on maize demand from the feed industry. The demand for feed is strongly determined by poultry population. However, although maize demand for feed was not statistically determined by the price of chicken meat, it is responsive to meat price, both over the short- and the long-term. The growth of projected domestic demand of maize will exceed the growth of projected domestic production, causing the maize deficit to continuously increase. The consequence is to either boost domestic production or imports.

In Malaysia, the forecasted supply of maize will fall short of the forecasted demand over the same period. By-products from the oil palm industry have potential in the development of ruminant feeds and even non-ruminant feeds if further treated with enzymes.

In the Philippines, the domestic demand of maize for feed is influenced by the wholesale price of maize, the production of poultry and the production of pork/swine. The projected domestic production of maize will be unable to keep pace with its high projected demand as feed. Only 65 per cent of maize feed demand could be met by domestic production. Potentially, the yield level could be raised to increase domestic maize production. Since livestock and poultry production grew at rates of 5 to 8 per cent over the last 15 years, there is room for feed crop development.

In Thailand, factors affecting domestic demand for maize are the wholesale price of maize, the price of broken rice which is the maize substitute, price of eggs, price of broilers and the number of hogs. The wholesale price of maize is the most influential on domestic maize demand. Thailand is the only participating country studied that is self-sufficient in maize for feed, even though the expansion of livestock industries causes shortages of domestically produced other feed crops, such as soybean meal. With the expansion of the dairy industry, there is always potential for fodder crops to develop significantly in future.

(**References available upon request**). ■

Table 4. Results of the demand analysis of the feed crops, Philippines, 1982-2002

Independent variable	Food			Feed			Other uses		
	Corn[a]	Rice	Soybean	Corn[a]	Rice	Soybean	Corn[a]	Rice	Soybean
Constant									
	(11.472)	(-2.599)	(-7.555)	(5.873)	(6.808)	(-6.517)	(6.628)	(-3.752)	(435.920)
Corn retail price	-0.31*	0.44**							
	(-1.673)	(2.377)							
Rice retail price	-0.81***	-0.09[ns]							
	(-3.737)	(-0.586)							
Soybean wholesale price			-0.34[ns]			0.12[ns]			
			(-0.681)			(0.283)			
Population		1.36***	5.30***						
		(12.299)	(5.432)						
Per capita GDP/income	-0.47**	0.36**	4.83***						
	(-1.993)	(2.453)	(3.398)						
Corn wholesale price				-0.08[ns]					
				(-0.545)					
Rice wholesale price $_{(t-1)}$					-0.31[ns]				
					(-1.353)				
Egg production					-1.57***				
					(-3.309)				

Note: [a] Yellow corn production was used because in reality, it approximates feed use in corn.
values in parentheses are t-values.
(t-1) lagged values by 1 year.
*, **, *** significant at 10, 5, and 1 per cent levels, repectively.
ns: not significant.

Source: D.C. Cardenas *et al.*, 2004.

Continued ...

Table 4. Results of the demand analysis of the feed crops, Philippines, 1982-2002 (continued)

Independent variable	Food			Feed			Other uses		
	Corn[a]	Rice	Soybean	Corn[a]	Rice	Soybean	Corn[a]	Rice	Soybean
Poultry production				0.22*	1.12***	2.78***			
				(1.862)	(2.895)	(9.409)			
Pork production				0.47***	0.46*				
				(3.904)	(1.828)				
Corn feed and food use							-0.45***		
							(-4.736)		
Rice feed and food use								2.54***	
								(3.342)	
Soy feed and food use									1.00***
									(7304.34)
Corn area							0.48***		
							(4.353)		
Rice area								0.26[ns]	
								(0.185)	
R^2 (per cent)	65.4	95.9	89.2	96.3	82.6	89.3	92.2	71.1	100

Note: [a] Yellow corn production was used because in reality, it approximates feed use in corn.
values in parentheses are t-values.
(t-1) lagged values by 1 year.
*, **, *** significant at 10, 5, and 1 per cent levels, repectively.
ns: not significant.
Source: D.C. Cardenas *et al.*, 2004.

Table 5. Maize demand for feed in Thailand

Variable label	Parameter estimate	t-statistic
Wholesale price of maize	-0.42	-2.52
Price of broken rice	0.19	2.61
Price of eggs (t-1)	0.21	1.49
Price of broiler	0.31	1.92
Price of hogs	1.09	4.58
R^2 = 0.91; DW = 2.11		

Sample period = 26 (1977-2002).
Source: Chamras Rojanasaroj *et al.*, 2004.

Table 6. Production and uses of the feedstuffs **Unit: thousand tons**

Items	1993		1998		2002	
	Production	Consumption	Production	Consumption	Production	Consumption
Maize	3,672	3,300	4,617	4,615	4,230	4,072
Soy meal	385	960	606	1,563	799	2,551
Cassava[1]	20,203	161	15,591	3,114	16,868	4,295
Fish meal, superior grade	523	645	624	611	570	589
Broken rice	1,521	1,317	1,781	1,701	1,967	1,573
Bran	2,176	1,873	2,548	2,206	2,814	1,853

[1] Production = fresh root cassava.
Consumption = shredded cassava.
Source: Chamras Rojanasaroj, *et al.* 2004.

CAPSA News and Activities

AGRIDIV

Country study teams finalized their work plan for phase II of the study in line with the conclusion of the planning meeting held on 20-22 July 2004. The implementation of phase II of the study began after the final work plans were approved by the project leader. The revised draft of phase I of the country study reports were submitted to CAPSA by the national experts. Final review and editing of the drafts has been carried out by the project leader and associate project reader in parallel with on-line discussions with national experts. ■

IS/DB

The Database section has completed the revamping of CAPSA's homepage. Information on the on-line database system has been updated and the database filling system has been backed-up. In addition, CAPSA periodicals, Palawija News and CGPRT Flash, have been converted into PDF.

The Information Services section has produced and distributed the following CAPSA publication: Working Paper No 77: El Nino Integrated Report by Yokoyama and Concepcion.

In addition, AGRIDIV country reports from India, Bangladesh, Sri Lanka and Myanmar are in editing process, and the draft of CAPSA Monograph No. 46 "Participatory Prospective Analysis" by Bourgeois and Balerin has been submitted to reviewers. ■