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**LINKAGES BETWEEN INDONESIAN GRAINS, LIVESTOCK  
AND AGRIBUSINESS POLICIES, AND OPPORTUNITIES  
FOR AUSTRALIAN INVESTMENT AND TRADE**

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## ABSTRACT

### LINKAGES BETWEEN INDONESIAN GRAINS, LIVESTOCK AND AGRIBUSINESS POLICIES, AND OPPORTUNITIES FOR AUSTRALIAN INVESTMENT AND TRADE

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Indonesian food consumption is changing rapidly with incomes, from a dominance of cereal staples to increased quantities of higher value products. Still, Indonesia's per capita consumption of these products is relatively low, for example per capita meat consumption is around a fifth of Malaysia's. This suggests a large potential growth that is not fully evident due to policy constraints at various levels. As well as adversely affecting the Indonesian economy, these policies also restrict Australian opportunities in the agricultural and agribusiness sectors. This paper is aimed at providing a better awareness of the potential market opportunities and current constraints.

Keywords: Indonesia, agribusiness, trade

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## 1. Introduction

It would be a mistake for Australian grain, livestock and agribusiness concerns to focus only on the situation for their own products in any assessments of Indonesian trade and investment opportunities. There are strong linkages between all these products in terms of competition for productive resources and the consumer purse, with policies in some sectors having marked effects on the situation in others

Circumstances in Indonesia are changing rapidly with increasing incomes. The dominance of cereal staples, in particular rice, is being lessened with the increased consumption of higher value products such as meats and processed products. Still, Indonesia's per capita consumption of these products is low relative to other comparable South East Asian countries, suggesting some Indonesian policies may be constraining potential consumption levels in these products

The changing situation on the consumption side is mirrored in Indonesia's changing production and trade. The goal of rice self-sufficiency has dominated Indonesian agricultural production for some time but conflicting demands for productive resources are starting to appear with the development of a greater diversification in Indonesian agricultural production. Such conflicts are also appearing in respect of trade flows, especially with the competitive production of some value-added products in Indonesia aimed for export. Such exports require competitively priced raw materials but arrangements in relation to some raw materials negate this.

Policies restricting the efficient allocation of resources within Indonesian agriculture and agribusiness will not only adversely affect the overall performance of the Indonesian economy but the opportunities for Australian investment and trade in these areas. Key preliminary questions in any analysis aimed at improving this situation are

- what are the key policy and other constraints to achieving the full potential, and
- what is the market potential under particular policies?

The remainder of this paper addresses these questions. In the next two sections, Indonesia's changing consumption patterns, and agricultural production and trade, as well as the factors underlying these changes, are analysed. This is followed by a section describing Indonesia's grains, livestock and agribusiness policies, and the linkages between them. Australia's investment and trade opportunities in relation to Indonesia's agricultural and agribusiness sectors, and possible constraints to these, are then discussed prior to some concluding comments.

## 2. Indonesia's changing consumption patterns

The key questions addressed in this section are what changes have taken place in Indonesia's consumption patterns, why have these changed as they have, and what's likely to happen to them in the future?

Indonesia is a rapidly developing country of around 200 million people, with a high-income, urban-based, middle-class that is already large in absolute terms, and growth rates of over 6 per cent in recent years. Indonesia's food consumption patterns have been changing quite rapidly in recent years in line with these developments, from a dominance of cereal staples, especially rice, to more value-added products such as meats and more highly processed products, often reflected in the consumption of sugar (see Table 1).

(Insert Table 1 around here)

There are two main sources of information on Indonesian consumption patterns, namely the per capita food consumption figures just presented and consumer expenditures obtained from the Social Economic National Survey (SUSENAS). The first mentioned is calculated from the Food Balance Sheet in which domestic food utilisation is defined as domestic production plus changes in stock plus imports minus exports. The usefulness of this source has been questioned as the per capita consumption estimates increase and decrease markedly from year to year, even when prices and other determinants are stable. The source faces difficulties as a result of being compiled from different base data and requiring estimates of conversion factors, waste levels, use as seed, animal feed and in industrial processes, and so on. Without good estimates for these aspects there could be some 'double counting', for example when some commodities are not consumed directly but used as an input to the production of other commodities, such as occurs in the case of some grains being used as feed for livestock.

The SUSENAS data is collected by direct interview usually with the head of household during one month of the year and relates to food expenditures one week previous, and non-food expenditures one month or one year previous. Although it overcomes many of the limitations of the apparent consumption approach, for example being based on a single source of information, it still has some limitations such as being based on expenditures rather than directly derived quantities which are more comparable over time. Table 2 of consumer expenditures shows the same movement from primary to more processed products as in Table 1 but for a broader range of foods.

(Insert Table 2 around here)

Both sources report averages around which there are large dispersions with some consumers absorbing zero product whilst others consume well above the average. Increases in incomes may take more consumers above the zero consumption 'threshold', resulting in greater responsiveness of consumption to income changes than previously measured. Both sources also face aggregation problems at the product level. For example, not all meats are the same, with the aggregate category 'beef' consisting of high quality, imported chilled and frozen product as well as poorer quality domestic product.

Despite problems with both sources of data, there is consistent evidence of changing consumption patterns. A number of factors underlie these changing consumption patterns. Important amongst these are population growth and its distribution between urban and rural areas, income levels and its distribution between the rich and poor, the prices of the various commodities, policies that affect these prime determinants, and underlying socioeconomic characteristics of the population such as tastes. These are now briefly dealt with in turn.

Indonesia's population growth is slowing. However, given the large size of the Indonesian population even small rates of growth in the population will mean large absolute increases in demand. Population growth is not the only demographic factor to affect food demand. Age composition is also a factor, with an increasing proportion of Indonesia's population falling in the higher nutritional needs group of 15 to 44 year olds. Differences in consumption patterns also exist between urban and rural populations because of differences in lifestyles, incomes and so on, and the increasing urbanisation of the Indonesian population with development will increase the importance of these differences. Population growth becomes an increasingly important determinant of total food demand as the responsiveness of demand to income and price changes declines towards zero and income responsiveness even becomes negative with development. These aspects are dealt with next.

As incomes rise, a more diverse pattern of consumption evolves with traditional foods being replaced by more processed and higher value foods (see Trewin 1995 for details of Indonesian expenditures by income groups). This evolution starts with the replacement of inferior staples such as cassava by more valued cereals such as rice and then evolves into these cereals being replaced by fruits, vegetables, fish and meat.

(using some cereals as feed inputs), and then in turn by processed foods. Over time as incomes grow it would be expected that the overall responsiveness of food demand to income changes would decline, as would that for more staple products, and those for processed products increase relatively

Prices are another generally significant variable affecting the demand for food. The responsiveness of the demand for some staple foods to changes in their own price would be expected to fall as development progresses but this responsiveness could also be affected by policies such as those connected with price support. Demand for specific foods are not only affected by their own prices but also by the prices of competing and substitute foods

Policies can affect food demand directly, or indirectly via their impact on key determinants just discussed such as urbanisation, incomes and prices. The most important direct Indonesian policy affecting food demand concerns the operations of BULOG, the government authority that regulates the market of many foods through stockholding, market operations, and control of trade

Finally, socioeconomic characteristics such as tastes can be key determinants of food demand although experience has shown that tastes can change with development, with more developed Asian economies displaying trends towards, though not exactly the same as, the consumption patterns of western economies.

Indonesia's per capita consumption of value-added products is low relative to some other South East Asian countries with similar development experiences (see Table 3<sup>1</sup>). For example, despite similar per capita GDP levels and socioeconomic characteristics, Indonesia consumed much more rice and much less wheat, meat and sugar than the Philippines. Indonesia consumed 12.3 kg per capita wheat and 5.8 kg per capita of meat in 1991 compared to 67.2 and 33.8 kg per capita respectively in Malaysia, which is more than can be explained by income differentials. Indonesian per capita consumption of dairy products is also very low at around 2 kg per annum per family.

(Insert Table 3 around here)

These per capita consumption figures suggest there could be a large potential growth in consumption of certain products as Indonesia develops and internationalises so long as current constraints can be recognised and overcome (see also Figure 1 comparing Indonesian consumption and income to other Asian countries). The underlying demand for a whole range of agricultural based commodities, covering the full spectrum from raw products such as feed grains to processed products such as high-valued meat products (e.g. prepared meals), could grow rapidly as the Indonesian economy further develops and internationalises. However, this strong underlying market potential is not fully evident at the moment as the current market is being constrained by policies at the agricultural, agribusiness and macro level that are adversely affecting the Indonesian economy, especially consumer welfare.

(Insert Figure 1 around here)

As mentioned earlier, rice self-sufficiency has dominated Indonesian agricultural production for some time. Some institutions set up to help administer this policy, such as BULOG have impacted on Indonesian consumption. For example, to be able to control the rice market, BULOG needs to control the market for substitute products such as imported wheat. To ensure Indonesian farmers receive price incentives to produce more rice, the price to consumers of competing products such as wheat are raised by tariffs, quantitative restrictions, and the like. This causes the consumption of these products to fall whereas that of rice remains higher than otherwise. Products in which Indonesia can be more easily self-sufficient in, such

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<sup>1</sup> The earlier figures for Indonesia differ from those in Table 1 but the key point about current relativities with other countries still holds.

as rice and chicken meat, are favoured over those in which it cannot, such as wheat, dairy products, and beef.

Although the key underlying cause of the resultant different Indonesian consumption pattern would appear to be policies supporting self-sufficiency, low consumption targets for some products are sometimes given different justifications. Justifications include that Indonesians prefer rice and not dairy or meat products, and that meat is bad for Asian's health. The first of these justifications is based on assumptions that are not willing to be fully tested in the market, and the market suggesting demand is being constrained. The second justification is based apparently on studies of the different diets and health of Chinese urban and rural workers<sup>2</sup> but other studies show meat is a prime source of iron and other nutritional needs.

Given the importance of rice self-sufficiency, a key aspect for changes to Indonesian policies is the turning point in rice consumption, that is, the point when overall rice consumption starts to fall and policies aimed at increasing rice consumption, such as opening costly new irrigation areas, will produce a loss-making, export surplus and have little justification. Without the policy focus on rice self-sufficiency, substitution in consumption and new opportunities in production would take place as a result of freeing up market forces. Letting these consumption side forces come more to the fore would also alleviate the current rice self-sufficiency pressures that have resulted mainly from falls in rice production growth. Indonesian per capita rice consumption is already levelling off (World Bank 1995). Moreover, the top 40 per cent of income earners are already consuming less rice now than they did in the 1980s. And the bottom 30 per cent are already consuming 80 per cent of the level of the top group, suggesting there is little expansiveness due to income growth left before this group's rice consumption starts to fall also. These trends are already evident internationally with per capita rice consumption falling in many countries as development has progressed, including Malaysia and Thailand. The World Bank believes Indonesia's per capita rice consumption will show a fall over the next 5 years and that total consumption will begin to fall within 10-12 years.

The last question put in this section concerned what consumption patterns are likely to be in the future, and this question needs to be considered in terms of underlying assumptions on trends in incomes and so on, and on whether current policies will be maintained or changed. However, in this section available projections will be basically presented to highlight trends such as the movement away from cereal staples, with the policy discussion mainly covered in later sections of the paper.

Target levels of consumption are produced by BAPPENAS for each REPELITA (5 year development plan). The consumption targets for REPELITA VI are given in Table 4. Per capita consumption targets in 1998-99 were highest for meat at 7.6 kg/capita/year (poultry dominating at 4.6 kg/capita/year with beef at only 1.6 kg/capita/year) followed closely by 6.2 kg/capita/year for milk and 3.0 kg/capita/year for eggs. The corresponding growth rates were 3.4 per cent for meat (4.3 per cent for poultry and 2.1 per cent for beef), 4.9 per cent for milk and 3.6 per cent for eggs. Similar relativities are observed for national consumption targets - meat, especially poultry, being larger than milk in absolute terms but milk and eggs having larger growth targets. Consumption of meat is targeted to increase from 1,208 kt to 1,542 kt in 1998-99, a growth rate of 5.0 per cent, made up of 940 kt of poultry (growth rate of 5.9 per cent) and 322 kt of beef (growth rate of 3.7 per cent). The egg consumption target was 605 kt and milk 1,265 kt, giving higher growth rates of 5.2 and 6.5 per cent from 469 kt and 923 kt respectively.

(Insert Table 4 around here)

The important aspect of these targets is not the numbers per se but that they are plans or a reflection of priorities. A similar point applies to projections. It is the underlying assumptions and methods used to obtain

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<sup>2</sup> Similar Australian studies have recently been highlighted (e.g. Gabrielle Chan, page 2, *The Australian*, 27 December 1995).

the numbers that are important. Projections may be produced with or without formal models, although the former enables a better assessment and revision of the projections. From the earlier discussion of the key determinants of consumption it can be appreciated that assumptions are required on demographics, incomes, prices, socioeconomic characteristics and the policy environment.

Many sets of projections have been produced of Indonesia's future demand for various commodities, reflecting different assumptions, methods and time periods. However, none of these projections are 'official' ones produced by government agencies. One set of comprehensive projections for various types of grains and other products have been produced by the World Bank (1992) for a range of real income growth rates but with a preferred rate of 6 per cent per annum (see Table 5). Population projections were obtained from BPS and were for an increase of 1.9 per cent per annum between 1988 and 1995, and then a fall to a rate of 1.4 per cent per annum. These rates lead to per capita real income growth rates of 4.1 per cent per annum between 1988 and 1995, and then 4.8 per cent per annum. The food demand projections are based on calorie consumption curves for major food groups estimated from data for seven Asian countries at various income levels (see Figure 1), with individual commodity projections being determined from a multi-stage decision process<sup>3</sup>. Feed demand projections are based on the assumption that growth in livestock production matches the growth in demand for animal products and that feed conversion rates are constant.

(Insert Table 5 around here)

The key point to note from Table 5 is the continuing transition out of staples, especially inferior staples, with the per capita consumption of grains expected to peak towards the end of the century. This is replaced by growth in more preferred foods such as meats, especially intensively-raised poultry, and associated feeds. These trends are even more evident under higher growth scenarios.

Another comprehensive set of Indonesian food projections have been produced by IFPRI/CASER (Rosegrant and Perez 1995) making use of a nine commodity partial equilibrium model of food supply and demand under alternative trade, pricing and investment policies (see Table 6). Key assumptions are world prices follow those projected by IFPRI's IMPACT simulation model and domestic prices maintain relativities so that Nominal Rates of Protection remain constant, exchange rates remain constant; per capita incomes grow at 4.4 per cent per annum, population at 1.4 per cent per annum; and technology and productivity grow significantly (crops 2.8 to 4.6 per cent from research and 5.0 to 16.8 per cent from extension, irrigation 3.3 per cent and livestock yields 3.0 to 4.5 per cent). Demand is determined from estimated responsiveness to price plus parallel shifts in the demand curves as a consequence of population growth, changes in income, and changes in prices of other commodities. The commodities are interlinked by the cross-price responses. Other linkages occur through corn, cassava and soybeans being consumed both as food and feed in livestock production, and thus having two demand schedules; one as food and the other as a derived demand in pork, chicken, milk and beef production. The model is calibrated using 1990 as the base year and is solved recursively.

(Insert Table 6 around here)

A number of key features are evident from Table 6. The baseline comparisons show a slowdown in growth of food crop consumption as a result of slowing population growth, increasing incomes, urbanisation and

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<sup>3</sup> The multi-stage process allocates between staples and non-staples first then between major groups such as cereals and finally between individual commodities. The equations are based on data from the seven Asian countries apart from the last stage which uses Indonesian data only. Constant calorie conversion factors are used to produce product weights. With some products such as vegetable oils, sugar and poultry where consumption is abnormally high given Indonesia's stage of development, lower income elasticities of demand were assigned.



changing tastes, with consumption increasing for higher value products such as meat and milk. Rice consumption is projected to grow at only 1.9, corn at 1.5, and cassava at 1.4 per cent per annum whilst soybean consumption is projected to grow at 3.3 per cent per annum due mainly to its use in a number of processed foods. On the other hand, feed consumption is projected to rise markedly - corn 4.5, cassava 4.4 and soybeans at 4.2 per cent per annum - as is consumption of the livestock end-products of poultry meat, beef, pork and milk. The comparisons under changed policies vary little which appears a result of the modelling used in the projections and the policies considered having few direct consumption effects.

The projections just presented differ in detail but not in terms of the general trends presented earlier from the World Bank analysis. The World Bank projects relatively lower levels of rice, feeds and meat consumption but higher levels of soybean food, wheat and milk consumption. Although the time the projections were made differs the main factors behind the differences would appear to be assumptions such as those on income growth rates and prices, the modelling approach and model parameter estimates.

### 3. Indonesia's changing agricultural production and trade

The key questions addressed in this section are much the same as those addressed in the previous section, namely what has happened to production, why, and what is likely to happen in the future? A broad view across commodities needs to be taken on these questions as there are strong interrelationships between competing products and their associated policies. In addition, Indonesian consumption and production need to be considered together to ascertain trade and other opportunities that may be available to Australian investors.

Past changes in Indonesia's food production and trade are illustrated in Table 7. It is evident from the table that there have been marked increases in production of all Indonesian grains and livestock products, more notably the latter. The most marked increases in grains has been in rice, followed by corn and soybeans from low bases, and then cassava. Wheat cannot be produced in Indonesia but imports have increased nearly ten fold over the period from a low base. Similar increases have been observed on the livestock side. Poultry meat production has grown in line with wheat imports, followed by pork, milk and beef production.

(Insert Table 7 around here)

Increases in production can come from extensification (increases in area under production or livestock numbers), and intensification (improvements in yields). The latter has tended to dominate grains mainly as a result of the introduction of high-yielding varieties and policies that facilitated the availability and use of necessary inputs for applying this technology, such as irrigation (up 40 per cent between 1969 and 1989) and fertilisers (up a massive 900 per cent over the same period). Indonesia's rice yields are high by world standards although not as high as the levels of China and other high yielding areas. This is not the case for some other crops, such as soybeans, where a combination of inappropriate resource endowments and the absence of key inputs such as research and extension have resulted in low yields by world standards (see Trewin and Tomich 1994 for more details on these aspects).

In the case of livestock products, most of the increases in production appear to come from an increase in livestock numbers, as can be appreciated from Table 8 which presents a time series of Indonesian livestock population numbers. Other key features of this table are the dramatic increases in layer and broiler populations since the early 1980s and the relatively large increases in dairy populations and relatively small increases in beef population.

(Insert Table 8 around here)

The above information indicates that diversification is taking place in Indonesian production as a result of differential rates of demand growth and technical change. It would be expected diversification would be towards products in which demand increases with rising incomes, and which make appropriate use of relative resource endowments (e.g. labour versus land). Diversification would be expected towards horticultural products, fisheries and small livestock products such as poultry, and inputs to these such as feed grains, as well as value-added products. A number of factors underlie these changing production patterns. Major determinants are those already mentioned such as production technologies, the availability and cost of inputs such as land, labour and capital, output prices relative to competing products, and policies that affect these determinants. Some of these determinants are now briefly discussed.

In relation to production technologies, the remarkable increases in rice yields and production experienced in the early 1980's from the introduction of new high yielding varieties are unlikely to be repeated in the short term. There is some potential in respect of yields of other crops such as soybeans but there is a question of whether Indonesia has the natural endowments or the policies, the policy emphasis having been on achieving rice self-sufficiency, to achieve its potential in these areas. The same applies to some extent in the livestock areas. However, yields may increase as a result of improved efficiencies as discussed later in respect of policy reforms.

The availability and cost of key inputs such as land are important determinants of production of many agricultural products. Economic development can lead to increases and decreases in land available for agricultural production, for example through gains from irrigation development and losses through industrial development. The World Bank expects these counteracting effects to balance out at least in the near future (World Bank 1992). Competition between agricultural products can have a significant impact on the availability and cost of key inputs for individual agricultural products and hence their production. Sugarcane stands out as a significant and unprofitable competitor for irrigated land on Java as a result of a government command to plant sugar in pursuit of self-sufficiency. In contrast to sugar, other activities such as horticulture, poultry and fish production, each with potential linkages to food processing and high value exports, can rival the profits of the dominant rice crop. Other food crops, notably vegetables and fruit on Java, have increased in production dramatically over the 1980's. Secondary food crops such as corn, cassava and soybeans, are increasingly becoming key feedstocks. In terms of agricultural value added, exports and jobs, fixation with rice self-sufficiency and other 'strategic' crops may become a significant brake on growth.

The responsiveness of production to prices are key determinants of overall supply. The responsiveness of rice production to its own price is much lower than that for corn and soybeans. Moreover, the harvested areas of corn and soybeans are relatively responsive to changes in the price of rice. Rice production also appears more responsive to its own price than to fertiliser costs suggesting output price would be a more effective policy than fertiliser subsidies. As expected, the responsiveness of supply to own prices are much lower than the equivalent responsiveness in demand.

Increased production can come from three sources, namely improved technologies that move the production frontier up, more intensive use of inputs that move firms along the production frontier, and more efficient policies that move firms towards the production frontier. The first two sources have already been discussed. Past policies have concentrated on subsidising input costs to ensure rice self-sufficiency. However, it has been suggested that future policies need to give greater emphasis to efficiency and productivity through policies such as diversification, better irrigation operations and maintenance, other more beneficial infrastructure investments, research and extension, and so on (World Bank 1992).

It has been demonstrated above that Indonesia's rice yields are high by world standards but slowing as full adoption of high yielding varieties takes place. Improved rice varieties are now used by more than 80 per cent of farmers. Yields are lower than world standards in some other crops which reflects an absence of

natural endowments or the impact of policies favouring rice over other crops. A similar situation applies in the livestock area. The bottom line of all of this is that self-sufficiency will be more difficult and costly to maintain or achieve in these areas. Costs would be reduced if forced production of some commodities (e.g. sugar) was eliminated and more imports were allowed, especially in commodities where Indonesia does not have a comparative advantage, and Indonesia concentrated on the production and perhaps export of commodities where it does have a comparative advantage.

Where does Indonesia's comparative advantage in agricultural production lie and how does its production compare to other countries in the region? One measure of a country's comparative advantage in agricultural production is Balassa's revealed comparative advantage index or agriculture's share of the country's exports relative to agriculture's share of global exports (Balassa 1965). This measure is shown in Table 9 for Indonesia and other East Asian countries between 1965 and 1992. A key feature of this table is that Indonesia's 'revealed' comparative advantage in agriculture index has changed little from 1975-79 to 1990-92 when agriculture was given strong policy support in contrast to the falling index in Malaysia and Thailand (Anderson and Pangestu 1995).

(Insert Table 9 around here)

The strong policy support that has been given to Indonesian agriculture, especially in relation to policies aimed at self-sufficiency, is also evident from comparing Indonesia's self-sufficiency ratios (production as a percentage of consumption) to those of other countries in the region. These ratios are given for various food products and countries over the period 1980-82 to 1990-92 in Table 10. A key feature of the table is the generally higher self-sufficiency ratios for Indonesia than for the Philippines, Taiwan, and Thailand, especially in livestock products such as dairy products and rudiment meats.

(Insert Table 10 around here)

The final part of this section, like with the previous section, looks to the future. What will Indonesia's agricultural production and trade likely to be in the future? Again assumptions concerning trends in productivity, and so on, and policy positions are critical to the estimates presented. BAPPENAS publishes production targets encapsulating such assumptions as it did with consumption targets (see Table 11). There are a number of key features of this table, both in its own respect and with respect to the earlier consumption plans. The key feature of the table on its own is the marked increase predicted in broiler population and production relative to other meats such as beef. This is obviously an area where Indonesia sees it has a comparative advantage and where it can convert feeds more efficiently into meats. The increase in this area, although large, is not as large as the consumption increases noted in Table 4, suggesting exports are planned in this area.

(Insert Table 11 around here)

Turning to the projections, again the World Bank has provided some supply projections of its own and comparisons with some other comprehensive projections (see Table 12). The projections are generally similar apart from the much lower BASM rice projections which appear based on higher consumer prices - consumers facing export parity prices rather than the current situation of import parity prices. The relatively low World Bank projections of soybean production reflect an assumption that their production potential is low. Other differences can also be put down to different assumptions, for example whether sugar production is forced over rice and other production.

(Insert Table 12 around here)

The earlier IFPRI projections incorporated supply projections along with the demand projections already discussed (see Table 6). The baseline comparisons in Table 6 show a slowdown in growth of production of food crops due to declining real prices and a slowdown in investment in research, extension and irrigation. Rice production is projected to grow at a relatively low 1.9, corn at 1.1 and soybean at 2.3 per cent per annum. Production growth for livestock products are high at between 4.3 to 4.7 per cent per annum for poultry, pork and milk, and at a lower 3.7 per cent per annum for beef. Overall, consumption growth is generally stronger than production growth, and beef and milk imports are expected to increase. The other comparisons show that the effects of trade liberalisation are relatively small because of the small price distortions and offsetting effects, but are more dramatic in livestock products, that public investment in research, extension and irrigation can have a significant impact; that the removal of the fertiliser subsidy has little impact on production, and that higher income growth results in significant imports.

Although there are no overall official projections, some individual agencies have given general projections of the situation for some specific commodities. For example, it is predicted by the Directorate-General of Livestock Services that excess demand for beef in Indonesia will be around 65,000 tonnes by the year 2000. This is in line with the general situation portrayed in the above formal projections.

#### 4. Linkages between Indonesian grains, livestock and agribusiness policies

The key questions to be addressed in this section are what are the linkages between the Indonesian grains, livestock and agribusiness sectors, and how do specific policies in one sector impact on other sectors? Up to this point these sectors have been considered just as part of general agriculture or in isolation of other sectors. In this section the focus will be on the interactions between the individual sectors.

The answer to the question on what linkages are there between individual sectors in the Indonesian economy is best addressed within a general equilibrium framework. From such a framework it is evident that linkages occur

- directly, through the purchase and sales of each others goods and services (input-output relationships), and
- indirectly, through competition for scarce inputs, and
- through economy-wide constraints such as operate on the balance of payments.

Such linkages in relation to Indonesia's grains, livestock and agribusiness sectors are strong, both in a forward and backward sense. Some of the largest input coefficients in Indonesia's Input-Output Tables relate to paddy rice inputs to the manufacture of food, beverages and tobacco, and the latter's input to livestock and its products, and to restaurants and hotels. There is evidence of strong competition from such sectors for scarce resources, especially capital and land. An example of this was given earlier in the case of competition for irrigated land between paddy rice, sugar and other high-value agricultural products. Examples of economy-wide constraints impacting on the sectors were also given earlier, such as the case of tight government budgets restricting government infrastructure investment, research and development, and so on, in various of the sectors.

The World Bank (1995) has advocated the Indonesian government encouraging the trend to greater relative consumption of wheat, other grain and livestock products by deregulating their import, as well as the wheat milling industry. This is advocated mainly on the basis of linked effects such as those just described. Such deregulation away from rice self-sufficiency would make consumers better off, slow rice consumption and thus take pressure off the self-sufficiency policy, and lead to greater stability as the wheat market is not as

thin a market as the rice market. It is beginning to be appreciated in Indonesian policy processes that arrangements in one sector can impose high social welfare costs on other sectors and the economy in general. This is reflected in the recent decision to deregulate soy milling. This decision was taken mainly on the basis that monopolistic arrangements driven by a policy of self-sufficiency were imposing excessive costs on the major feed input to the domestic poultry industry and negating the industry's potential on the developing export and domestic markets. Indonesia's food processing sector is large, around 10 per cent of GDP, but its exports are minimal, around a fifth of those of Singapore which does not have the same potential comparative advantage of Indonesia in terms of raw materials (World Bank 1994). Forces outside the sector concerned are becoming more important in the determination of policies.

The linkages just described are often key determinants of comparative advantage in agricultural production. Many of the constraints that prevent Indonesia from being an efficient producer of some agricultural products can be traced back to key inputs such as productive resources like land, capital, infrastructure, technology, and so on. But they can also be traced back to policies in other sectors affecting these inputs and other market aspects. These linkages are analysed in the remainder of this section. However, before analysing linkages between policies in the grains, livestock and agribusiness sectors, by way of developmental background, the policies are presented in a general sense and individually within each sector.

Indonesia's agricultural policies should be addressed within Indonesia's general development goals of growth, equity and stability. A larger number of more specific objectives within these general goals include self-sufficiency, low and stable consumer prices, poverty alleviation, employment promotion, value adding/agribusiness, and saving foreign exchange. A wide range of specific policies have been put in place to meet these objectives including producer and consumer subsidies, land use regulations, import licensing/quotas, tariffs, and export restrictions. Some of the key features of these as pointed out earlier are the emphasis on self-sufficiency, direct controls through agencies such as BULOG, and non-tariff barriers such as restrictive import licensing (mainly rice related and covering 35 per cent of production).

Grains, in particular rice, is the dominant component of Indonesian agriculture. It is covered by a whole raft of policies including controls on seed imports, acreage controls, subsidies of key inputs such as fertiliser, irrigation, extension advice and credit, as well as BULOG operations. Some of these policies favour specific components of the grains sector, for example acreage controls and extension advice appear concentrated on rice production to the detriment of some other grains. Other policies appear more general but end up favouring components of the grain sector, for example irrigation and fertilisers are far more important inputs for rice than other grain production and their subsidisation favours rice over other grain production. Even aspects such as the transport of product would appear affected by the dominance of rice self-sufficiency, rice shipping getting precedence over that of feed grains and livestock products. BULOG's operations which control imports, milling and prices of grains are also oriented to achieve the dominant policy of rice self-sufficiency. As mentioned earlier, BULOG administers wheat prices mainly on the basis of the situation in the rice market. The Uruguay Round has had some impact on rice policy, with Indonesia agreeing that there will be access for 90 kt of rice at a 90 per cent tariff and a 180 per cent tariff overall. Similarly, a local content scheme for soybeans will have to be replaced by tariffs under the Uruguay Round agreement (Pomeroy 1995).

Policies in the Indonesian livestock sector can be basically divided into those that apply to the dairy, extensive and intensive livestock industries. A key feature of policies in this area is the involvement of small holders as livestock production is seen as a means of providing small holders with greater diversification and income producing opportunities. An example is the nucleus-plasma arrangement where small (plasma) farmers are dependent on a larger (nucleus) operation for inputs, the costs of which are recovered through output sales. Subsidised credit programs for purchasing stock also support the involvement of smallholders. Indonesian livestock policies are broadly covered in Trewin, Rosegrant and Ervidodo (1995).

The dairy industry policies have been discussed in some detail in Erwidodo and Trewin (1994) but in summary concern a special credit program for small farmers to purchase imported cattle, a local content scheme (the import ratio requirement - BUSEP), import tariffs (generally 30 per cent plus 10 per cent VAT), import licensing and restrictions on investing in milk processing. Moreover, the import of full cream milk does not occur due to a policy of protecting local industry.

Policies in the extensive livestock sector can be represented by those in the beef cattle industry. Like with dairy cattle there is a special credit program for small farmers to purchase imported cattle. In recent years, cattle imports have been subject to a 15 per cent tariff, unless they were feeder steers although these were still subject to licensing, as well as various quarantine and health regulations. Interregional trade of all livestock is also regulated through a quota system. In addition, beef cattle exports are strictly prohibited. The tariff barriers increase as the degree of processing increases (see Table 13), with imports of fresh, chilled and frozen meat being subject to tariffs of 20 to 30 per cent and more elaborately processed meats face tariffs of up to 70 per cent. No quotas apply but most meat imports must be through licensed importers, generally state trading companies. Imports of meat must also be certified to have been slaughtered in a manner consistent with Muslim law. The processing and marketing stages are generally highly concentrated and involve state agencies or cooperatives representing the interests of farmers. The government may intervene directly in the market to stabilise general meat prices.

(Insert Table 13 around here)

The intensive livestock sector is dominated by the poultry industry. Specific poultry policies include a number of measures aimed at fostering small scale operations, including extension programs and restrictions on the size of flocks where any product is sold on the domestic market. There have also been restrictions on the importing of breeding stock which has protected a Day Old Chicks cartel. At the product stage, there is a 25 per cent tariff on chicken meat and non-tariff protection from quarantine regulations. In addition, chicken meat may be exported only with a special permit or license. In relation to pig policies, these are in the main similar to those outlined for beef cattle, namely escalating import tariffs and a variety of non-tariff barriers. However, pork can be exported but only with a special permit or license.

Agribusiness in the broad is the sector that adds value to raw material inputs. It consists of five components, namely inputs, production, post-harvest and processing, marketing and distribution; and support services. The main information available on the sector relates to food processing. The key policy impacting on agribusiness would appear to be the licensing provisions that apply fairly generally throughout the Indonesian economy. BULOG appears to be attempting to climb up the protein chain through monopoly arrangements with millers, etc. BULOG has assigned to Bogasari a monopoly position in toll flour milling in which Bogasari keeps the by-products and the flour is sold to a connected player in Indofood who controls 80 per cent of the noodle market. Other related players are involved in the shipping and port handling used in the import of wheat grain. Excessive profits are evident even with a high return being allocated to old capital equipment and some of BULOG's management fees appear excessive. The food, beverages and tobacco sector receives very high levels of assistance from arrangements such as those described in Erwidodo and Trewin (1994) in relation to dairy products.

As has been illustrated previously, for example in the case of feed grain policies and the performance of the livestock sector, policies in one sector can impact on other sectors. Such linkages are often difficult to trace through the various sectors and to measure their impact on individual sectors. For this reason a number of summary measures have been developed to quantify the overall impact of all policy effects on individual sectors. One such measure is the Effective Rate of Assistance (ERA) which measures the degree to which assistance causes actual value added to diverge from the value added that would have prevailed in the

absence of assistance. In other words, the ERA measures the net effects of assistance considering output and all inputs used. A positive ERA implies that production is receiving net positive incentives. Changes in assistance that reduce the divergence between ERAs are likely to reduce the welfare costs of assistance.

Recent estimates of ERAs for Indonesia have been produced by Fane and Condon (1995) and a number of these are reproduced in Table 14. A key feature of this table is the effect of the earlier mentioned escalation of tariffs. At the aggregate level the ERA on food, beverages and tobacco are 29 per cent compared to 14 per cent for food crops and livestock. Another feature is the dispersion within these aggregates with some sectors such as soybeans, milk livestock and slaughtering having very high ERAs whilst other sectors within the same aggregates such as cassava, livestock and milled polished rice have very low ERAs. ERAs tended to be high in sectors competing with imports and low or negative in export sectors.

(Insert Table 14 around here)

#### 5. Australian opportunities in Indonesian grains, livestock and agribusiness

The key questions to be addressed in this section are at what level of the grains, livestock, agribusiness chain might Australia's opportunities lie and what might be the best type of opportunity (trade in goods, investment, etc)? It is not a matter of saying Australia should export at the most processed stage as this may not be in the best interests of either Australia or Indonesia, and trade should be mutually beneficial to all parties. The live cattle beef exports situation (see Rutherford 1995) is a good case study of many of these issues and will be described next.

Australian live feeder cattle and meat exports to Indonesia are increasing rapidly. This has been especially the case for the former, sourced from northern Australia, once Indonesia shifted away from a policy aimed at importing breeder cattle in 1989 by exempting feeder import licence holders from duties. (See Table 15 for Australia's trade with Indonesia in selected products.)

(Insert Table 15 around here)

Should both these forms of export be taking place or should Australia focus on one or the other? Northern Australia's live feeder cattle trade with Indonesia would appear to be the result of a comparative advantage in producing (e.g. less breeding, feeding and disease problems than areas of Indonesia) and supplying suitable cattle (e.g. lower transport costs than competing areas outside Indonesia). But why does this comparative advantage not appear to flow through to meat exports? Indonesia appears to have elements of a comparative advantage in later stages of beef production as a result of factors such as lower wage rates (see Trewin 1995b for discussion of the importance of comparative advantage in determining the existence of livestock and meat rather than just feed trade flows). Moreover, in the last section there was some discussion of Indonesian self-sufficiency policies and other aspects, such as the lack of appropriate infrastructure, that impede more processed exports from Australia such as meat. However, there are also Indonesian policies impeding the import of feeder cattle such as the bias towards poultry production. There are also Australian aspects that affect the comparative advantage in later stages beef production such as the tally system which increases the costs of slaughtering cattle in Australia by about 70 per cent. However, again there are some compensating aspects such as Indonesia importing less waste product if it imports selected beef cuts as compared to importing the live cattle.

Regardless of the outcome of the interplay of the various forces just discussed, exports at both levels exist because the Indonesian market is segmented. For example, there is a lower price market segment supplied mainly by locally slaughtered cattle and a higher price, quality premium market segment servicing international hotels, and so on, supplied mainly by imported chilled product, including product from southern

Australia. In the middle is a more competitive segment supplied from subsidised exports from India, South America, and so on. The segmentation of the market into distinct product supplies and demands explains why Australia is exporting both live feeder cattle and beef. But the segmentation is not total, for example Indonesians gaining a familiarity with beef derived from Australian feeder cattle at the lower end of the market could have a positive impact on their purchasing practices as their incomes grow and they move up to the higher end of the market. Moreover, if Indonesia used higher protein feeds and had better slaughtering facilities, both aspects that could be supplied from Australia, then Indonesian meat from feedlots would be able to compete better at the higher end of the market.

Restricting Australia's live feeder cattle exports would cut out this and perhaps the feedgrain and associated agribusiness trade but have little impact on Australia's meat exports. The best thing Australia might do is address the high costs its internal arrangements impose on slaughtering, as well as the impediments imposed on live cattle and more processed exports by Indonesia. Restricting assistance to Indonesia's beef industry will also be counterproductive as Indonesia is likely to continue to demand cattle or meat imports, and such investments are likely to improve Australia's reputation and promote the use of Australian goods and services. Investments by Indonesians and Australians in each other's cattle industries are already occurring. Here each country can gain a return under open trade from the comparative advantage of the other that would not exist under restrictive trading arrangements. For example, the Bakrie Brothers have invested money from Indonesia into Australian cattle properties and Heytesbury Pastoral Group have invested Australian money into Indonesia feedlotting operations. It is such joint interests that open up and expand Australian trade and investment opportunities in Indonesia.

Similar situations apply in the other industries being covered in this paper. In the case of wheat and processed wheat products, the former, although confidential, would appear to have much larger exports on the basis of its dominance of the large 'confidential items' aggregate in the trade figures. Prepared animal feeds are increasing rapidly mainly on the basis of the large increases in intensive livestock production. Australia has an obvious comparative advantage in wheat production over Indonesia as no wheat can be grown in Indonesia. Comparative advantage in processed wheat products will depend on factors such as the relative transport costs of raw and processed products. The more interesting comparison of advantage is between wheat and rice. BULOG has control of wheat imports and milling, and manages these aspects on the basis of a rice self-sufficiency policy. Wheat imports lose out under such arrangements. However, the AWB is constrained in trying to change this situation as it has to keep good relations with BULOG given its monopoly position.

The situation is different for milk and dairy products. Exports of both milk and more processed products such as butter and cheese are increasing rapidly. It would appear the demand for processed dairy products is outstripping the desire to achieve self-sufficiency in this area. Australia would appear to have a comparative advantage over Indonesia in milk production but the potential situation is less clear in respect of dairy products because of the high levels of concentration and assistance in this sector of the Indonesian economy. Different policies and institutions that would allow the import of world priced inputs and a more competitive dairy processing sector could result in some parts of dairy processing having a comparative advantage over Australia. Still Australia as a whole could gain from such developments given the marked increases in Australian food processing machinery exports to Indonesia in recent years. The absence of direct BULOG involvement in the sector also enables the ADC to take a more pro-active role in its dealings with Indonesia than does the AWC.

The above discussion has mainly concerned trade but there are strong linkages between trade and investment with the latter seen as a means of more effectively accessing overseas markets and creating trade opportunities (EAAU 1994). Australia's direct investment in South East Asia, including Indonesia, is low relative to its total foreign direct investment and its exports to the region, and relative to investment in the



region by other countries. Moreover, the investment in agriculture and agricultural related industries such as food processing is very small given Australia's comparative advantage in this area, especially the former. A recent study showed that only 6 out of 14 of the largest of the Australian-owned food manufacturers had significant operations in South-East Asia (McKinsey 1992). However, there are large constraints to some investments in Indonesia. Investment in dairy processing is prohibited, BULOG administers a number of monopoly arrangements in the grain processing area, and meat processing has a large government presence, either directly or through licensing.

## 6 Conclusion

The previous sections addressed specific questions on Indonesia's changing consumption, production and trade patterns, linkages between Indonesian agricultural and agribusiness sectors and policies, and Australian trade and investment opportunities in these sectors. These specific questions were based on two main questions concerning key policies and constraints and the market potential of these sectors.

In summary, the conclusions reached were that Indonesian consumption is changing rapidly with increasing incomes, from a dominance of cereal staples such as rice to increased quantities of higher value products such as meats. Changes have taken place in Indonesian agricultural and agribusiness production and trade in line with the consumption changes. There has been greater diversification in agricultural production but production in many areas such as beef cattle has not been able to keep pace with the increases in consumption and imports have increased. Some imports, such as feed grains, are important inputs into value-added products, like poultry production, which Indonesia would hope to export given competitively priced inputs.

Still consumption is low in many products when compared to similar South East Asian countries suggesting some Indonesia policies are constraining the consumption, production and/or trade in these products. The policies concerned need not be specific policies in the sector being affected. It was described in the earlier sections how the dominant policy of rice self-sufficiency has had an adverse impact on the consumption and production of other grains and livestock products. This impact occurs because of competition for scarce productive resources and because of economy-wide constraints such as budget funds.

Past and some current policies could be characterised as achieving self-sufficiency through subsidies, etc., direct controls through government agencies such as BULOG, and non-tariff barriers such as import licenses. New policy directions have been stated as including more diversified, sustainable production; greater market operations, and less emphasis on raw material production and more on value added income. Forces outside agriculture will become more important in determining these directions. Still Indonesia's tariff structure shows an escalation towards greater protection of value-added products and this is also reflected in the ERAs being higher for more value-added products.

As well as adversely affecting the Indonesian economy, policies restricting the efficient allocation of resources within Indonesian agriculture and related sectors also restrict Australian trade and investment opportunities in the agricultural and agribusiness sectors. There are large potential opportunities for Australia throughout the agricultural and agribusiness sectors, right from feed and other grains through to livestock and meat products, and including agribusiness aspects such as veterinarian and other services. Given the current policies, these opportunities are more likely to be at the raw product end. However, this should not be considered necessarily a bad thing as that might be where Australia's comparative advantage may lie as well as where market access is easier. Australia hindering such exports will have costs in terms of lost exports at this level and most likely without any increase in exports at the more value-added level. Constraints in both countries, such as escalating tariffs in Indonesia against more value added products and labour arrangements that add significantly to processing costs in Australia, should be tackled so that true

comparative advantage can be realised and mutually beneficial trade and investment take place. Appropriate investment if allowed will facilitate the development of such trade.

This paper just presents an overview of the linkages between Indonesian grains, livestock and agribusiness policies, and opportunities for Australian investment and trade. Much more detailed analysis in a number of areas is required before any firm conclusions can be drawn. In general, much more detail is required on future factors affecting consumption, production and trade, in particular the various policies being applied that affect Indonesia's agricultural and agribusiness sectors. Specifically, more detailed information is required on the various costs facing and the structure of the industries making up the Indonesian agricultural and agribusiness sectors. These are the next steps planned for the overall project.

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**Table 1: Indonesian per capita food consumption (kg/capita/year), 1983 to 1992**

Commodity	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
<b>Cereals</b>										
Wheat flour	7.62	6.18	5.64	5.96	6.86	6.59	6.93	7.88	7.71	10.36
Unhusked rice/ Rice	144.78	140.2	143.16	147.36	143.17	150.03	140.84	146.25	145.53	147.91
Maize	26.08	27.35	21.61	29.25	24.71	30.72	26.81	29.22	28.73	34.64
Fresh Maize	1.82	0.98	0.97	0.97	0.97	1.87	1.87	1.87	2.08	2.08
<b>Starchy Food</b>										
Cassava	57.67	60.66	59.13	51.49	51.72	48.06	51.41	42.42	48.87	57.4
Others	13.55	13.7	13.96	13.18	11.03	11.55	11.65	10.16	10.44	11.15
<b>Pulses nuts and oil seeds</b>										
Soyabeans	4.45	6.51	6.44	8.8	7.67	9.47	8.8	10.47	11.01	12.57
Others	14.29	15.26	16.02	16.64	16.18	16.69	16.78	17.04	17.55	19.55
<b>Meat<sup>1</sup></b>										
Beef	0.76	0.8	0.86	0.85	0.85	0.84	0.88	0.89	0.91	1
Pork	0.43	0.51	0.56	0.68	0.57	0.61	0.53	0.64	0.42	0.5
Local chicken meat	0.43	0.54	0.51	0.53	0.53	0.56	0.58	0.57	0.63	0.65
Improved chicken meat	0.19	0.30	0.43	0.47	0.56	0.57	0.64	0.82	0.95	1.08
Other	1.22	1.28	1.18	1.24	1.23	1.22	1.22	1.32	1.28	1.37
<b>Fruits</b>	22.33	25.83	22.88	32.54	27.34	26.25	22.95	27.86	29.01	32.54
<b>Vegetables</b>	13.56	17.07	18.59	22.3	20.81	20.55	23.32	17.12	25.68	23.19
Eggs	1.48	1.65	1.70	2.06	2.08	2.21	2.24	2.35	2.46	2.68
Milk	3.32	3.90	3.19	3.44	3.86	4.2	3.68	3.74	3.49	4.31
Sugar	12.89	11.1	12.95	13.28	13.91	12.22	16.44	14.77	15.5	14.4
Fish	10.83	11.09	11.51	11.47	11.78	12.76	12.58	12.91	13.13	13.38
Oil & Fats	5.95	7.65	6.87	7.15	7.72	7.95	8.7	8.92	9.57	12.59

Note 1: The meat figures are significantly lower than those given by the DGLS. The DGLS appear to determine its figures from supply defined as production plus imports, ignoring stock changes and exports. It may also use different conversion rates. However, the trend in the figures are comparable.

Source: Food Balance Sheet for Indonesia in Statistical Year Book of Indonesia, Vol. 1985 to 1993.

**Table 2: Share of Indonesia food expenditure by degree of processing,  
1980, 1981, 1984, 1987, 1990 and 1993**

	1980	1981	1984	1987	1990	1993
<b>Primary</b>	63.41	61.01	58.98	57.79	59.09	54.46
<b>Secondary</b>	26.02	27.46	28.32	27.79	27.19	30.18
<b>Tertiary</b>	10.57	11.53	12.7	14.42	13.72	15.37

**Notes:**

- a. Primary: rice, corn, cassava, fish, fruits and vegetables
- b. Secondary: flour, meats, sugar, milk, tempe, tahu, refined vegetable oil, spices.
- c. Tertiary: bread, biscuits, processed dairy and meat products, canned products, processed meats, and prepared foods

**Source** Calculated from the Average Per Capita Weekly Consumption and Expenditure by Food Items, in National Socio-economic Survey, Indonesia.

**Table 3: Per capita income and food consumption, South East Asia 1981 and 1991**

	1981						1991					
	GDP per capita US\$	Apparent per capita consumption					GDP per capita US\$	Apparent per capita consumption				
		Rice	Wheat	Meat kg	Beef	Sugar		Rice	Wheat	Meat kg	Beef	Sugar
<b>Singapore</b>	5,691	72.7	40.0	60.4	3.4	58.4	14,487	75.2	82.3	77.6	5.3	68.8
<b>Malaysia</b>	1,772	92.2	33.5	17.4	1.3	31.8	2,581	77.4	67.2	33.8	3.3	38.1
<b>Thailand</b>	730	201.0	4.2	14.6	3.1	13.3	1,600	151.2	8.7	19.7	3.1	20.9
<b>Indonesia</b>	608	152.3	9.3	2.9	0.9	11.9	624	155.5	12.3	5.8	1.0	14.4
<b>Philippines</b>	720	104.3	16.6	15.9	1.7	22.9	717	101.2	27.5	17.9	1.4	24.0
<b>Brunei</b>	23,289	143.6	21.5	33.3	5.0	25.0	13,160	118.8	14.0	60.0	7.2	33.8
<b>Vietnam</b>	n.a.	151.2	32.0	11.1	0.6	3.6	119	206.0	3.4	18.1	1.7	7.6
<b>Laos</b>	n.a.	242.7	4.3	25.8	2.1	1.6	178	223.8	3.5	26.8	2.1	1.9
<b>Cambodia</b>	n.a.	136.9	4.3	6.7	1.9	0.9	130	190.5	0.0	11.0	2.3	0.6
<b>Myanmar</b>	168	243.8	0.4	6.0	2.2	1.9	197	199.6	0.4	6.7	2.0	0.5

Source: East Asian Analytical Unit (1994)

Table 4: REPELITA VI Consumption Targets, 1994/95-1998/99

	1993	1994/95	1995/96	1996/97	1997/98	1998/99	Growth rate (%)
<b>Per capita consumption (kg/person/year)</b>							
<b>Meat</b>	6.36	6.62	6.80	7.03	7.28	7.55	3.38
poultry	3.73	3.90	4.04	4.21	4.40	4.60	4.30
beef	1.42	1.45	1.48	1.51	1.55	1.58	2.08
other	1.25	1.26	1.28	1.31	1.43	1.37	1.99
<b>Eggs</b>	2.48	2.58	2.67	2.76	2.86	2.96	3.61
<b>Milk</b>	4.88	5.20	5.35	5.35	5.88	6.19	4.87
<b>National consumption ('000 t)</b>							
<b>Meat</b>	1,208.0	1,271.2	1,328.8	1,394.1	1,465.6	1,542.1	4.97
poultry	704.2	749.6	788.6	834.3	884.8	939.8	5.94
beef	269.1	279.0	289.3	299.9	311.0	322.4	3.68
other	234.6	242.5	250.9	259.9	269.8	279.9	3.59
<b>Eggs</b>	468.8	495.8	521.1	547.8	575.8	605.1	5.24
<b>Milk</b>	922.5	998.2	1,044.0	1,111.0	1,184.0	1,265.0	6.52

Source: REPELITA VI



Table 5: Demand projections for food and feed (real GDP growth 6 per cent per annum)

	Units	1988	1995	2000	1988-1995 (% growth)	1995-2000 (% growth)
Population	Million	176	200	216	1.9	1.6
Real PCE <sup>a</sup>	Trillion Rp	65	98	130	6.0	6.0
per capita PCE	US dollar	333	440	544	4.1	4.3
Cereals	Indexed	100	118	129	2.4	1.8
Rice	'000 t	26,075	30,836	33,725	2.4	1.8
Wheat	"	1,593	2,237	2,788	5.0	4.5
Corn	"	5,740	6,797	7,654	2.4	2.4
- food	"	4,725	5,157	5,307	1.3	0.6
- feed	"	1,015	1,639	2,347	7.1	7.4
Root Crops	Indexed	100	100	99	0.1	-0.3
Cassava	'000 t	11,555	11,558	11,567	0.0	0.0
Sweet potato	"	1,900	1,701	1,565	-1.6	-1.7
Other	Indexed	100	72	53	-5.6	-5.9
Sugar	'000 t	2,201	3,171	4,052	5.4	5.0
Vegetable Oils	Indexed	100	142	180	5.1	4.8
Oil Crops	"	100	124	146	3.1	3.3
Soybeans	'000 t	1,737	2,345	2,959	4.4	4.8
- food	"	1,378	1,751	2,098	3.5	3.7
- feed	"	359	593	861	7.4	7.7
Peanuts	"	545	600	645	1.4	1.5
Other	Indexed	100	126	150	3.3	3.5
Vegetables	"	100	128	154	3.6	3.8
Pulses	"	100	127	146	3.5	2.8
Fruit	"	100	145	195	5.5	6.1
Meats	"	100	142	189	5.1	5.8
Pork	'000 t	106	153	202	5.4	5.7
Poultry (native)	"	98	139	181	5.1	5.4
Poultry (intensive)	"	99	186	300	9.4	10.0
Other	Indexed	100	120	138	2.7	2.8
Milk	'000 t	729	1,059	1,404	5.5	5.8
Eggs	"	385	610	832	6.8	6.4
Fish	"	2,218	3,148	4,000	5.1	4.9
Total calories	Indexed	100	121	137	2.8	2.5

<sup>a</sup> Private Consumption Expenditure in GDP Accounts in 1985 Rupiah  
Source: World Bank (1992)

Table 6: Production, consumption and net exports of Indonesian commodities in 2000 ('000 t)

	Baseline 1990	Baseline 2000	Trade liberalisation	Low investment	High investment	Subsidy phaseout	Transfer subsidy
<b>Rice:</b>							
Production	30495	36589	36589	35855	37336	36157	36382
Consumption	30563	37025	37025	37025	37025	37025	37025
per capita (kg/yr.)	165.8	175.7	175.7	175.7	175.7	175.7	175.7
Trade	-68	-436	-436	-1170	311	-868	-643
<b>Corn:</b>							
Production	6333	8014	8014	7645	8399	7920	8060
Consumption - food	4447	5218	5218	5218	5218	5218	5218
- feed	1772	2713	2713	2586	2789	2713	2718
per capita (kg/yr.)	24.1	24.8	24.8	24.8	24.8	24.8	24.8
Trade	114	83	83	-159	391	-11	124
<b>Cassava:</b>							
Production	14759	16352	16352	16016	16694	16352	16448
Consumption - food	8181	9494	9494	9494	9494	9494	9494
- feed	1418	2149	2149	2049	2210	2149	2154
per capita (kg/yr.)	44.4	45.1	45.1	45.1	45.1	45.1	45.1
Trade	5160	4708	4708	4473	4990	4708	4799
<b>Soybeans:</b>							
Production	968	1214	1214	1161	1269	1214	1234
Consumption - food	729	1015	1015	1015	1015	1015	1015
- feed	780	1170	1170	1115	1203	1170	1172
per capita (kg/yr.)	4.0	4.8	4.8	4.8	4.8	4.8	4.8
Trade	-541	-971	-971	-969	-948	-971	-953
<b>Wheat:</b>							
Consumption	1758	2243	2243	2243	2243	2243	2243
per capita (kg/yr.)	9.5	10.6	10.6	10.6	10.6	10.6	10.6
<b>Poultry meat:</b>							
Production	486	731	731	704	758	731	732
Consumption	486	729	729	729	729	729	729
per capita (kg/yr.)	2.6	3.5	3.5	3.5	3.5	3.5	3.5
Trade	0	2	2	-25	29	2	3
<b>Beef:</b>							
Production	302	418	418	406	431	418	419
Consumption	306	476	476	476	476	476	476
per capita (kg/yr.)	1.7	2.3	2.3	2.3	2.3	2.3	2.3
Trade	-4	-58	-58	-70	-46	-58	-58
<b>Pork:</b>							
Production	308	479	479	460	497	479	480
Consumption	305	474	474	474	474	474	474
per capita (kg/yr.)	1.7	2.2	2.2	2.2	2.2	2.2	2.2
Trade	3	5	5	-14	23	5	6
<b>Milk:</b>							
Production	507	802	802	768	837	802	804
Consumption	699	1051	1051	1051	1051	1051	1051
per capita (kg/yr.)	3.8	5.0	5.0	5.0	5.0	5.0	5.0
Trade	-192	-249	-249	-283	-214	-249	-247

Source: Rosegrant and Perez (1995)

Table 7: Production and net trade of various commodities ('000 t), 1961-1990

Year	Rice		Corn		Cassava		Soybean		Wheat	Poultry		Beef		Pork		Milk	
	Prod.	Net trade	Prod.	Net trade	Prod.	Net trade	Prod.	Net trade	Import	Prod.	Net trade	Prod.	Net trade	Prod.	Net trade	Prod.	Net trade
1961	7978	-1112	2116	3	9558	320	382	0	153	54	0	157	2	94	1	195	-117
1962	7902	-1159	2171	0	9761	41	355	3	87	55	0	164	2	105	1	196	-78
1963	8146	-1133	2470	-1	10004	411	309	0	101	56	0	159	1	116	1	188	-136
1964	8297	-1092	2480	-19	10480	1	349	0	44	57	0	170	1	116	0	192	-113
1965	9555	-203	2670	3	10894	638	366	0	45	58	0	174	1	116	0	195	-31
1966	10051	-323	3117	86	9700	730	373	27	66	58	0	169	-1	110	0	196	-40
1967	10148	-370	3099	159	9303	568	368	7	212	60	0	169	-4	99	0	188	-3
1968	11665	-552	2882	66	10227	644	373	8	510	57	0	178	3	132	0	192	-120
1969	12079	-610	2140	156	9394	1229	348	1	409	58	0	183	-3	115	0	189	-199
1970	14213	-1006	2676	286	9069	1364	445	4	509	59	0	219	10	110	0	188	-263
1971	14845	-527	2448	219	9187	1845	463	1	353	71	0	177	7	132	0	176	-281
1972	14646	-780	2604	80	8974	1383	465	3	501	79	0	206	8	127	0	185	-295
1973	14088	-1962	3482	181	9335	242	484	36	881	80	0	248	11	110	0	176	-311
1974	15346	-1194	3136	197	10857	1606	524	4	784	88	0	257	10	115	0	193	-350
1975	17131	-730	2746	51	10799	1122	528	-18	723	93	0	262	7	110	0	172	-275
1976	16683	-1374	2405	-65	10369	348	457	-171	968	97	-1	238	4	115	-1	205	-395
1977	16477	-2083	2948	-4	10558	683	462	-89	758	102	-1	171	0	115	0	206	-541
1978	17322	-1948	3809	-25	10944	1229	549	-130	793	110	-2	165	-2	115	-1	208	-689
1979	18453	-1999	3283	-78	11758	2923	603	-177	767	142	0	204	-2	126	0	208	-605
1980	21310	2136	3670	-20	11613	1495	586	-101	1488	174	-3	199	-2	126	0	174	-872
1981	22351	-559	4135	5	11479	1504	635	-361	1438	185	-3	186	-8	132	-1	200	-850
1982	23420	-321	2949	-82	11157	630	460	-361	1491	197	-2	189	-6	143	0	180	-1045
1983	22891	-1217	4662	-12	10508	778	464	-222	1757	262	-2	244	-6	165	-1	218	-1038
1984	24414	-436	4879	98	10820	1562	668	-401	1452	288	-1	262	-5	203	0	275	-922
1985	27026	261	3984	-51	11969	2173	772	-302	1338	328	-1	275	-3	214	0	360	-573
1986	26558	116	5452	-62	11478	1616	950	-360	1623	350	-2	286	-4	242	0	418	-483
1987	27954	-34	4731	-224	12278	2956	906	-287	1697	388	-1	275	-6	253	0	427	-464
1988	30355	-63	6144	-33	13228	3262	888	-466	1601	415	0	283	-6	257	1	461	-427
1989	33132	-210	5763	182	14509	4786	969	-391	1825	450	0	293	-4	284	3	500	-224
1990	30495	-68	6333	114	14759	5160	968	-541	1758	486	0	302	-4	308	3	507	-192

Note: Production values are net of wastes, by-products, etc. Net trade - positive values are exports, negative are imports.

Source: Rosegrant and Perez (1995)

Table 8: Indonesian livestock population ('000 head) 1969-1993

Year	Dairy	Beef	Pig	Other <sup>a</sup>	Native chicken	Layer	Broiler	Duck
1969	52	6477	2878	14124	61788	688	-	7269
1970	59	6137	3169	13275	62652	706	-	7370
1971	66	6245	3382	13672	73841	1799	-	10416
1972	68	6286	3350	13700	79627	3000	-	12404
1973	70	6389	2622	13057	79906	2202	-	12503
1974	86	6380	2906	12935	98650	3450	-	13620
1975	90	6242	2707	12748	94572	3903	-	14123
1976	87	6237	2947	13422	97504	4878	-	15162
1977	91	6217	2979	14047	101686	5807	-	16032
1978	93	6330	2902	14589	108916	6071	-	16032
1979	94	6362	3183	14758	114350	7007	-	18689
1980	103	6440	3155	14888	126310	22940	-	21078
1981	113	6512	3364	15092	132878	24568	25462	18689
1982	140	6594	3587	15293	139787	26312	28110	22420
1983	198	8894	4248	18584	159462	28102	31033	23861
1984	203	9236	5112	17125	166815	29559	110580	24694
1985	208	9318	5560	16427	155627	31875	143657	23870
1986	222	9432	6216	20278	162991	38689	173795	27002
1987	233	9510	6339	19700	168405	39968	218183	26025
1988	263	9776	6484	20300	182879	38413	227044	25080
1989	288	10094	6936	20813	191433	40452	262918	24135
1990	294	10410	7136	21322	201366	43185	326612	25553
1991	306	10667	7612	21598	208966	46885	407908	25369
1992	312	11211	8135	22317	222530	54146	459097	27342
1993	351	11356	8635	22222	259321	54306	526960	28577

<sup>a</sup> 'Other' consists mainly of goat but also includes sheep, buffalo and horses.

Source: Directorate-General Livestock Services (1994)

**Table 9: Agriculture's 'revealed' comparative advantage index,  
Indonesia and other East Asian countries, 1965 to 1992**

<b>Indonesia</b>	
1965-69	2.69
1970-74	1.82
1975-79	1.12
1980-84	0.81
1985-89	1.51
1990-92	1.13
<b>Malaysia</b>	
1965-69	2.35
1970-74	2.76
1975-79	2.77
1980-84	2.40
1985-89	2.23
1990-92	1.31
<b>Thailand</b>	
1965-69	3.66
1970-74	3.98
1975-79	4.20
1980-84	4.58
1985-89	4.62
1990-92	3.32
<b>China</b>	
1965-69	2.08
1970-74	2.24
1975-79	1.97
1980-84	1.46
1985-89	1.78
1990-92	1.36
<b>Vietnam</b>	
1965-69	1.06
1970-74	1.17
1975-79	1.60
1980-84	2.05
1985-89	2.91
1990-92	3.02

Source: Food and Agriculture Organisation (1994)

Table 10: Self-sufficiency in various food products, various countries, 1980 to 1982 and 1990 to 1992.

1980-1982

	Rice	Wheat	Coarse grain	Sugar	Dairy	Meat of bovine	Meat of poultry & pig	Meat of sheep & goat
Indonesia	96.13	-	98.77	67.75	22.18	98.82	99.65	99.87
Philippines	102.24	-	88.54	245.67	3.36	93.56	99.9	99.49
Taiwan	112.14	0.4	3.31	175.64	10	28.11	102.2	7.32
Thailand	139.6	-	510.35	288.51	7.39	100.15	104.14	93.35
Other Asia	99.73	81.12	81.02	66.56	90.04	92.71	96.66	89.45
All Asia	100.89	79.66	81.53	81.07	87.23	92.98	97.23	89.65

1990-1992

	Rice	Wheat	Coarse grain	Sugar	Dairy	Meat of bovine	Meat of poultry & pig	Meat of sheep & goat
Indonesia	99.16	-	98.99	87.17	63.59	98.26	99.69	99.5
Philippines	97.1	-	92.51	114.31	2.53	89.77	99.92	98.46
Taiwan	108.93	0.37	7.43	95.72	25.63	8.06	119.35	2.53
Thailand	156.72	0.15	121.2	376.96	16.28	100.9	118.96	92.11
Other Asia	100.14	85.93	83.15	77.85	93.53	91.26	96.8	95.51
All Asia	101.49	84.16	82.36	88.13	91.42	91.15	98.1	95.29

Source: FAO in International Economic Data Bank, The Australian National University.

Table 11: REPELITA VI Production Targets, 1994/95-1998/99

	1993	1994/95	1995/96	1996/97	1997/98	1998/99	Growth (%)
<b><u>Population ('000):</u></b>							
Beef cattle	11235 4	11594 4	11966 0	12348 9	12744 0	13151 8	3 2
Dairy cattle	340 6	359 3	379 1	399 9	421 9	445 1	5 5
Pig	8384 5	8719 9	9068 7	9431 4	9808 7	10201 0	4 0
Other extensive	22943 8	22917 7	23318 6	23726 7	24141 8	24564 9	1 9
Native chicken	224648 3	233634 3	242979 6	252698 8	262806 8	273319 0	4 0
Broiler	609196 7	683518 7	762806 9	854725 1	962420 5	1074061 3	12 0
Layer	54990 9	59555 1	64498 2	69851 6	75649 3	81928 1	8 3
Duck	26147 1	26539 3	26937 4	27341 5	27751 6	28167 9	1 5
<b><u>Production ('000t):</u></b>							
Beef	278 8	288 9	299 3	311 2	221 4	333 0	3 5
Milk	402 4	425 3	449 4	474 8	501 8	530 2	5 7
Pork	137 3	137 3	142 8	148 5	154 5	160 8	4 0
Other meat	139 5	141 7	144 1	146 6	149 0	151 6	1 7
Native chicken	247 3	253 2	261 1	268 3	275 9	283 5	2 8
Intensive poultry	463 8	507 7	553 1	603 8	660 4	718 1	9 3
Chicken eggs	496 7	526 8	558 6	592 6	628 7	666 9	6 5
Duck eggs	107 3	109 3	111 3	113 3	115 2	117 5	1 8
Paddy	48181 0	49169 0	50157 0	51185 0	52194 0	53243 0	2 0
Rice	31318 0	31960 0	32602 0	33257 0	33926 0	34608 0	2 0
Maize	6460 0	8288 0	8601 0	8925 0	9261 0	9611 0	3 8
Soybeans	1709 0	1849 0	1907 0	1968 0	2030 0	2095 0	3 2
Cassava	17285 0	16384 0	16412 0	16439 0	16467 0	16495 0	0 2

Source REPELITA VI

**Table 12: Projections of supply of agricultural products (per cent per annum)**

	<b>BASMa</b>	<b>AARD<sup>b</sup></b>	<b>World Bank</b>
	<b>1991-2000</b>	<b>1988-2000</b>	<b>1988-2000</b>
Rice	1.3	3.2	3.2
Corn	3.9	3.0	3.8
Root crops	3.5 <sup>c</sup>	1.4 <sup>d</sup>	-0.1
Sugar	4.1	3.3	2.0
Soybeans	5.6	3.4	2.3
Vegetables		0.9	3.7
Fruit		1.0	5.7
Meat <sup>e</sup>	4.4	4.1	5.4
Eggs		4.8 <sup>f</sup>	6.2
Fish	4.4		5.2
Coconut	3.7	4.9	3.3
Oil palm	6.4	18.6	5.7
Rubber	4.5	5.4	2.9
Coffee	3.3	2.8	3.0
Spices		2.8 <sup>g</sup>	2.8
Forestry			1.0

<sup>a</sup> BAPPENAS Agricultural Sector Model, rice at export parity price.

<sup>b</sup> AARD-BORIS.

<sup>c</sup> Cassava.

<sup>d</sup> Cassava and sweet potato.

<sup>e</sup> Weighted average of poultry (0.35) and other meat (0.65), weights from BASM. Production increases are assumed to equal increases in domestic demand.

<sup>f</sup> Rate of growth of modern technology layers.

<sup>g</sup> Average of six spices.

Source: World Bank (1992)



**Table 13: Ad valorem tariffs on agrifood products imported by Indonesia, 1990**

	Beef			Wheat			Dairy		Sugar	
	Unprocessed	Lightly processed	Highly processed	Unprocessed	Lightly processed	Highly processed	Lightly processed	Highly processed	Raw	Refined
Average	5	30	32	1	6	33	28	27	10	10
Range	0-15	30	30-40	0-5	0-15	10-60	5-40	20-40	10	10

Source: ABARE (1995)

**Table 14: Selected Indonesian ERAs, 1995**

<b>Sector</b>	<b>Gross output Billion Rp. 1990</b>	<b>ERA %</b>
Paddy	14082	9
Maize	1600	5
Cassava	1982	0
Soybeans	1152	64
Vegetables	4038	27
Fruits	3736	20
Sugar cane	925	21
Livestock	1987	5
Milk livestock	187	32
Poultry	3246	22
Other livestock products	74	27
Marine fish	2083	30
Freshwater fish	-	30
Dried smoked fish	1,29	21
Slaughtering	3415	195
Processed meats	79	-1
Milk products	733	115
Processed veg. & fruit	126	-21
Processed fish	1577	-35
Refined oil	2809	7
Milled polished rice	15590	2
Wheat flours	429	-47
Other milled cereals	960	57
Bread bakery products	1020	78
Noodles etc	378	143
Processed sugar	1938	46
Processed soybean	1411	25
Other food	844	21
Animal feeds	1004	5

Source: Fane and Condon (1995)

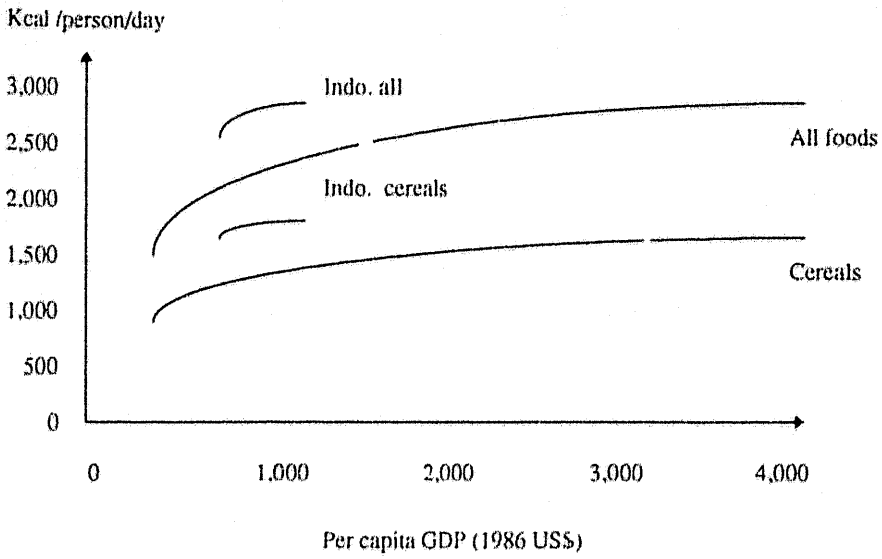
Table 15: Australian exports to Indonesia, selected exports 1989-94, A\$'000

	1989	1990	1991	1992	1993	1994
<b><u>Unprocessed Foods</u></b>						
Live animals	7,387	5,613	6,000	9,869	29,364	64,511
Wheat	207,601	148,978	136,087	0 <sup>1</sup>	144 <sup>1</sup>	0 <sup>1</sup>
Total unprocessed foods	219,462	159,922	150,865	36,038 <sup>1</sup>	68,159 <sup>1</sup>	98,374 <sup>1</sup>
<b><u>Processed Foods</u></b>						
Beef	2,096	2,980	3,877	5,614	11,512	17,127
Meat chilled or frozen NES	477	674	785	990	1,868	2,053
Edible animal offals	461	1,394	2,313	3,923	3,813	6,436
Meat and meat preparations NES	310	419	489	670	594	1,151
Milk	7,177	12,372	17,370	14,709	29,884	30,914
Butter	2,442	1,700	4,925	6,569	12,490	7,356
Cheese	3,328	2,791	5,529	5,951	6,794	9,722
Wheat flour	45	14	59	85	112	134
Malt	4,440	5,341	4,725	2,896	4,725	3,230
Biscuits, etc	54	138	249	453	636	905
Cereal preparations NES	2,015	1,625	2,214	604	1,105	1,643
Animal and vegetable fats	390	368	999	1,095	1,315	1,154
Prepared animal feeds	4,057	4,445	5,515	13,107	17,311	11,847
Total processed foods	31,100	40,806	55,416	65,032	106,464	113,005
<b>Total food and beverages</b>	<b>250,562</b>	<b>200,728</b>	<b>206,281</b>	<b>101,070</b>	<b>174,623</b>	<b>211,379</b>
Food processing machinery	n a	3,107	8,601	2,574	8,294	13,284

<sup>1</sup> Excludes confidentialised wheat exports

Source: DFAT - Australia's exports of food and beverages to the world

**Figure 1: Calories consumption versus income (average for 7 Asian**



Source: World Bank (1992)