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**THE SUGAR DEVELOPMENT STRATEGY WITH AN
ECONOMIC CRISIS AND COMPETITIVE MARKETS**

**I. Wayan Rusastra, Rohayati Suprihatini and Muhamad
Iqbal**

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**Lead institution: CIES • University of Adelaide • Adelaide • SA 5005 • Australia
Telephone (61 8) 8303 4712 • Facsimile (61 8) 8223 1460 • email: cies@economics.adelaide.edu.au
Homepage: <http://www.adelaide.edu.au/cies/>**

**CASER/CSIS/CIES/ANU
joint research project on**



Policy analysis of linkages between Indonesia's agricultural production, trade and environment

Rapid economic growth in Indonesia has been accompanied by significant structural changes, including for its agricultural sector and its unique natural environment. Recently questions have been raised about the impact of Indonesia's agricultural, industrial, trade and environmental policies on sustainable rural development. The nature of interactions between the economic activities of different sectors and the environment are such that an intersectoral, system-wide perspective is essential for assessing them. An international perspective also is needed to assess the impact on Indonesia of major shocks abroad, such as the implementation of the Uruguay Round agreements, APEC initiatives, or reforms in former centrally planned economies. There is increasing pressure on supporters of liberal trade to demonstrate that trade reforms at home or abroad affecting countries such as Indonesia will not add to global environmental problems (e.g., deforestation, reduced biodiversity). Again, this requires system-wide quantitative models of the economy and ecology, because typically there are both positive and negative effects at work, so the sign of the net effects ultimately has to be determined empirically.

To begin to address these issues, the Australian Centre for International Agricultural Research (ACIAR) has generously provided funds for a collaborative 3-year project (to mid-1999) involving the University of Adelaide's Centre for International Economic Studies (CIES) as the lead institution, Bogor's Centre for Agro-Socioeconomic Research (CASER) which is affiliated with the Ministry of Agriculture, Jakarta's independent Centre for Strategic and International Studies (CSIS), and the Economics Division of the Research School of Pacific and Asian Studies (RSPAS) at the Australian National University in Canberra. Being based on Indonesia with its rich diversity of environmental resources (and on which there are relatively good data) and its rapid economic growth, the project could also serve as a prototype for similar studies of other developing countries in Southeast Asia and elsewhere.

The key objective of the project is to assess the production, consumption, trade, income distributional, regional, environmental, and welfare effects of structural and policy changes at home and abroad particularly as they will or could affect Indonesia's agricultural sector over the next 5-10 years. Among other things, the analysis will focus both on the effects of economic changes on the environment, and on the impacts on Indonesia's agricultural production and trade of resource and environmental policy changes. The implications of regional and multilateral trade liberalization initiatives and Indonesia's ongoing unilateral trade reforms will be analysed, along with other potential domestic policy changes and significant external shocks such as the entry of China and Taiwan into the World Trade Organization. The analysis will draw on and adapt computable general equilibrium (CGE) models such as the national INDOGEM Model (built as part of an earlier ACIAR project) and the global GTAP Model.

The project is being undertaken in close collaboration with the Indonesian Ministry of Agriculture and ministries involved in trade, planning, and the environment. A Research Advisory Committee has been established to encourage close collaboration of representatives from those and other ministries.

ACIAR INDONESIA RESEARCH PROJECT

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Senior Agricultural Economists
Center for Agro-Socioeconomic Research
Bogor, Indonesia

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Introduction

For the last 25 years, the sugar industry change remarkably. Sugar import increase substantially, ie. 35.1%/year, and sufficiency index drop from 0.85 to 0.63 for the period of 1970-1997. This an indication of strong increasing demand for direct and indirect consumption. In 1997, total sugar domestic used was 3,486 thousand ton, in which the contribution of domestic production was 63.0%. On average, in 1996, per capita sugar domestic consumption was still low, ie. 15.1 kg, far below the consumption of other developing countries such as Filipina 25 kg/capita and Malaysia 43 kg/capita/year (Baharsjah, 1996). This evidence imply there is wide opportunity to expand sugar industry to fulfil increasing domestic demand.

Starting by 1971, the main government strategy dealing with sugar industry is to foster domestic production through the involvement of the farmers and stabilising price in such away to give enough incentive to producer and also affordable for the consumer. Based on the President instruction (Inpres) No.9/1975, the government introduced sugarcane smallholder intensification program (TRI) with the ultimate goal empowering the farmers through their involvement in farmer's group and cooperative, therefore they will have strong enough bargaining position with the sugarcane factory (Mubyarto, 1985). Other strategies to increase sugar production are to rehabilitate government own sugar factory in order to improve their efficiency and production capacity, as well as relocation program by expanding new investment of sugar factory outside Java.

President decision (Keppres) No.43/1971 is the starting point of Bulog involvement in sugar marketing with the responsibility of stabilising price and distributing sugar. Bulog's role was strengthen by the regulation issued by Ministry of Trade and Cooperative No.122/KP/III/1981, in which Bulog was given the right to buy all domestic sugar production and as a monopoly in sugar import. The provenue and af. factory price of sugar are determined by the Ministry of Finance and by controlling the supply as well as its distribution, Bulog was expecting to be able to stabilise sugar price for the benefit of the both side, farmers and the consumer.

On January 15, 1998, the government of Indonesia and IMF signed the Letter of Intent, in which one out of 50 items is dealing with sugar industry. Effectively, since February 1, 1998, all trader will be given the right to import and distribute sugar in domestic market, and the farmers are freed formally and informally from the obligation to plant cane. In implementing that agreement, on January 21, 1998 the government issued two president instruction (Inpres), ie: (1) Inpres No.5/1998, dealing with the removal of TRI program, and instructing related government official to free the farmers for the regulation to plant cane; and (2) Keppres No.19/1998 and SK Ministry of Trade No.21/1998 considering the totally phase-out the Bulog obligation to

import and distribute sugar and wheat flour. In general, the reformation program of sugar industry are intended to liberalise and privatise the sugar agribusiness that will affect the all aspect of sugar development system. Sugar is considered as strategic commodity, therefore the anticipative impact of sugar reformation program is really needed in formulating the policies for future development of this commodity.

Based on those background, the objective of this paper are: (1) To evaluate the current status of cane farm efficiency and production structure of sugar industry; (2) To asses the nature of market structure, marketing efficiency, and sugar price stability; (3) To evaluate the nature of sugar consumption and determining supply projection and demand for sugar; and (4) To asses the possible impact of sugar industry reformation program and to formulate the anticipative development strategies for sugar agribusiness.

The structure of sugar production and farm analysis

Spatial and intertemporal structure of sugar production

The trend of structural sugar production by region, land type, management system and farming system are important in determining the performance of sugar industry as a whole. Table 1 indicate the aggregate performance of sugar industry in Indonesia. This country had an experience of high sugarcane performance during the period of 1930-1940, indicated by high cane (TCH) and sugar (TSH) productivity per hectare. For the following period, 1950-1960, the cane factory, area harvested, cane and sugar productivity decreased, then followed by remarkable declining of sugar production.

Starting by the early of 1970, the government introducing the massive and comprehensive sugar development program (intensification, rehabilitation, and extensification), with the result of increasing sugar production from 715 thousand ton to 2091 thousand ton in 1996, or increased by 7.70%/year. The growth of sugar production is mainly determined by the increasing of cane area with the annual growth rate of 15.65%/year. For the period of 1970-1996, the harvested cane area increased from 81,677 ha to 401,188 ha. On the other hand the cane and sugar productivity as well as sugar rendement decreased continuously, by the amount of 1.00%, 0.89%, and 0.89%/year, respectively. All of these indicating the low performance and efficiency of the cane farming and sugar processing industry.

Spatial structure of sugar production indicated that Java is still as a dominant contribution of sugar production, even though it's share has been decreasing constantly from 84.93% (1987) to 63.12% in 1998, or decreasing by 2.33%/year (Table 2). Recently, outside Java contribution reach 36.88% or increase by 13.16% per year. In the future, national sugar performance will be

determined by the capabilities in handling the problem of sugar development in Java in term of efficiency improvement and sugar competitiveness with other alternative crops especially rice, and the success of extensification program outside of Java.

The structural trend of cane farming in Java indicate that the contribution of rainfed cane farming and ratoon cane category has been increasing over-time (Table 3). There is strong indication that cane have no enough competitiveness with rice in irrigated land. Due to capital and labor constraint, farmers more preferred to ratoon system with lower cost of production. In 1996, cane farming in Java dominated by rainfed cane farming (50.6%), and ratoon category (67.9%), with the increasing growth rate of 13.2% and 10.4%/year for the period of 1980-1996, respectively. P/SE and P3GI (1996) indicated that in 1991/92 the yield of rainfed cane farming is 20.10% lower than irrigated cane farming (75.68 vs 94.72 ton/ha), and the yield of ratoon category is 10.44% lower than plant cane category (83.2 vs 92.9 ton/ha).

The comprehensive picture of cane farming by type of land at national level shown in Table 4. The role of irrigated cane farming with the proportion of 70.26% of national sugar production in 1988, now (1997) remain only 46.72%. The decreasing trend of sugar production in irrigated land with the magnitude of 4.20%/year, can be decomposed into decreasing harvested area by 3.18%/year and decreasing sugar yield by 1.02%/year. On the other hand the sugar production in rainfed land has been increasing sharply for the last ten year, by 7.51%/year, which mainly due to increasing harvested cane area (7.55%/year), but stagnant in sugar yield with the average of 4.93 ton sugar/ha. Briefly, it can be concluded that the main problem of increasing sugar production in the future are decreasing trend of sugar yield and area harvested in irrigated land, and stagnant yield in rainfed cane farming.

The performance sugar production will also be determined by the structure of cane farming and industry by the group of management system. Table 5 indicate that the proportion of factory's cane farming decrease considerable from 81.3% (1965) to 35.8% in 1995. At this moment the farmer's cane farming system dominate (64.2%) total harvested cane area. Therefore, the complexity of TRI, land conversion, high competition with other commodities, in conjunction with implementing the sugar industry reformation program will greatly affecting the sugar production in the future.

The performance of sugar industry categorised into government and private own factory shown in Table 6. There is distinct differences of their performance in term of present factory capacity, cane area, and productivity. The average of present factory capacity of the government own factory is significantly lower than private own factory, ie. 5,100 ton vs 9,300 ton cane per day. The harvested cane area and productivity of government own factory are also lower with the proportion 47.9% (9,244 ha vs 19,294 ha) and 52.7%

(3,61 ton vs 6,85 ton sugar/ha) of private own factory, respectively. It is clear that efficiency improvement of government own factory is really needed through enhancing factory capacity, cane area, and productivity. As the standard, in order to achieve technical and economic efficiency the minimum land requirement for the factory is 20,000 ha (Prabowo, *et al.*, 1997).

Sugar industry development outside of Java

The relocation of sugar industry is one of the sugar development strategies initiated by the government. To implement this strategy properly, the removal of sugar industries in Java have to be conducted carefully and must be in line with the capacity to develop sugar industry outside Java, in order to avoid the declining of sugar production. Prabowo, *et al* (1997) have determined the economic efficiency index as a measure in deciding to close the sugar factory in Java. The calculation of this index is based on three indicators, i.e.: total milling day per year, factory capacity (ton cane per day), and technology adoption indicated by the sugar rendement.

Based on the information for the last ten years (1985-1995), 17 factory (29%) out of 59 factory in Java have a total milling day below the normal standard of 150 milling day, i.e. 87 - 147 milling day per year. The low milling day is an indication of cane limitation as a raw material for the industry. By considering the minimum criteria of factory capacity of 2000 TCD, 28 unit factory (47.5%) were not able to fulfil the requirement. Beside that, 19 unit factory (32.0%) can be rating as having low technological adoption, indicated by the sugar rendement under 7.5%.

Based on the three indicator, Prabowo, *et al* (1997) come up with the economic efficiency index of 59 factory in Java, as presented in Table 7¹. The government have decided to close 27 factory in Java for the period of 1998 - 2002, in which for the first stage it will be closed 20 factory up to 2001, and the rest have to be conducted in 2002. The removal of those 27 factory with the total capacity of 483,000 ton sugar per year, have to be compensated by the realisation of 13 sugar factory development outside Java.

The study of land potential for cane farming outside of Java conducted by Prabowo *et al* (1997) as presented in Table 8, indicated that: (1) The total land potential for cane is 1,230,342 ha, where 67% located in Irian Jaya, 11% in Southeast Sulawesi, 10% in West Nusa Tenggara, 9% in East Kalimantan, 3% in Central Sulawesi; (2) The proportion of area classified as PDR I (First, Priority of Development Recommendation) is 139,482 ha (11.3%), PDR II 579,970 ha (47.1%), PDR III 278,220 ha (22.6%), and classified as PDR IV &

³ The economic efficiency index (Y) is calculated by using the following formula: $Y_i = (aX_1 + bX_2 + cX_3) : (a+b+c)$, where X_1 = total milling day per year; X_2 = factory capacity (ton cane/day); X_3 = sugar rendement (%); $a = 5$, as a weighted of raw material (cane) limitation; $b = 2$, as a weighted of factory capacity, and $c = 1$, as a weighted of technology adoption factor.

V are 278,220 ha or 22.6% of total land potential for cane farming. If the PDR I and PDR II can be considered technically feasible for cane farming, then the land potential is 719,542 hectare. This figure indicate that there is wide opportunity to expand sugar industry outside of Java. Recently, total cane area in Indonesia is approximately 450,000 ha.

The finding of feasibility study outside Java indicate that sugar industry financially will generate profit if satisfied the following criteria: (a) Occupied cane area to produce 75,000 - 100,000 ton sugar per year; (b) Factory's capacity of 8000 TCD (ton cane per day); (c) The amount of total investment of US\$ 120 million for cane farming, equipment, housing, and infrastructure; (d) Be able to produce the quality standard of plantation white sugar; (e) The availability of normal interest rate for investment, but not the commercial one; (f) Be able to perform high efficiency standard for cane farming, processing and sugar marketing; and (g) The cost of sugar production at the most of US\$ 250 per ton.

The possible impact of price policy on production

The involvement of government (Bulog) in stabilising sugar price initiated in 1971 and then it's obligation was strengthen in 1981. By this time, the provenue and af.factory price of sugar are set by the government and sugar supply and distribution are monopolised by Bulog. The historical data in Table 9 indicate that the government was favouring paddy compared to sugar, where the floor price of rice increased every year for the period of 1986-1998.

For that span of time the provenue price of sugar increased only 17.56%/year, on the other hand floor price of paddy increased much more faster, ie. 39.28% per year. Initially the price ratio of sugar and paddy is determined for the magnitude of 2.4, but since 1992 the price ratio have been declining consistently, and in 1998 the ratio is just 1.45. For the last 12 year the price ratio declined 3.79% annually. The evidence clearly pointed out that the government policy is bias to rice that will strengthen the paddy competitiveness to sugar cane.

The government policy in determining and stabilising sugar price seem to be not in line with the improvement of the farmer's welfare. Because of the increasing price of production input and consumption goods, the real provenue price of sugar decline considerably (Table 10). For the period 1986-1996 the real provenue price have been decreasing by 3.34%/year, mainly due to increasing price index paid by the farmers by amount of 20.67% per year. On the other hand, nominal provenue price just increase by 10.43%/year. For the farmer side and with the existing sugar industry performance, the price policy set by the government is not appropriate to cover the increasing price of production input and consumption goods in order to give enough incentive and improve the welfare of the cane farmer.

As mentioned above that the provenue price set by the government was not strong enough to give conducive economic environment to support sugar production. For the last 11 year (1985-1997), sugar production just increased by 2.45%/year, and at the same time sugar domestic demand for direct and indirect consumption increased by 8.25% annually (Table 11). Sugar import increase remarkably, and in 1997 the proportion of import to domestic sugar production is 59.18%. For the period of 1985-1997 the self sufficiency index declining by 3.0%/year, and in 1997 the ratio of domestic production with respect to domestic sugar utilisation or self sufficiency index remain 0.63.

Financial benefit and comparative advantage

The main competing crops of sugar either in wetland or dryland in Java is food crops (rice or secondary crops). The nature of comparative advantage, financially or economically, will depend on the type of land, cropping pattern, cane categories (plant cane or ratoon), trade regime, and exchange rate fluctuation. The last indicator represent the impact of monetary crisis hitting the nation since the mid of 1997. Hypothetically can be predicted that the impact of increasing exchange rate on the financial and economic benefit as well as comparative advantage of sugar industry are as follow: (a) Financial and economic benefit of sugar will increase, assuming that the increase exchange rate will affect just a pat of production cost; and (b) The change of economic environment will affect both side (sugar and its competing crops), therefore the nature of comparative advantage will remain the same, as long as the nature of production cost is constant.

Recently, the government had liberalised the input and output market of sugar and food crops. The input subsidies was remove completely and the output price is link to international price. The government no longer maintain the cheap output price policy. In this case the increasing exchange rate will give benefit to both side, sugar and food crop's farmer. Table 12 clearly show that the financial benefit of all cropping pattern increase in conjunction with the increasing exchange rate from Rp 5,000 to Rp 10,000 against US\$. The status of financial competitiveness among the four cropping pattern are remain the same for different exchange rate. Food crop on irrigated land (represented by cropping pattern A) is financially more profitable than sugar (*Pola D*). Cropping pattern dominated by secondary crop in dryland area (*Pola B*) seem to be less competitive compared to cane farming. The other alternative cropping pattern on dryland (*Pola C*) consisting of rice and fallow is not significantly different with the cane farming (*Pola D*). It seem that, by the changing of economic environment, food crop (rice) especially in irrigated land, financially is still more profitable compared to cane farming.

Economically, sugar industry have marginal comparative advantage, in which DRCR (Domestic Resource Cost Ratio) approaching to 1.00, by type of land (irrigated and rainfed), cane categories (plant cane and ratoon), and also by trade regime either import substitution (IS) or export promotion (EP). Slight changing of economic price, productivity, and exchange rate will affect the nature of sugar comparative advantage (Table 13 and 14). Conversely to sugar, rice have high comparative advantage especially for the import substitution trade regime. Gonzales *et al* (1993) find out that DRCR of rice in Java is 0.60, outside of Java 0.70, and Indonesia as a whole 0.55. This indicate that rice is economically more efficient in using domestic resources in order to save one unit of foreign exchange. The increasing exchange rate will affect both commodities, and the nature of economic comparative advantage will remain the same. Therefore the problem of sugar industry is remain there, ie. how to improve its productivity and efficiency for all aspect of sugar agribusiness, cane production, processing, and sugar marketing.

Market structure and price stabilisation policy

Market structure and marketing efficiency

Out of 70, around 81.43% (57 unit) of sugar factories are located in Java (Table 15). The production share of Java's sugar industry is 63,44% of national sugar production of 1,992 thousand ton in 1997/98. Spatial identification show that there are four major producing area, ie. East Java, Lampung, Central Java, and West Java, with total share of production 91.3% (Table 16). The remaining production share (8.7%) is the contribution of other 5 provinces, ie. South Sulawsi (2.70%), South Sumatera (1.95%), North Sumatera (1.78%), Yogyakarta (1.17%), and South Kalimantan with the share of national sugar production of 0.52%.

The concentration ratio of the biggest four producing region (CR-4) is indicated by their production share, ie. 91.3% of national sugar production in 1997/98 (Table 16). The rate of industrial concentration of those respective regions is represented by the rate of Herfindahl Index (HI-4), with the magnitude of 0.29. The HI-4's value of 0.29 indicating the relatively weak rate of concentration, therefore there will be the possibility of open competition due to relatively well regional distribution, even though the production share of those region is relatively high (91.3%).

By taking into account the rate of industrial concentration (HI-4) based on the group of factory (Table 17) with the magnitude of 0.38 and the value of CR-4 of 88.9%, indicate a strong indication of the existence of oligopolistic market structure of national sugar industry. Prasentianto and Dumairy (1996) revealed that the higher the value of HI-4 followed by relatively high CR-4's value will be more possibility of the existence of strong industrial

concentration. Figure of Table 17 indicate that sugar market share is actually concentrated on three group of factories, ie. government own factory, Indo Lampung, and RNI, which occupied more than 80% of national market share.

Marketing efficiency is the product of market structure, marketing system, and the nature of sugar industry's efficiency. Table 18 show that there is no improvement of price share received by the farmer and the sugar factory, due to the nature of marketing system in which the provenue and af.factory price are set by the government. During the period of 1988 - 1997, even the price received by the farmer decreasing form 66.4% to 61.8%, and received by sugar factory declining from 82.8% to 76.9%. By implementing sugar reformation program, there will be an indication of better marketing efficiency, because all parties will strive for efficiency improvement. The price received by the farmer will increase due to their freedom to sell and determine the price of their product.

The possible impact of sugar reformation to price stability

Since 1970 up to 1998 Indonesia has implemented three regime marketing system. The accomplishment of free market up to 1970 resulted in high spatial and inter-temporal sugar price fluctuation, with the magnitude of 30.9% and 46.4%, respectively (Table 19). The enforcement of semi-controlled marketing system during the period of 1971-1980, where around 60 - 70% of the market share controlled by the government, yield considerable declining inter-temporal price fluctuation from 46.4% to 19.8%. The full controlled marketing system carried out since 1981 by purchasing all domestic sugar production and controlling import. Bulog govern almost all market share, and since then Indonesia experiencing the most stable sugar price, spatially and over time.

The broad spectrum of sugar price variation in 15 selected provinces and span of time representing the moment of three regime marketing system shown in Table 20. In 1970, representing free marketing system, sugar price variation is relatively high, ranging from 9.74% in Pekanbaru to 16.69% in Denpasar. Sugar price variation is relatively moderate in 1973 and 1977 during the implementation of semi-controlled marketing system. When market share is fully controlled since 1981, price variation all over the country are at the lowest rate. For example, in 1994 sugar price variation ranging from 0.84% in Pekanbaru to 2.24% in Denpasar. Based on this evidence, quite clear that marketing and price regulation implemented by the government can generate price stabilisation at national level. This historical evidence also imply that by implementing sugar reformation program, there will be strong indication of sugar price instability.

The information on Table 21 pointed out that domestic sugar price for the period of 1987-1996 are stable at high price level. On average sugar domestic price is almost twice world market price, indicated by the average

ratio of sugar domestic price and world price of 2.0. This an indication of low productivity and low efficiency of national sugar industry. Due to successful implementation of sugar price stabilisation policy, domestic price variation is lower than international market, then followed by low price transmission coefficient. During period 1987-1996 the average transmission coefficient is 0.27, ranging from 0.10 to 0.57. By the implementation of sugar reformation program, there will be a strong indication of reducing domestic sugar price, but with high instability.

Consumption, supply and demand for sugar

The nature of sugar consumption

In general, participation rate of sugar consumption in rural area is lower than urban area (86.63% vs 96.20%). For both regions, the higher the income groups will be followed by higher participation rate of sugar consumption (Table 22). For the first five income groups, especially in the rural area, the rate of participation are lower than 90.0%. In average, their rate of participation is 76.5% in rural area and 77.5% for Indonesia as a whole. This mean that around 22.5% of those group of people does not serve sugar in their daily menu. During the economic crisis this group of people will be affected more compared to high income groups.

Sugar consumption by income group and region, in 1996, indicate that for those living in rural area consume sugar 10.0% lower than urban area, ie. 8.47 kg vs 9.41 kg/capita (Table 23). The higher the income group, the higher the rate of sugar consumption for both regions, urban and rural area. In general, for the lowest income group their rate of consumption is 20.5% of the highest income group (2.59 kg vs. 12.65 kg/capita/year). Economic crisis will seriously affect not just consumption participation, but also the rate of consumption, especially for the low income group, with the average consumption of 5.42 kg sugar/capita/year.

For the last ten years (1987-1996) direct sugar consumption increased by 1.65%/year, from 7.62 kg to 8.80 kg/capita (Table 24). The consumption growth rate is higher in rural area compared to urban area (2.16% vs. 0.19%/year), but still under economic growth rate during that time (Purwoto, et. al., 1998). The share of sugar consumption expenditure for those period decrease by 1.38%/year from 3.13% (1987) to 2.74% in 1996. On the other hand, sugar contribution on calorie intake constantly increase from 4.10% to 4.36%, or slightly improve by 0.70%/year. During period of 1987-1996, the average sugar calorie price at consumer level is 86.0% more expensive than calorie come from rice (Rp 32.50 vs. Rp 17.26/100 Kcal).

Even though the share of sugar to total expenditure is relatively low, but sugar consumption's elasticity with respect to income is relatively high, ie. 0.48 in 1996 (Simatupang, 1997). Compared to 16 year ago (1980) by using

the same source of data (National Socio-Economic Survey) and similar functional form (Engel function), Susmiadi (1986) pointed out that sugar income elasticity is 0.65. During that period (1980-1996), sugar income elasticity decline by 1.74%/year. Income elasticity in rural area is usually higher than urban area, ie. 0.79 vs. 0.49 in 1980 and 0.67 vs. 0.33 in 1996. Meaning that, for those who living in rural area with lower sugar consumption tend to be more responsive to income change for sugar consumption than the urban people. Due to more people living in rural area with higher income elasticity, then the economic crisis will seriously affect the aggregate demand for sugar.

The possible impact of economic crisis on supply and demand for sugar

Demand projection for sugar up to 2010 are based on population growth of 1.6%/year and income elasticity of 0.48. Declining income elasticity following the previous year is not considered due to the nature of economic crisis since the mid of 1997. As a base year is 1996 with total population of 198,205 million and 15.10 kg/capita sugar consumption (Food Balance Sheet, CBS, Jakarta). Declining economic contraction is consider since 1997 up to 2000, zero economic growth for 2001, and gradually improvement of the economy for the rest of the year.

For the supply side, the previous analysis show that the financial and economic competitiveness of cane farming in Java compared to other competing crops is remain the same for different exchange rate. By the changing of economic environment, food crop (rice) especially in irrigated land, financially is still more profitable compared to cane farming. On the other hand, expanding sugar industry outside Java in the condition of economic crisis will be restrained by huge investment cost of US\$ 120 million per unit of factory and difficulties to get non-commercial exchange rate. Based on those evidence, this study will be considering "the status quo of sugar supply", by following the growth rate of 3.82%/ year determined by the government (DGEC, 1996).

Table 25, clearly show that economic crisis seriously affect the sugar consumption. The consumption per capita declining by 2.91%/year from 15.10 kg in 1996 ton 13.34 kg in 2000. Due to the existence of population growth, total demand for sugar slightly decline from 2,993 thousand ton to 2,817 thousand ton for the same time, or decreasing by 1.47%/year. In relation with the nature of supply, the economic crisis have an interesting long-term effect. Sugar shortfall decreasing from 588,661 ton in 1996 to 76,594 ton in 1999, then followed by decreasing surplus from 154,320 ton in 2000 to 451 ton in 2005. For the rest of the years Indonesia will again be encountering an increasing sugar deficit from 22,440 ton in 2006 to become 133,984 ton in

2010. In the future in order to fulfil all domestic demand, the government have to determine production growth rate at least 4.43%/year starting by the year of 2000, ie. above the current targeted growth of 3.82%/year.

Conclusion

The comparative studies by considering the increasing of exchange rate (monetary crisis) does not affect the nature of comparative advantage of sugar compared to main competing crops. Sugar still have less financial profitability and economic efficiency compared to rice in order to save one unit of foreign exchange. In addition, sugar received more output price protection (NPR) compared to rice, which give burden to consumer but not really benefit the farmers. Therefore by implementing sugar reformation program will seriously affect sugar industry, in which the industry must be strive for productivity and efficiency improvement in all aspect of sugar agribusiness, ie. cane production, processing, and sugar marketing.

The problem of sugar industry in Java as a major producing region in the near future is remain the same, ie decreasing trend of sugar yield and area harvested in irrigated land, and stagnant yield in rainfed cane farming. In addition, less competitiveness of sugar industry in Java also seriously determined by high inefficiency of the industry, representing by total milling day (TCD) below the normal standard, small factory capacity, and low technological adoption indicating by low sugar rendement. In order to improve efficiency and sugar industry competitiveness, rehabilitation and gradually phased-out sugar industry in Java have to be conducted. The implementation of the relocation program, must be conducted carefully by considering the measurement of economic efficiency index of the industries in Java and the capabilities in expanding sugar industry outside of Java, is order to maintain domestic sugar production.

Sugar price stabilisation policy implemented by the government since 1971 and strengthen in 1981, seem to be successfully improve and maintain low domestic price variation and defending sugar industry from relatively high international price instability. The evidence for the last ten year also indicated that domestic sugar price is stable at high price level, in which domestic price almost twice world market price. Again, this an indication of low productivity and high inefficiency of national sugar industry. This historical evidence clearly imply that by implementing sugar reformation program, there will be strong indication of decreasing domestic sugar price but with higher price instability. This is a challenge for all party in sugar industry to improve their performance for the benefit of the producer and the consumer.

The economic crisis will seriously affect domestic sugar consumption, especially in the rural area and for the low income group, due to higher sugar

share on household expenditure and income elasticity. By assuming predicted declining economic contraction up to 2000, decrease sugar per capita consumption by 2.91%/year, and its magnitude will back to normal (15.10 kg/capita/year) in 2007. By considering "the status quo of sugar supply" with growth rate of 3.82%/year determined by government, the country will again encountering sugar deficit in 2006. In the near future in order to fulfil total domestic demand, the government have to determine production growth rate at least 4.43%/year starting by the year of 2000, ie. in line with the growth of total domestic demand.

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Table 1. The historical trend of sugar cane factory, area harvested, yield and sugar production in Indonesia, 1930-1996

Year	Number factory	Cane area (Ha)	TCH	Rendement (%)	TS H	Production (ton)
1930	179	196,592	130	11	15	2,907,078
1940	92	83,521	138	13	18	1,472,484
1950	30	27,783	88	11	9	259,771
1960	53	72,726	82	11	9	651,810
1970	55	81,677	96	9	9	715,312
1980	59	188,772	73	9	7	1,249,948
1990	67	364,932	77	8	6	2,119,589
1991	67	386,004	73	8	6	2,262,505
1992	67	404,061	79	7	6	2,306,463
1993	67	414,626	79	8	6	2,455,060
1994	67	425,268	71	8	6	2,440,683
1995	69	419,295	72	7	7	2,092,450
1996	69	401,188	72	7	7	2,090,800
Growth (%/year) 1970-96	1.02	15.65	-1.00	-0.89	-0.89	7.70

Source: Indonesian Sugar Research Institute (P3GI), Pasuruan, East Java, Indonesia.

Table 2. The structure sugar production by region in Indonesia, 1987-1998

Year	Java (%)	Outside Java (%)	Indonesia (Ton)
1987	84.93	15.07	2,137,462
1988	85.04	14.96	1,923,462
1989	84.09	15.91	2,053,333
1990	79.90	20.10	2,126,947
1991	80.11	19.89	2,259,264
1992	81.23	18.77	2,265,108
1993	78.00	22.00	2,490,449
1994	77.46	22.54	2,453,566
1995	74.16	25.84	2,077,000
1996	70.71	29.29	2,076,000
1997	63.97	36.03	2,189,975
1998	63.12	36.88	1,815,248

Source: Indonesian Sugar Research Institute (1997) and Bulog (1998).

Table 3. Growth and proportion of cane area by land type and categories (plant cane and ratoon) in Java, 1980-1996 (%)¹⁾

Year	Land type		Plant categories		Cane area (Ha)
	Irrigated	Rainfed	Plant cane	Ratoon	
1980	79.1	20.9	68.7	31.3	133,100
1985	61.2	38.8	44.4	55.6	192,400
1990	50.6	49.4	43.6	56.4	270,200
1991	49.3	50.7	42.3	57.4	289,000
1992	52.1	47.9	41.1	58.9	303,400
1993	47.7	52.3	38.0	62.0	310,200
1994	46.7	53.3	34.4	65.6	312,500
1995	45.9	54.1	34.7	65.3	295,800
1996	49.4	50.6	32.1	67.9	274,900

1) The growth rate of irrigated and rainfed cane's area are 2.2% and 13.2%/year, respectively; 0.8% and 10.4%/year for plant cane and ratoon. The annual growth rate for total cane's area in Java is 5.1%.

Source: Sugar Statistics, P3GI, Pasuruan.

Table 4. The structure of sugar production by irrigated and rainfed land in Indonesia, 1988-1997

Year	Irrigated land			Rainfed land		
	Area (Ha)	Sugar yield (mt/ha)	Sugar prod. (mt)	Area (Ha)	Sugar yield (mt/ha)	Sugar prod. (mt)
1988	147,824	7.64	1,128,647	99,256	4.81	477,712
1989	143,120	7.87	1,126,823	105,703	5.14	543,341
1990	136,892	7.59	1,039,101	133,266	4.91	654,488
1991	143,122	7.40	1,058,906	145,899	5.27	769,589
1992	158,013	7.31	1,154,294	145,430	5.01	729,136
1993	147,877	7.23	1,069,555	162,311	5.30	859,789
1994	146,028	7.08	1,033,671	166,496	5.18	862,337
1995	135,737	6.27	850,881	160,072	4.42	706,718
1996	126,746	6.02	762,917	163,405	4.42	721,665
1997	105,500	6.65	702,000	166,738	4.80	800,600
Growth (%/year)	-3.18	-1.02	-4.20	7.55	-0.04	7.51

Sources: Indonesian Sugar Research Institute (P3GI), Pasuruan.

Table 5. The harvested area of sugarcane by type of farming management in Indonesia, 1965-1995

Year	Factory's cane (%)	Farmer's cane (%)	Harvested area (Ha)
1965	81.3	18.7	87,408
1966	85.1	14.9	80,819
1967	87.7	12.2	79,032
1968	85.1	14.9	76,961
1969	84.2	15.8	78,812
1970	84.7	15.3	81,667
1975	79.5	20.5	104,777
1980	43.9	56.1	188,772
1985	27.8	72.2	277,615
1990	32.0	68.0	365,926
1995	35.8	64.2	420,951

Source: Anonymous, 1997 (Simatupang, 1998).

Table 6. The structure and production of new sugar factories initiated by Joint Sugar Projects Unit(JSPU) in Indonesia, 1976-1995

Project	Location	Year started	Present factory capacity (TCD)	Present cane area (ha)	1996 sugar production (tons)	TSH
<u>A. Government own</u>						
1. Jatitujuh	West Java	1976	6,000	8,992	16,271	2.03
2. Sei Lemayang	North Sumatera	1982	4,000	7,341	37,529	5.68
3. Kuala Madu	North Sumatera	1984	4,000	7,746	42,984	6.42
4. Cinta Manis	South Sumatera	1984	7,000	14,016	40,940	3.23
5. Bunga Mayang	Lampung	1984	10,000	16,361	39,437	2.71
6. Subang	West Java	1984	4,000	5,247	15,340	3.63
7. Takalar	South Sulawesi	1984	3,000	6,650	26,897	4.08
8. Caming	South Sulawesi	1985	3,000	5,827	12,255	2.87
9. Pelaihari	South Kalimantan	1986	4,800	11,015	20,988	1.88
<u>B. Private own</u>						
10. Gunung Madu	Lampung	1978	10,000	21,767	151,888	6.98
11. Gula Putih Mataram	Lampung	1987	10,000	20,945	157,686	7.53
12. Sweet Indo-Lampung	Lampung	1995	8,000	15,170	92,067	6.00
Total	-	-	73,800	141,077	654,282	-

Source: Poey, D.K.C. (1997), PT. Kerry Plantations Services Indonesia, Jakarta.

Table 7. Index of economic efficiency as an orderly measure to gradually phased-out sugar factory in Java, 1997

Sugar Factory	Total milling day (day/year)	Factory capacity (TCD)	Rendement (%)	Economic efficiency index
1. Kalibogor	87	1068	6.55	1.88
2. Jatiwangi	117	1048	7.20	3.38
3. Kadhipaten	128	1184	7.46	7.36
4. Gempol	102	1006	7.60	8.13
5. De Maas	138	886	7.46	9.38
6. Padjarakan	136	1155	7.49	11.50
7. Pandjie	129	1742	7.58	11.88
8. Olean	136	1082	7.97	12.13
9. Karangsuwung	139	1147	7.70	13.63
10. Banjaratma	129	1484	8.17	14.50
11. Subang	119	3046	6.27	14.63
12. Colomadu	153	1144	7.48	15.00
13. Jatibarang	131	1689	8.80	17.13
14. Tersana Baru	135	2851	7.04	17.50
15. Sindanglaut	142	1753	7.98	19.50
16. Rendeng	147	2198	7.64	20.50
17. Cepiring	156	1742	7.42	20.75
18. Pangka	155	1563	8.06	21.63
19. Wringginanom	158	1144	8.12	21.75
20. Rejosari	156	2019	7.49	22.25
21. Mojo	144	2302	8.15	23.50
22. Kanigor	158	1898	7.64	24.25
23. Gunung Madu	152	9279	7.13	25.38
24. Ceper Baru	159	1390	8.75	27.63
25. Madukismo	159	2858	7.32	28.50
26. Assembagoes	162	2258	8.00	30.63
27. Sumberharjo	163	1802	7.95	30.63
28. Sudhono	162	2410	7.64	30.75
29. Semboro	159	4839	4.48	30.88
30. Wonolangan	165	1292	8.16	30.88
31. Krebet Baru I	163	2431	7.38	31.00
32. Rejoagung Baru	156	4052	8.11	31.63
33. Gending	166	1369	8.06	32.00
34. CAndi	169	1586	7.17	32.50
35. Kedawung	163	2335	7.96	32.75

Sugar Factory	Total milling day (day/year)	Factory capacity (TCD)	Rendement (%)	Economic efficiency index
36. Krebbe Baru II	164	3471	7.29	34.13
37. Gondang Baru	167	1530	8.35	34.50
38. Kebonagung	164	3477	7.33	35.25
39. Tulangan	180	1272	7.64	35.88
40. Mojopanggung	169	2210	7.48	36.13
41. Krian	184	1106	7.82	37.63
42. Krembung	181	1354	7.85	38.00
43. Purwodadi	171	2005	7.79	38.25
44. Watutulis	180	1827	7.84	39.63
45. Jombang Baru	176	1933	7.89	40.00
46. Lestari	167	2326	8.39	40.13
47. Tasikmadu	165	2847	8.60	40.38
48. Pradjekan	169	2665	8.29	41.50
49. Ngadirejo	169	3888	7.89	42.75
50. Sragi	171	3217	7.65	43.38
51. Pagotan	181	2318	8.15	45.75
52. Pakis Baru	182	2743	7.66	46.00
53. Merican	191	2305	7.73	46.50
54. Cukir	188	2343	8.30	49.00
55. Trangkil	205	2700	7.88	50.38
56. Pesantren Baru	190	4933	8.97	54.75
57. Gempolkrep	192	4551	9.40	55.63

Source: Prabowo, D., *et al* (1997).

Table 8. The priority of development recommendation (PDR) of cane area plantation, outside of Java Indonesia (hectare)

Region	PDR I	PDR II	PDR III	PDR IV	PDR V	NDR	Total
1.Pasir-East Kalimantan	64,065	49,530	-	-	-	-	113,595
2.Poso-Central Sulawesi	13,595	24,845	-	-	-	-	38,440
3.Kendari, Kolaka, Buton-Southeast Sulawesi	23,937	17,625	6,500	12,735	76,375	-	137,172
4.Plampang, Empang, Dompu-West Nusa Tenggara	1,955	35,940	2,190	76,375	-	-	116,460
5.Merauke-Irian Jaya	35,930	452,030	269,530	67,185	-	-	824,675
Total	139,482	579,970	278,220	156,295	76,375	-	1,230,342

Source: Prabowo, D. *et al* (1997).

Table 9. The ratio of sugar's provenue price and paddy's floor price in Indonesia, 1986-1998

Year	Provenue price of sugar (Rp/quintal)	Floor price of paddy (Rp/quintal)	Price ratio of sugar and paddy
1986	46,500	17,500	2.66
1987	46,750	19,000	2.46
1988	51,425	21,000	2.45
1989	60,000	25,000	2.40
1990	65,000	27,000	2.41
1991	70,800	29,500	2.40
1992	79,500	33,000	2.41
1993	79,500	36,000	2.21
1994	79,500	42,000	1.89
1995	91,080	46,000	1.98
1996	95,000	52,000	1.83
1997	95,000	60,000	1.58
1998	145,000	100,000	1.45
Growth (%/year)	17.65	39.28	-3.75

Source: Indonesian Sugar Council (DGI), Jakarta.

Table 10. Nominal and riil provenue price of sugar in Indonesia, 1986-1996

Year	Nominal provenue (Rp/quintal)	Price index paid by farmer	Riil provenue (Rp/quintal)
1986	46,500	122.65	37,912
1987	46,750	137.40	34,025
1988	51,425	153.88	33,419
1989	60,000	166.65	36,004
1990	65,000	181.08	35,896
1991	70,800	203.28	34,829
1992	79,500	218.23	36,429
1993	79,500	233.58	34,035
1994	79,500	268.23	29,638
1995	91,080	299.91	30,369
1996	95,000	376.21	25,251
Growth (%/year)	10.43	20.67	-3.34

Source: Anonymous, 1997.

Table 11. Trend of sugar production, import, and domestic utilisation in Indonesia, 1930-1997 (thousand ton)

Year	Production	Net import	Domestic used	Indexes of sufficiency ¹⁾
1930	2,900	-2,222	678	4.28
1940	1,472	-1,102	370	3.96
1960	652	-35	617	1.06
1970	715	128	843	0.85
1975	1,035	89	1,134	0.91
1980	1,250	416	1,666	0.75
1985	1,725	3	1,828	0.94
1990	2,084	244	2,328	0.90
1991	2,259	357	2,616	0.86
1992	2,265	310	2,575	0.88
1993	2,462	165	2,627	0.94
1994	2,443	281	2,724	0.90
1995	2,077	1,016	3,093	0.67
1996	2,094	1,200	3,294	0.64
1997	2,190	1,296	3,486	0.63
Growth (%/year) 1985-1997	2.45	61.59	8.25	-3.00

1) Ratio of domestic production w.r.t. domestic consumption.

Source: Van Ark (1988) and Anonymous (1997) (as cited by Simatupang, 1998) and Saifullah (1998).

Table 12. The net financial benefit of cane farming compared to alternative crops with different exchange rate in Java, 1997 (Rp 1000/Ha)

Exchange rate (Rp/US\$)	Cropping pattern ¹⁾			
	Pola A	Pola B	Pola C	Pola D
5000	12,248	9,003	10,388	10,736
6000	16,030	11,845	13,452	14,183
7000	19,844	14,767	16,536	17,641
8000	23,644	17,670	19,623	21,088
9000	27,452	20,600	22,709	24,535
10000	31,257	23,493	26,951	27,982

1) **Pola A** :Rice DS - Secondary crops - Rice WS - Rice DS - Secondary crops - Rice WS - Rice DS.

Pola B : Secondary crops - Secondary crops - Rice WS - Secondary crops - Secondary crops - Rice DS - Secondary crops

Pola C : Rice DS - Fallow - Rice WS - Rice DS - Fallow - Rice WS - Rice DS

Pola D : <----- Plant cane -----> <----- Ratoon I ----->

May '96

July/August '97

July '98

Source: Center Agro Socio-Economic Research (CASER), 1998, Bogor.

Table 13. The comparative advantage and protection structure of sugar (plant cane) by type of land and trade regime in Java, 1992

Description	Irrigated land		Rainfed	
	IS	EP	IS	EP
1. NEB (Rp/ton)	44,165	11,565	-9	-32,610
2. DRCR	0.9196	0.9781	1.0000	1.0641
3. Protection structure				
∑ NPR (%)	43.94	46.63	43.94	46.63
∑ IT (%)	2.28	2.28	-1.04	-1.04
∑ EPR (%)	53.76	57.32	56.94	60.73
4. Economic price (Rp/kg)	710	697	710	697
5. BEP of economic price (Rp/kg)	666	685	710	730
6. Actual productivity (ton sugar/ha)	9.24	9.24	6.65	6.65
7. BEP productivity (ton sugar/ha)	8.67	9.09	6.65	6.96
8. Actual exchange rate (Rp/US\$)	2,074	2,074	2,074	2,074
9. BEP exchange rate (Rp/US\$)	1,945	2,038	2,074	2,172

Source: Based data from P3GI and CASER, 1996, Bogor (Rusastra, et al., 1998).

Table 14. The comparative advantage and protection structure of sugar (ratoon) by type of land trade regime in Java, 1992

Description	Irrigated land		Rainfed	
	IS	EP	IS	EP
1. NEB (Rp/ton)	-25,995	-58,595	21,870	-10,728
2. DRCR	1.0495	1.1165	0.9585	1.0212
3. Protection structure				
Σ NPR (%)	43.94	46.63	43.94	46.63
Σ IT (%)	1.56	1.57	0.04	0.04
Σ EPR (%)	55.70	59.43	56.64	60.42
4. Economic price (Rp/kg)	710	697	710	697
5. BEP of economic price (Rp/kg)	735	756	688	708
6. Actual productivity (ton sugar/ha)	6.61	6.61	6.28	6.28
7. BEP productivity (ton sugar/ha)	6.85	7.17	6.07	6.38
8. Actual exchange rate (Rp/US\$)	2,074	2,074	2,074	2,074
9. BEP exchange rate (Rp/US\$)	2,147	2,250	2,147	2,107

Source: Based data from P3GI and CASER, 1996, Bogor (Rusastra, *et al.*, 1998).

Table 15. Number of factory and sugar production by province in Indonesia, 1997/98

Province	Number factory (unit)	Production (ton)	Proportion to national sugar production (%)
<u>Java</u>			
East Java	33	883,476	44.35
Central Java	15	245,658	12.33
Yogyakarta	1	23,322	1.17
West Java	8	111,453	5.59
<u>Outside Java</u>			
Lampung	6	578,555	29.04
South Sulawesi	3	53,873	2.70
South Sumatera	1	38,746	1.95
North Sumatera	2	35,481	1.78
South Kalimantan	1	10,276	0.52
Total	70	1,992,245	100.0

Source: Bulog, 1998 (Saifullah, *et al.*, 1998).

Table 16. Market share of four province as major sugar production in Indonesia, 1997/98¹⁾

Provinces	Production (ton)	Share (%)
1. East Java	883,476	44.4
2. Lampung	578,555	29.0
3. Central Java	245,658	12.3
4. West Java	111,453	5.6
Total	1,819,142	91.3
Other provinces	173,103	8.7
Indonesia	1,992,245	100.0

$$1) \text{ HI-4} = (0.44)^2 + (0.29)^2 + (0.12)^2 + (0.06)^2 = 0.29$$

$$\text{CR-4} = (0.44) + (0.29) + (0.12) + (0.06) = 91.3$$

Source: Bulog, 1998 (Saifullah, *et al.*, 1998).

Table 17. Market share of four province sugar factory as major sugar production in Indonesia, 1997/98¹⁾

Factory groups	Production (ton)	Share (%)
1. Government own (PTPN)	1,108,951	55.7
2. Indo Lampung	346,742	17.4
3. Rajawali Nusantara Indonesia (RNI)	247,370	12.4
4. Kebon Agung	66,947	3.4
Total	1,770,010	88.8
Other factories	222,010	11.2
Indonesia	1,992,245	100.0

$$1) \text{ HI-4} = (0.58)^2 + (0.18)^2 + (0.13)^2 + (0.04)^2 = 0.38$$

$$\text{CR-4} = (0.58) + (0.18) + (0.13) + (0.04) = 88.9$$

Source: Bulog, 1998 (Saifullah, *et al.*, 1998).

Table 18. The marketing margin of sugar as percentage of retail price in Indonesia, 1988 - 1997

Description	1988	1991	1994	1997
1. Provenue	66.4	62.8	61.5	61.8
2. Exploitation cost	5.3	7.1	6.9	5.4
3. Taxes	9.8	11.4	11.5	8.4
4. Fee and incentive	1.2	0.9	2.0	1.4
5. Factory af. price	82.8	82.2	81.9	76.9
6. Wholesale price	94.2	90.0	88.7	86.7
7. Retail price	100.0	100.0	100.0	100.0

Source: Ministry of Finance; Bulog; CBS, Jakarta (Saifullah, *et al.*, 1998)

Table 19. Inter-temporal and spatial fluctuation of sugar retail price in relation with marketing system in Indonesia, 1970-1998 (percent)

Year	Price fluctuation (%)		Marketing system
	Inter-temporal	Spatial	
1970	46.4	30.9	Free market
1971 - 1980	19.8	31.3	Government control 60-70% market share
1981 - 1997	10.1	19.2	Government control almost all market share (90-95%)

Source: Bureau of Price and Market, Bulog (Saifullah, *et al.*, 1998).

Table 20. The coefficient of sugar price variation in selected province in Indonesia, 1970-1994 (%)

Provinces	1970	1973	1977	1982	1986	1994
1. Banda Aceh	11.75	3.93	5.51	1.33	0.79	0
2. Medan	12.51	1.99	16.96	0.91	1.72	0
3. Pekanbaru	9.74	5.88	12.28	0.20	2.82	0.84
4. Palembang	14.76	4.95	7.22	1.60	2.68	1.05
5. Lampung	10.64	4.48	5.23	0.05	2.56	1.22
6. Jakarta	13.96	2.34	3.48	1.05	2.34	1.76
7. Bandung	12.74	4.09	3.24	1.95	0.41	1.33
8. Semarang	15.07	2.10	3.50	1.39	1.25	2.15
9. Yogyakarta	15.07	1.99	3.22	1.81	1.37	1.19
10. Surabaya	16.45	2.79	3.64	2.00	1.22	1.73
11. Pontianak	14.58	5.96	4.66	1.06	1.28	1.76
12. Banjarmasin	13.83	3.69	4.43	1.25	0.36	0.92
13. Ujungpandang	12.59	5.07	5.02	2.19	1.65	2.24
14. Denpasar	16.69	2.66	7.35	0.92	1.88	0
15. Mataram	13.88	5.84	5.66	1.27	2.09	1.74

Source: Bulog (Simatupang, *et al.*, 1998).

Table 21. Wholesale price and coefficient of sugar price variation at domestic and international market, 1987-1996

Year	World market (ex London) US\$/Ton	Domestic market US\$/Ton	Ratio DM/WM	Coefficient of price variation (%)		Coefficient of transmission WM-DM ¹⁾
				WM	DM	
1987	192	392	2.04	6.59	3.75	0.57
1988	262	428	1.63	14.35	1.63	0.11
1989	318	476	1.50	11.66	5.60	0.48
1990	310	528	1.70	14.61	1.48	0.10
1991	231	537	2.32	8.74	2.51	0.29
1992	233	562	2.41	8.58	2.12	0.24
1993	260	570	2.19	9.27	1.56	0.17
1994	291	551	1.89	10.47	1.89	0.18
1995	334	558	1.67	7.28	3.64	0.50
1996	295	582	1.97	7.07	0.69	0.10

1) Coefficient of transmission is the ratio of domestic and world price variation coefficient.

Source: Bureau of Price and Market; Center of Research and Development, Bulog, Jakarta (Saifullah, *et al.*, 1998).

Table 22. Participation rate of sugar consumption by expenditure group and region in Indonesia, 1993 (%)

Expenditure groups (Rp/capita/month)		Rural	Urban	Total
1.	< 10,000	57.58	-	57.58
2.	10,000 - 14,999	69.76	81.16	70.38
3.	15,000 - 19,999	79.79	91.76	81.02
4.	20,000 - 29,999	85.53	92.10	86.74
5.	30,000 - 39,999	89.93	95.41	91.66
6.	40,000 - 59,999	92.94	97.09	94.96
7.	60,000 - 79,999	95.85	97.86	97.20
8.	80,000 - 99,999	96.92	98.39	98.04
9.	100,000 - 149,999	95.82	98.34	97.92
10.	150,000 - 199,999	95.74	98.20	97.92
11.	> 200,000	100.00	97.06	97.36
Aggregate		86.63	96.30	90.00

Source: Sudaryanto, T. (1996).

Table 23. Sugar consumption by expenditure group and region in Indonesia, 1996 (kg)

Expenditure groups (Rp/capita/month)		Rural	Urban	Total
1.	< 15,000	1.00	2.72	2.59
2.	15,000 - 19,999	2.26	3.71	3.66
3.	20,000 - 29,999	4.71	5.45	5.38
4.	30,000 - 39,999	6.41	7.07	6.96
5.	40,000 - 59,999	7.72	8.82	8.52
6.	60,000 - 79,999	9.19	10.56	9.97
7.	80,000 - 99,999	10.06	11.72	10.78
8.	100,000 - 149,999	10.90	12.77	11.47
9.	150,000 - 199,999	12.41	13.42	12.63
10.	200,000 - 299,999	12.91	13.79	13.04
11.	> 300,000	12.44	14.54	12.65
Aggregate		8.47	9.41	8.80

Source: Central Bureau of Statistics, Jakarta (1997)

Table 24. Trend of sugar consumption by region in Indonesia, 1987-1996 (kg/capita/year)

Year	Rural	Urban	Aggregate
1987	7.03	9.26	7.62
1990	7.36	9.06	7.88
1993	7.57	9.29	8.14
1996	8.47	9.41	8.80
Growth rate (%/year)	2.16	0.19	1.65

Source: Central Bureau of Statistics, Jakarta

Table 25. The projection of supply and demand for sugar in Indonesia, 1996-2010

Year	Population ¹ (1000 head)	Consumption ² (kg/capita)	Total demand (ton)	Supply ³ (Ton)	Shortfall (Ton)
1996	198,205	15.10	2,992,895	2,404,284	-588,611
1997	201,376	15.39	3,099,177	2,550,016	-549,161
1998	204,598	14.36	2,938,027	2,525,016	-413,011
1999	207,872	13.67	2,841,610	2,765,016	-76,594
2000	211,197	13.34	2,817,368	2,971,688	+154,320
2001	214,576	13.34	2,862,444	3,051,688	+189,244
2002	218,009	13.47	2,936,581	2,988,688	+52,107
2003	221,497	13.66	3,025,649	3,038,688	+13,039
2004	225,041	13.92	3,132,571	3,138,688	+6,117
2005	228,641	14.25	3,258,134	3,258,585	+451
2006	232,299	14.66	3,405,503	3,383,063	-22,440
2007	236,015	15.08	3,559,106	3,512,296	-46,810
2008	239,791	15.51	3,719,158	3,646,466	-72,692
2009	243,627	15.96	3,888,287	3,785,761	-102,526
2010	247,525	16.42	4,064,361	3,930,377	-133,984

1) Based on population growth of 1.6% per annum.

2) Based on income elasticity of 0.48 (Simatupang, 1997), and predicted economic growth of 4.0% (1997), -14.0% (1998), -10.0% (1999), -5.0% (2000), 0.0% (2001), 2.0% (2002), 3.0% (2003), 4.0% (2004), 5.0% (2005), and 6.0% for the rest period of 2006-2010.

3) Data of 1996-2004 from DGEC (1996), and the rest are based on the previous production growth of 3.82%/year.