The Food Policy Support Activity

Final Report

Website:www.macrofoodpolicy.com

BAPPENAS/DEPARTMEN PERTANIAN/USAID/DAI FOOD POLICY ADVISORY TEAM

JULY 2004

The DAI RAISE Food Policy Support Activity in Indonesia

Poverty Reduction in Indonesia via Food Trade Policy, Economic Governance, and Nutritional Improvement

Summary of the Final Report

Background

At the height of the 1997-1999 crisis, USAID Indonesia established a macro food policy program, the Food Policy Support Activity (FPSA), to address short- and long-term issues related to food security and rural income growth in Indonesia. Two years of severe drought, the collapse of food import mechanisms, a tripling of rice prices, and extensive job losses had contributed to major food security problems. For the past five years, the FPSA team, in collaboration with numerous Indonesian government agencies and universities, has generated state-of-the-art policy analyses, field-based insights into the impact of the financial crisis on rural livelihoods, well-trained regional agricultural economists, quiet but effective support for key staff of policy makers, and direct policy advice for policymakers. These efforts have focused on supporting key food trade reforms, enacted in 1998, as well as longer-term policy initiatives for reinvigorating rural economic growth.

Accomplishments

The Indonesian government enacted major agricultural policy reforms in 1998. The reforms abolished import monopolies for food commodities such as rice, wheat, sugar, and soybeans, eliminated domestic marketing monopolies, removed input subsidies, and allowed unrestricted trade by the private sector in agricultural commodities. These sensible and long overdue reforms met with strong, well-organized opposition. Those who benefited from regulations of agricultural trade in the past included powerful interests in the government, political parties, and favored business groups. For the past five years, the FPSA team has supported progressive elements in the government, research institutions, and private business by providing timely policy analysis, advice, and teaching in a wide variety of venues. A progressive Minister of Finance and other technocrats have used FPSA analysis to defend this opening of the agricultural and food economy to market forces. In consequence, greater participation in agricultural trade by the private sector has made a major contribution toward enhancing Indonesia's food security and improving the availability of food to low income groups.

Indonesian food consumption patterns have improved dramatically, and liberalized trade had been a major factor behind those improvements. The 1999 and 2002 national food consumption and expenditure surveys reveal that real food expenditures of the poor grew by 22%, raising them 7% above their 1996 levels, the pre-crisis peak. Expenditures on micronutrient-rich foods – meats, dairy products, and fruits and vegetables – led these increases. The sharply improved trade environment, both international and domestic, triggered many of these developments. The poor, who spend two-thirds of their income on food and work predominantly in agriculture and the rural economy, have been the major beneficiaries of this liberalization of food and agricultural policies.

In 2003, four years after the initiation of FPSA, the USAID Mission Director sent a strongly laudatory message to the Assistant Administrators of the EGAT and ANE Bureaus, USAID/Washington, and their senior economics staff. He emphasized the unique contributions of the FPSA team, their access to the highest levels of policymakers in Indonesia, and their success in teaching and communicating policy analysis and advice to Indonesian colleagues. Concurrently, the chief economist in the USAID Economic Growth Office prepared a conceptual report on the potential future role of USAID in strengthening Indonesian universities. This report, *Regional Universities, Ends or Means*, dated March 12, 2003, proposed to use the FPSA university outreach program as the basis for strengthening regional economic analytical capacity.

A total of 104 economists representing 45 regional universities are participating members of this university outreach program. Research teams within this network have completed twenty-two field research reports, applying the analytical techniques of the Policy Analysis Matrix (PAM) to a diverse selection of agricultural commodities. *Applications of the Policy Analysis Matrix in Indonesian Agriculture*, published in Indonesia in both English and Indonesian, summarizes the considerable body of teaching material used in this training program – the PAM lectures, eight case studies representing the best field research reports, a lessons learned paper, and a computer tutorial. During its nearly four years of implementation, the university outreach program became a unifying force for the entire FPSA program and contributed substantially to USAID's support and understanding of decentralization.

FPSA support to Indonesia's Food Security Agency (FSA), based within the Ministry of Agriculture, has been extensive. Two FPSA economists, in collaboration with FSA analysts, have undertaken extensive analysis of how to establish trade and pricing policies for key commodities that appropriately balance the needs of both consumers and producers. The collaborative team has incorporated key data sets from BPS (the Central Bureau of Statistics) in a manner that will allow continuing access and use of these data by FSA staff. When the Minister of Agriculture desires analyses of food policy issues, he now turns to his FSA analysts who have been trained by and collaborated with FPSA staff members.

FPSA staff established the Starchy Staple Ratio (SSR) as both the FPSA progress indicator and as an important measure of changes in the quality of food consumption. The SSR, a measure of the share of cereals and tubers in total household food expenditure, declines as income increases and food consumption becomes more diversified. Changes in the SSR during the past five years have been consistent with and indicative of the improved and diversified food consumption results reported above.

The project team has been opportunistic in linking its work with other groups and individuals undertaking complementary activities. FPSA supported the transfer of a state-of-the-art econometric model for predicting El Nino, Southern Oscillation (ENSO) weather patterns on rice and corn production in Indonesia. The Center for Environmental Science and Policy, Stanford University, developed this model over a 4-year period at a cost to Stanford of $600,000. With modest additional expenditure, FPSA established the continued operation of this model by Indonesian counterparts in the Indonesian Food Security Agency. That model now is run totally by FSA staff.

The lead economist at the International Rice Research Institute (IRRI) in the Philippines has been a regular team member of FPSA, producing analyses of the world rice market that have influenced Indonesia's acceptance of international rice trade as a key element of a

progressive, food security strategy. FPSA has sponsored a study of the efficiency of rice marketing and milling in Indonesia as part of an IRRI comparative analysis of marketing margins in Indonesia, Thailand, and the Philippines.

For the past five years, the World Bank and other donors have relied on FPSA analysis to inform the Jakarta debate on macro food policies in Indonesia. The links between agricultural prices, poverty reduction, and pro-poor growth have been a fundamental framework for the FPSA program. At the December 2003 CGI for Indonesia, both the World Bank and USG delegations used the food policy trade reforms and resultant improvements in food consumption of the poor as a major rationale for continuing lending to Indonesia.

In the past year, the FPSA has embarked on a new initiative that has highlighted the rapidly expanding role of supermarkets, especially on Java. The supermarkets revolution has the potential to be the major driver of the agricultural diversification process in the country. Although much of the attention to date has addressed how Indonesian farmers might enter supermarket chains, a consumer perspective is required to analyze the increasing role of supermarkets influencing Indonesian food security. The FPSA program was opportunistic in attracting the world's leading authorities on how the supermarkets revolution is affecting various regions of the world and how lessons from that experience might be applied in Indonesia.

USAID requested that FPSA include biotechnology in the last year of the program. DAI then hired one of Indonesia's outstanding biotechnology scientists to analyze the current regulatory framework for biotechnology in Indonesia. She assessed the current status of this regulatory framework and identified priority actions required to complete an internationally acceptable framework that would attract both Indonesian and private investments in these technologies. Her report is now being used by the Director General for agriculture research as the blueprint for future support for biotechnology in Indonesia.

The FPSA has been extremely cost-effective. During the past three years, average expenditures to support a full team complement were only $1.65 million per annum. This level of funding supported nine DAI American economists (seven provided STTA strategic inputs) and three top-level Indonesian economists. Major beneficiaries have been the approximately 110 million Indonesians who still live on less than $2/day.

An effective vehicle for making the FPSA output widely available is the project website, www.macrofoodpolicy.com. Maintained jointly by DAI and Stanford University, the website has been a valuable resource for implementation of the university outreach program and an effective means of communicating with the broader research community that is interested in the team's work. The website contains 16 working papers, 46 policy briefs, 8 published manuscripts, 22 research papers, and the entire set of university outreach teaching materials. DAI and the university network team will maintain this website at their own cost for the next several years.

Issues for the Future

- Indonesia needs a market-oriented, dynamic rural economy that will attract increasing levels of investment and create jobs (much employment will be off-farm in SMEs, mostly engaged in processing and services related to agricultural commodities). This goal will not be accomplished by the current government's populistic fixation on the protection of low-value, food-staple commodities. The structural transformation of the rural economy will come about only through productivity-enhancing investments in infrastructure, technology, policy analysis, and rural health and education. An important component of the analytical agenda is to deepen understanding of how the supermarkets revolution is reshaping agriculture for both producers and consumers.

- Rice remains the most important commodity in Indonesia, particularly for the poor. The typical Indonesian household obtains over half of its food energy from rice. Poor households allocate one-fourth of their expenditures for rice. Rice policy and prices thus are the central issues for poverty reduction. During 1999-2003, the positive experience with a more market-oriented, open rice trade regime (with tariffs) contributed to the much improved consumption patterns of the poor. Getting rice policy right remains critically important to enhance food security and to facilitate diversification of Indonesia's rural economy.

- The next GOI administration will need to define clear strategies for economic growth and poverty reduction. Public sector investments will need to be focused on building physical and human infrastructure for renewed agricultural and rural economic growth. Price and trade policies will need to remain as open as possible to provide best service to poor farmers and to low-income consumers. Acting on the current political rhetoric favoring greater bureaucratic control of key agricultural trade policies would represent a tragic retreat from the open trade policies that help the poor. A reintroduction of monopoly control of trade in key agriculture commodities would be a major setback for future economic growth and poverty reduction. Indonesia's "food security time bomb" is due not to rising imports of rice but to continuing rural and urban poverty. Politically motivated protection of food staples would feed the rich and starve the poor.

The Indonesian Food Policy Program – Main Report

The Food Policy Agenda

The Food Policy Support Activity (FPSA) was initiated in 1999 in the immediate aftermath of the 1997/98 Asian economic crisis. The crisis had caused the most severe downturn in the Indonesian economy in three decades and had precipitated a political upheaval. Major economic reform measures were initiated at the height of the crisis, including agricultural policy reform. The impact of the crisis and reforms on food availability and the rural economy was not well understood at the time. The objective of the FPSA was to assist Indonesian policy makers in developing food and agriculture policies in this new environment. Understanding how the economic downturn, the collapse of the exchange rate, and the reform measures had affected food availability and the rural economy over the previous two years was a crucial first step toward developing an improved food policy environment.

The 1998 Crisis and the Drought

The Asian economic crisis caused a sharp contraction in economic activity in Indonesia and a surge in food prices. During the first year of the crisis, the price of rice, the staple foodstuff for most of the population, tripled. Other food prices also rose sharply.[1] With a lag, input prices, such as fertilizer and pesticides, began to rise. Higher food prices were a potential boon to farmers, but much of the rural population, and virtually all of the urban population, are net consumers of food. For net consumers, high food prices cause immediate hardship. Since food accounts for two-thirds of the expenditure of poor households in Indonesia, understanding the impact of high food prices on poverty was an urgent task.

The early stage of the crisis was also accompanied by a severe drought that caused agricultural production to drop. This contributed to additional upward pressure on food prices while at the same time reducing rural income. The drought partly offset the beneficial impact of high output prices on farm income. Although the drought was over by mid-1998, policy changes implemented at the end of 1998 caused farm input prices to rise and affected rural credit programs. By 1999, when the FPSA project began, favorable weather conditions had returned but the net impact on the rural economy of high output prices, high input prices, policy reform and changes in rural credit, was unclear.

Agriculture Policy Reforms

Prior to 1998 Indonesia had a highly regulated food system. Government import monopolies existed for major food commodities, such as rice, wheat, flour, sugar and soybeans. The national food logistics agency (Bulog) was responsible for stabilizing prices, both at the farmgate and retail level, for foods deemed "strategic" (mainly rice and sugar, but at times also including cooking oil, chili peppers and other items). It was also responsible for defending a floor price for rice. Bulog used purchase, distribution, storage, and imports in an

[1] Rice prices rose 207% during the first year of the crisis (July 1997-September 1998) while other food prices (*bahan makanan non-beras*) rose by 130%. The general price level (CPI) rose by 86% over this period.

effort to achieve price stability and defend the floor price. While these efforts may have increased the stability of food prices in certain periods, Bulog failed to stabilize rice prices at critical junctures, such as during the 1987/88 and 1994/95 droughts, and during the combined drought and economic crisis of 1997/98. By the 1990s, the costs of Bulog's stabilization effort had grown, partly because of rising corruption, and the benefits of stabilization had declined, both because rice accounted for a smaller share of the national economy and a smaller share of the average household's budget. Calls to reform agricultural policy in general, and Bulog in particular, escalated in the decade leading up to the crisis.

In 1998 the Government of Indonesia announced a major deregulation program for agriculture. Import monopolies for rice, wheat, flour, sugar, and soybeans were to be eliminated and imports opened up to private traders. Subsidies and price controls for urea fertilizer were also to end. Agricultural credit would no longer be provided by the central bank. These reforms were implemented toward the end of 1998 and significant private sector rice imports began in early 1999.

With the elimination of input subsidies, the price of urea fertilizer more than doubled. This led to concern that higher input prices would have a negative impact on farm income and on agricultural production. Disruption to Indonesia's financial system caused by the economic crisis and changes in government credit programs for rural areas also led to concerns that farmers might have difficulty obtaining credit. At the same time, however, the government sharply raised the rice floor price. Consequently, there was a realization that the net impact of policy reform and relative price changes was complex. Higher output prices from the exchange rate depreciation, the removal of monopolies, and increased competition in both input and output markets should increase farm income. But higher input prices following removal of subsidies and the collapse of the exchange rate, combined with the lingering impact of the 1997/98 drought, could offset these positive developments, at least in part.

To get a clearer picture of the situation facing Indonesian agriculture following these enormous changes in 1997 and 1998, the FPSA decided to focus initially on the rice economy. There were three reasons for this choice. First, rice is the most important rural activity. Rice farmers account for 39% of the rural population and 25% of the total population.[2] Second, rice is the most important consumer good in Indonesia, accounting for 7.8% of the urban CPI and more than 12% of the rural CPI. As the main wage good, rice prices affect labor costs and strongly influence the inflation rate. Rice also accounts for about 5% of GDP. Thus, rice has a major impact on the macro economy. Third, poor households in Indonesia spend one-third of their income just on rice. Rice prices therefore have a profound impact on the national poverty rate.

To investigate the impact of the agricultural reform measures and the multi-dimensional economic crisis on the rural economy, the FPSA worked together with the Center for Agro Socio-Economic Research, an experienced research institution and division of the Ministry of Agriculture located in Bogor, to conduct field research in key rice-growing regions of Indonesia. The research team initially identified three critical issues – the international competitiveness of rice farming systems, the effectiveness of rural markets, and the levels of

[2] This is calculated from the 2001 Susenas survey.

household incomes on rice farms – to be addressed in the field research. These three issues are closely linked. Many analysts feared that the rural markets for rice, fertilizer, labor, credit, and land had been severely impacted by the macroeconomic crisis. If that were true, rice farmers would lose income and face difficulties in competing against rice imports, unless they received high protection or subsidies from the government. For example, analysts worried that the country's banking crisis would reduce the availability of commercial credit in rural areas, cause farmers to be short of working capital for their purchased inputs and thus buy less fertilizer and hire less labor, and create undesired reductions in rice productivity and output, farm incomes, and international competitiveness. The initial focus of the field research thus was to find out how Indonesia's rice farmers were adjusting to the changes brought about by the macroeconomic crisis.

The field research stretched over a three-year period and produced major findings on the rural economy with direct relevance to national food policy. FPSA staff supported the field research with intensive analysis of secondary data sources, including time series data on domestic food prices, farmgate output and input prices, production, yield, imports, and world prices and trade. By combining micro field data with macro data, FPSA researchers drew a comprehensive picture of the impact of the crisis, and the reforms, on Indonesia's rural economy.

Key Findings from Field Research

The initial round of field research, conducted in five regencies during the 1999/2000 wet season and the 2000 dry season, focused on the competitiveness and efficiency of rice farming. A second round of field research during the 2000/2001 wet season and the 2001 dry season broadened the scope of the study to look at other *sawah*-based activities, at the overall structure of household income for rice farmers, and at farm laborer households. Two additional regencies were added in the second round.[3] Several key findings emerged from these three years of field research:

1. Rice farming remained profitable in all research locations. This was true despite a sharp rise in the price of fertilizer, pesticide and seed over the previous 2-3 years. Higher input prices were offset by a 128% rise in the farmgate price of paddy. The return to farm management -- measured as the profit from rice farming after taking into account all costs, including the imputed cost of family labor and family-owned land -- averaged 25% of gross revenue in the research sites in 1999/2000. Profits were lowest in Agam (22% return to farm management) and highest in Kediri (31% return to farm management).

2. Rice farming remained internationally competitive in all research locations. Costs of production per kilogram of rice were below the world market price of rice. In 2000, removal of the Rp 430/kg rice import tariff and remaining subsidies would have erased much of the profitability of rice farming, but revenues would still have exceeded production costs in all locations.

[3] The five regencies included in the first round were Agam, Sidrap, Majalengka, Klaten and Kediri. The second round added Ngawi and Indramayu.

3. The competitiveness of rice farming is very sensitive to the exchange rate and the world price of rice. A strengthening of the exchange rate or a decline in the world dollar price of rice would reduce the competitiveness of rice farming in Indonesia. At a long run exchange rate of Rp 9,000/US$, and with no tariff, non-tariff barriers, or subsidies, rice farming would remain competitive in Agam down to a world price of $144 per ton, and in Kediri down to a world price of $117 per ton, given the 2000 cost structure. If the exchange rate were to strengthen to Rp 8,000/US$, rice farming would no longer be competitive in Agam, based on the 2000 cost structure, but would remain competitive in other research sites.

4. Although rice farming remained very profitable on a per unit basis, income from rice farming was low because average farm size in Indonesia is very small. The average rice farmer cultivates less than one-half hectare of land. With such a small amount of land, the average rice farmer in the regencies studied by CASER would have earned profits of just Rp 626,000 rupiah per crop, or 1.3 million per year with double cropping, in 2000. For a family of four this would amount to a monthly per capita income from rice farming of just Rp 27,000, or only around one-third of the 2000 poverty line of Rp 76,000 per person.

5. Because average farm size is so small, most rice farm households have multiple sources of income. Household surveys conducted in the research locations in 2000 and 2001 found that the average rice producing household derived only 28% of its income from rice. Non-rice agriculture accounted for 33% of household income and non-agricultural activities for an additional 39%. With average farm size of less than one-half hectare and with rice accounting for only 28% of income, even a doubling of rice prices would not solve the farm income problem.

6. Deregulation of input markets at the end of 1998 increased the price of fertilizer, seed and pesticide, but at the same time improved the supply of agro-inputs to rice farmers. Prior to deregulation, widespread shortages of fertilizer were reported as subsidized fertilizer intended for small farmers was diverted to large plantations and the export market. In 1999, 2000 and 2001, CASER's field research in the seven "rice bowl" regencies found that supplies of fertilizer were readily available at the village level. Deregulation of the fertilizer market made possible the establishment of many new retail outlets ("kiosks") in the villages, improving accessibility and creating a competitive retail market. Although prices of seed, fertilizer and pesticide rose sharply during the crisis as the exchange rate depreciated and subsidies were removed, rice yields per hectare did not drop, indicating that input intensity had not declined.[4]

7. CASER's field research found that rice farmers in the seven research sites relied primarily on self-financing for working capital requirements in rice production. The working capital needs in rice farming are relatively small and can be financed out of household savings for most rice producers. In addition, there is a large gap between the interest rate on loans and the interest rate on savings in rural areas which creates an

[4] Average paddy yield during the three years preceding the economic crisis (1994-1996) was 4.37 tons per hectare. This is almost identical to the average paddy yield during the three years following the crisis (1999-2001) of 4.35 tons.

incentive for farmers to self-finance. High rural lending rates and lack of access to formal credit markets did not prevent farmers from growing rice, but did create an obstacle to diversification into high value added activities with greater income potential, such as fruit and vegetables, as capital requirements in these activities are much larger than in rice.

8. Rural markets for outputs, land and labor were found to be competitive and efficient. On average, rice farmers in the research locations received 82% of the retail price of rice in adjacent urban markets (*kabupaten* capitals), indicating that margins in processing, storage and trading are relatively small. Sale of farmland is uncommon but there is an active land rental market. Labor institutions changed over time in response to changes in the supply of and demand for labor, technological change, and other economic conditions, indicating a flexible and efficient rural labor market.

Macro Food Trends after Deregulation

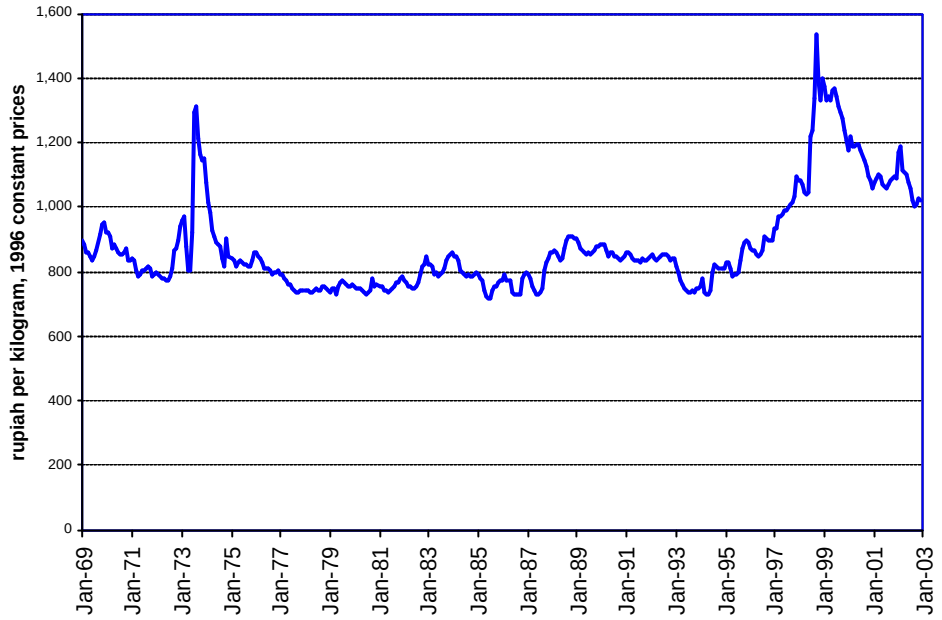
Following the elimination of Bulog's import monopoly, significant private sector rice imports began in early 1999.[5] Private imports reached 2.6 million tons in 1999, exceeding Bulog's imports of 1.6 million tons. Although total rice imports were much less in 1999 than in 1998, they were accompanied by a downward trend in prices. This decline in rice prices was viewed with alarm by agricultural interests who quickly blamed liberalization of rice trade for creating a "flood" of imports harmful to farmers. In response, the government enacted a specific tariff of Rp 430/kg on rice imports effective January 2000.

Despite the new tariff, concern about excessive private rice imports and low rice prices intensified during the first half of 2000 when Indonesia's biggest rice harvest in history was accompanied by a further drop in rice prices. Since data on crop production are available only with a one-year lag and initial projections did not suggest a record rice crop in 2000, the drop in prices was blamed on imports rather than on a bumper crop. Concern about low prices was especially intense during the peak harvest period in March 2000 when average farmgate paddy prices dropped below the government's official paddy floor price. This led to strong criticism of the 1998 decision to liberalize rice trade and to demands for greater protection for rice farmers.

In this discussion on rice policy, there was no mention of the fact that rice prices had risen faster than other prices during the economic crisis and were much higher, in real terms, than at any time during the two decades preceding the crisis (Figure 1). During the first year of the crisis, the retail price of rice tripled while the overall cost of living less than doubled (Figure 2). After reaching a peak in September 1998, rice prices began to come down, but they remained abnormally high in real terms. Even during the record rice crop in April 2000, the retail price of rice remained 138% higher than it had been in June 1997, whereas the overall CPI had risen only 96% over this time period. As can be seen in Figure 2, the decline in rice prices from September 1998 to October 2000 was partly a reaction to previous overshooting.

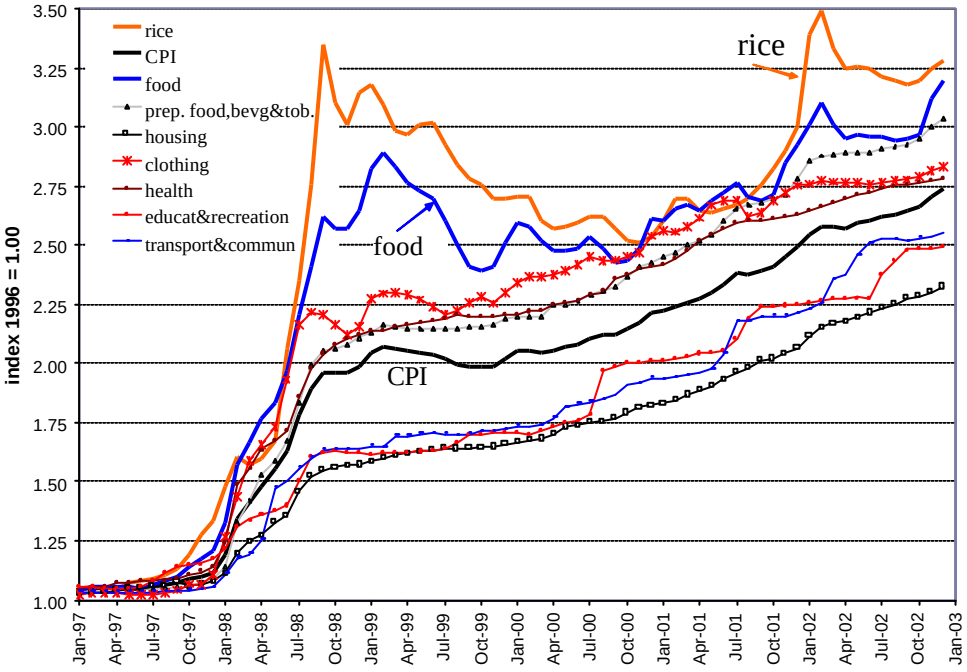
[5] Private sector rice imports in 1998 were carried out under contract with Bulog.

Figure 1. Real Price of Rice (nominal price adjusted for inflation) 1969-2003



Source: Rice price from Bulog, CPI from BPS.

Figure 2. Rice Prices and the CPI (nominal indexes)



Source: BPS, consumer price data, processed.

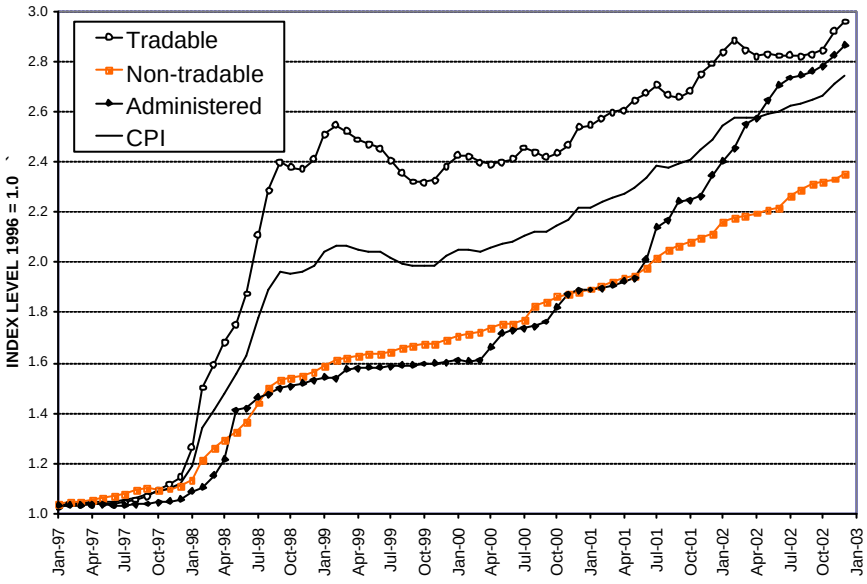
Changes in relative prices: tradables and non-tradables

The economic crisis not only caused rice prices to increase, but more importantly resulted in a readjustment of relative prices throughout the Indonesian economy. Prices of tradable commodities rose rapidly as the exchange rate collapsed, while prices of non-tradables, such as housing and services, rose much more slowly. Administered prices were held back by

government policy, at least until 2001. These relative price changes can be clearly seen in Figure 2 above, which shows that the price of food (*bahan makanan*) increased more than any other category of the CPI. Within the food category the price of rice increased more than the average price of food. In addition to food, prices of clothing and prepared food, beverages and tobacco also increased more than the CPI, as did the price index for health which was driven up by increased costs of imported medicine. By contrast, the price indexes for housing, education and recreation, and transportation and communication, rose less than the overall CPI, because these goods and services cannot be easily exported or imported.[6]

The impact of an exchange rate depreciation on the relative price of tradables and non-tradables is well known in international trade literature and has been intensively studied in other countries, but in Indonesia the importance of this phenomenon was not widely appreciated.[7] This was partly due to a lack of good time series price data. No published series is available showing price movements for tradables and non-tradables. However, an informal series can be constructed from the 659 items included in Indonesia's consumer price index. If these 659 items are grouped into tradables, non-tradables and administered prices, the resulting diagram reveals a large increase in the price of tradables relative to non-tradables during the crisis (see Figure 3).[8] It also shows the restraining impact of administered prices on the aggregate price level up until 2001. Perhaps because these relative price changes were not well documented, the fact that farmers had benefited from the 1997-1998 exchange rate depreciation was largely ignored in the public discussion of agricultural problems.

Figure 3. Tradables, Non-Tradables and Administered Prices



Source: BPS, consumer price index data, processed.

[6] The price index for transport and communication is strongly influenced by fuel, electricity and telephone rates, prices of which are set by the government. During the first three years of the crisis the government made a policy decision to hold price increases for administered items below the general inflation rate.

[7] See Lawrence E. Hinkle and Peter J. Montiel, *Exchange Rate Misalignment: Concepts and Measurement for Developing Countries*, Oxford University Press, 1999, for an empirical discussion of the impact of depreciation on the relative price of tradables and non-tradables.

[8] Administered prices account for 17% of the CPI, non-tradables account for 33% and tradables account for 50%.

Input costs and the floor price

Attention was instead focused on the harm done to farmers by rising input prices and supposedly low output prices. Fertilizer prices had been on an upward trend since the beginning of the crisis, but prices surged when the urea subsidy was removed at the end of 1998, rising by 96% in just two months. By mid-2000 the farmgate price of urea had reached Rp 1,200/kg, up 146% since the start of the crisis -- an even bigger increase than the 128% rise in paddy prices over the same period. Prices for other agro inputs, such as pesticide and seed, had also risen as the rupiah depreciated. Advocates of farm protection focused on these increases in input prices, and on the fact that farmgate paddy prices were below the official floor price, to argue that farmers were being squeezed by low output prices and high input prices.

In this uncertain situation, the joint CASER/FPSA field research in major rice growing regions provided valuable information to policy makers. From detailed interviews with more than 500 rice farmers, CASER's field researchers were able to construct comprehensive farm budgets. These budgets revealed that the cost of urea fertilizer amounts to at most 10% of the value of wet paddy for the average farmer. Therefore, a 100% increase in fertilizer prices requires only a 10% increase in paddy prices to fully compensate rice farmers. Since the actual increase in paddy prices from mid-1997 to mid-2000 was 128%, this was far more than enough to compensate for the 146% rise in urea fertilizer prices.

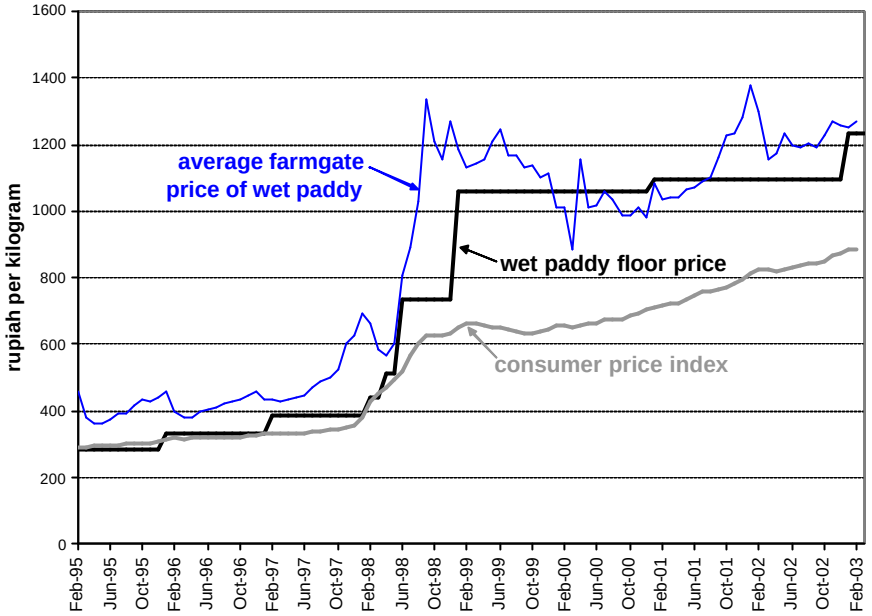
CASER's research also found that all agro inputs (fertilizer, pesticide, herbicide and seed) account for less than 16% of the value of paddy, meaning that agro input prices would have to rise more than eight-fold to negate the positive impact on farm income of the 128% increase in paddy prices. The two biggest inputs in rice farming are land and labor, and cost increases for these inputs were less than the rise in paddy prices, indicating that rice farming was more profitable in 2000 than it had been pre-crisis.[9]

In addition to input costs, attention was also focused on the relationship between farmgate prices and the official floor price for paddy. As can be seen in Figure 4, average farmgate paddy prices dropped below the floor price in 2000. Figure 4 also shows, however, that the floor price of wet paddy rose from Rp 330/kg in January 1997 to Rp 1060/kg in January 1999.[10] In other words, the government more than tripled the floor price for paddy during the first two years of the crisis. Over this same period (January 1997 to January 1999) the general price level doubled. By April 2000, the floor price had risen 221% relative to January 1997 while the general price level had risen by 99%. In real terms, the floor price had been raised 61%.

[9] Farm budget data collected by CASER reveal that land and labor account for between one-half and two-thirds of the value of paddy output, depending on location. Labor costs (upah buruh tani) rose by 136% between the first half of 1997 and the first half of 2002, while paddy prices rose 177%. The real cost of labor to rice farmers therefore **fell** 15% over this five year period.

[10] Officially, the floor price is set in terms of dry paddy (*gabah kering giling* or GKG). But following each change in the floor price, a joint decree (SKB) from the Ministry of Agriculture and Bulog establishes a wet paddy reference price that is equivalent to the dry paddy floor price. Since it is widely believed that farmers sell most of their harvest as wet paddy, the press focuses on the farmgate price of wet paddy.

Figure 4. The wet paddy floor price, the average farmgate price, and the CPI.



Note: The consumer price index has been scaled to be comparable to the floor price. This was done by multiplying each monthly value of the CPI by 3.192, making the CPI equal to 330 in January 1997, giving it the same value in that month as the floor price.
Source: The actual wet paddy price (*harga rata-rata GKP tingkat petani*) is from BPS, as is the CPI (*IHK*). The floor price is from Bulog and CASER (PSE).

The problem in 2000, therefore, was not that farmgate paddy prices were too low; adjusted for inflation, paddy prices were higher than at any time over the two decades preceding the crisis (1977-1997). The problem was that policy makers set the floor price in January 1999 on the basis of extremely high paddy prices in late 1998, not realizing that the tripling of paddy prices during the first year of the crisis was the result of an overshooting of the exchange rate. This overshooting caused rice prices to become out of line with other prices in the economy. As the exchange rate recovered, rice prices declined, but it was not politically possible for the government to reduce the floor price.

Deregulation and Food Price Stability

A major reason for opposition to the deregulation of food imports was the fear that open imports would lead to excessive food price volatility. In the decades preceding the economic crisis, one of the main justifications for the government's food import monopolies had been to prevent instability in the world market from spilling over to the domestic market. It was feared that removing the government's food import monopolies would cause domestic food prices to become unstable, creating a severe burden on both consumers and producers.

However, experience since deregulation at the beginning of 1999 has shown that rice prices have actually been more stable than they were prior to 1998. This is true both at the retail level and at the farmgate level. Month-to-month variation in rice prices, as measured by the coefficient of variation, was lower over the four-year period 1999-2002 than over the two decades prior to the economic crisis. The coefficient of variation of retail rice prices averaged 0.120 during 1977-1997 but fell to 0.097 during January 1999-December 2002. For

farmgate paddy prices, the coefficient of variation fell from an average of 0.151 during 1980-1997 to 0.113 during January 1999- December 2002.[11]

The increased stability of rice prices following deregulation was seen most dramatically during the 2002-2003 El Nino drought. Prior to deregulation, major droughts caused retail rice prices to rise by more than 30%, despite Bulog's rice import monopoly and the government's commitment to rice price stabilization. By contrast, from the post-harvest trough in May 2002 to the pre-harvest peak price in February 2003, the average retail price of rice rose by only 4%. Prices were stable even during November-December 2002 despite the simultaneous occurrence of a demand shock (Ramadhan) and a supply shock (the drought). The contrast between the recent drought and comparable droughts in 1987/88 and 1994/95, when retail rice prices shot up by 31-32%, has been obvious.

The reason for the change is also clear. During past droughts the government delayed importing additional rice until a large price increase had already occurred. This was due both to the bureaucratic nature of a government import monopoly and to political sensitivity concerning rice imports. By contrast, during the 2002/2003 drought, the private sector behaved proactively, bringing rice in before prices shot up. Rice imports more than doubled from 1.4 million tons in 2001 to 3.7 million tons in 2002, with most of this increase due to private sector activity. Private importers do not face the same bureaucratic problems and political constraints that government importers face, and they are therefore able to act quickly in the face of domestic supply disturbances. This flexibility results in more stable food prices.

The fact that open food trade will stabilize prices in the face of a domestic disturbance, such as a drought, could be predicted from standard international trade theory. This advantage of an open import policy was ignored in the past because it was assumed that food price volatility would come mainly from the world market, not from domestic disturbances. Thirty years ago this may have been true. In the 1970s, the world rice market was small, thin and unstable, and supply to Indonesia was dominated by a single exporter, Thailand. Today the world rice market has grown to 28 million tons and there are several new large exporting countries such as Vietnam and India. As a result of this increase in the size of the market and the entrance of new players, prices are more stable than in the past. According to a recent study, the average absolute change in world market rice prices dropped from 24% in 1965-1981 to 11% in 1985-1998 and world market rice prices were more stable than world market wheat or corn prices between 1985 and 1998.[12] Increased competition from new exporting countries has also driven down long-term rice prices. Importing nations can now count on inexpensive rice from multiple sources at prices that are more stable than in the 1970s or early 1980s. This change in the world market, and Indonesia's experience with open trade over the past four years, indicates that volatility is likely to come mainly from domestic production disturbances, not from international disturbances. The optimum response to domestic disturbances is to maintain an open rice market with an active role for private traders.

[11] See Sjaiful Bahri and L. Peter Rosner, "Rice Price Stability During and After Bulog," FPSA draft working paper.

[12] David Dawe, "The Changing Structure of the World Rice Market, 1950-2000," Food Policy, 27 (2002)

Food Prices and Poverty

In an effort to minimize food imports and to promote food self-sufficiency, Indonesia has followed a high food price policy over the past five years. This can be seen from the fact that food prices, including rice prices, have been abnormally high by historical standards (see Figures 1 and 2 above). In real terms, the price of rice has been higher over the past five years than at any time during the two decades preceding the economic crisis. Domestic rice prices have also been kept well above world rice prices through tariffs and non-tariff barriers.[13] This high food price policy has obvious implications for the welfare of the poor.

Poor families in Indonesia spend more than two-thirds of their income on food and more than one-third of their income on rice. An increase in rice prices therefore has an immediate impact on poverty. It has been estimated that a 10% increase in rice prices increases the number of Indonesians living in poverty by two million individuals.[14]

One mitigating factor is that some poor households are producers of rice. In rural areas, 39% of households grow some rice; for the entire population, 25% of households grow some rice. Among rice producers, those who produce more rice than their family consumes (net producers) will experience higher incomes when rice prices rise. If many of the poor are net rice producers, higher rice prices could reduce overall poverty.

Unfortunately, rice farms in the more densely populated regions of Indonesia are so small that many farmers do not produce enough rice to meet their own needs and are forced to buy rice at some point during the year. Large farmers produce a surplus, but large farmers tend not to fall below the poverty line. The poorest residents in rural areas are marginal farmers and farm laborers, most of whom are net consumers of rice. Poverty among these groups increases when the price of rice rises.

Some analysts have claimed that higher rice prices will encourage increased rice production, which will increase the demand for labor, raise rural wages, and have a positive multiplier impact on the rural economy. This assertion ignores the fact that consumers who pay more for rice are forced to reduce spending on other goods and services. Any positive multiplier effect from higher rice production is at least partly offset by a negative multiplier effect as income is shifted from other goods and services to rice, causing demand for these other goods and services to decline. Moreover, farmers who grow more rice in response to higher rice prices are likely to reduce production of other crops, such as vegetables, fruit and *palawija*, and these other crops might be more labor-intensive than rice. Consequently there is no reason to assume that higher rice prices will raise rural wages or have a positive multiplier impact on the rural economy.

The immediate impact of Indonesia's high food price policy on poverty is clear. Abnormally high food prices have increased poverty, both in urban and rural areas. Whether in the long

[13] Since imposition of the Rp 430/kg tariff in 2000, rice prices in Indonesia have been at least 30%, and during some periods more than 50%, above border prices. This indicates that the tariff has been effective despite press reports of rice smuggling.

[14] See Mohamad Ikhsan, "Kemiskinan dan Harga Beras," in *Bunga Rampai Ekonomi Beras*, LPEM-FEUI, 2001.

run high food prices stimulate production, to such an extent that real wages for the rural landless rise, is an unanswered empirical question. What is certain is that the poor have to eat in the short run, and the harmful short run impact of high food prices on the poor – and on the nutritional well being of poor children in particular – has been well documented.[15]

Policy Implications

Three important empirical facts emerged from the collaborative analysis by FPSA and CASER: 1) food prices in Indonesia are abnormally high both by historical standards (relative to pre-crisis levels) and by international standards; 2) rice farming in Indonesia remains profitable on a per unit basis and competitive with imported rice; and 3) rice accounts for a small portion of farm household income.

The abnormally high price of food, and of rice in particular, indicates that the government should avoid policies that would put additional upward pressure on food prices, as this would only add to the already heavy burden on low income consumers who spend most of their income on food. Instruments other than price should be used to boost agricultural productivity and raise farm incomes.

Rice remains profitable on a per unit basis and rice income accounts for only a small share of farm household income. Hence higher paddy prices are both unnecessary and ineffective as a means to boost farm household income. The problem that rice farmers face is not that rice prices are too low, but that farm size is too small. With extremely small farms, raising rice prices will not reduce rural poverty. The most effective way to reduce rural poverty is to encourage small farmers to diversify their incomes, either into high value agricultural activities such as horticulture and livestock, or into non-agricultural activity. Investing in rural infrastructure, research and development for non-traditional crops or livestock, and policies that support diversification, will boost farm household income more effectively than will further increases in the already high price of rice.

The fact that rice producing households already earn 33% of their income from non-rice agriculture and 39% of their income from non-agricultural activities demonstrates that Indonesian rice farmers are already highly diversified. Small farmers – those with less than ½ hectare of *sawah* – understand that their future does not lie in rice farming. Unfortunately, the government has historically focused on rice self-sufficiency as the single overriding goal of agricultural policy and has encouraged farmers to specialize in this crop. Government investment in agriculture has been disproportionately focused on rice. A relaxation of the self-sufficiency paradigm would allow the government to devote more resources to non-rice agriculture. This is the most effective way to raise rural incomes and to bring policy in line with the needs of Indonesian farmers.

[15] See Steven Block et. al., 2002, "Macro Shocks and Micro (scopic) Outcomes: Child Nutrition During Indonesia's Crisis," . Nutrition Working Paper No. 1, DAI- Food Policy Support Activity, for a discussion of the impact of high food prices on child nutrition.

FPSA Support for the Food Security Agency

The Food Security Agency (FSA) is responsible for monitoring the adequacy of Indonesian food consumption and promoting policies to enhance adequate diets. FPSA activities that support the FSA provide for both long-term strategic information requirements of the agency, as well as critical short-term policy inputs. The long-term information improves our understanding of household food consumption and welfare patterns, and helps understand how agriculture and trade policies – working through household incomes and market prices – influence them. A secondary focus deals with food production, but in a relatively narrow sense – evaluating the likely impacts of El Niño-related weather shocks on Indonesian food crop production. The focus on short-term policy inputs has been largely responsive to timely and pressing policy questions – such as evaluating what prices appropriately balance the needs of food producers and consumers – which must be addressed routinely in order to establish internally consistent domestic price supports and international trade policies. This review clarifies the overall strategy of these activities, and summarizes their key findings.

Food Consumption

Despite its base in the Ministry of Agriculture, the FSA explicitly approaches food security from the perspective of household food consumption decisions, and the prices and incomes that affect them. The long-term policy analyses have sought to respond to this innovative mandate. In the area of food demand, long-term strategic analyses have focused on: 1) improving food demand function estimates; 2) improving their use by the MoA to predict future consumption; 3) enhance the capacity within the MoA to routinely update food consumption estimates; and 4) develop simple, yet sensitive measures of nutritional welfare, based on household food consumption measures. In this review, we document some of the major FPSA food demand modeling activities; discuss how these models are currently used in forecasting food demand; and how a highly sensitive measure of nutritional welfare has grown out of these studies.

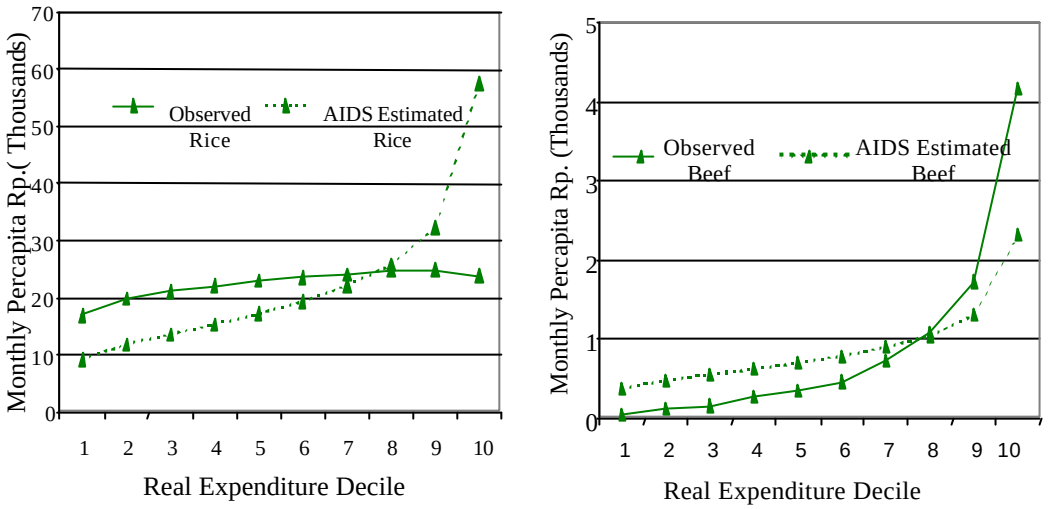
Modeling Food Demands: Unraveling a Puzzle

Despite a long history of food demand function estimation in Indonesia, off-the-shelf methods – those using the methods used consistently in previous years – have yielded systems of food demand functions with puzzling implications. By drawing on the extensive consumer demand literature from the past decade, it appears some of the most puzzling problems have been resolved, yielding systems of demand equations with generally plausible parameters. Given the widespread historical use of demand system parameters taken from generally implausible sets of results, the importance of this advance should not be understated.

These efforts initially sought to estimate a linear approximation of the Almost Ideal Demand System (LA-AIDS) for 21 major food commodity groups. The 21-group specification enabled a functional separation of major food types (e.g., tubers, fruits, vegetables, etc.) while also separating specific key policy relevant products, such as rice, sugar, chicken, etc. One of the puzzling implications of these estimates is displayed in Figure 1 for 1999 rice

consumption. It shows the observed and LA-AIDS estimated pattern of rice expenditures by income decile. Observed expenditures grow from Rp.15,000-20,000 for the poorest two deciles, then level off at about the 8^{h} decile at just under Rp.25,000 before declining slightly. But the LA-AIDS estimated demands grow much too fast with incomes. They predict only half the observed rice expenditures of the poorest two deciles, and nearly double those of the wealthiest. The converse of this problem is displayed in Figure 1 for beef demands. It shows LA-AIDS estimated per-capita beef expenditures growing much less rapidly with income than the observed.

Figure 1. Observed and LA-AIDS ("off-the-shelf") Estimated 1999 Per-Capita Rice and Beef Expenditures



This pattern of LA-AIDS-estimated over-estimation of the rice income elasticities extends to all the relatively inferior foods – specifically tubers and other grains – and to other years as well. Similarly, the pattern of under-estimating those for beef extends to other "luxury" foods – especially chicken and other meats – and to other years as well. At the risk of overwhelming the reader, graph A1 in the Appendix displays comparisons for all the "extreme" food groups for the years 1993, 1996 and 1999. These "extreme" foods are those that would, according to actual expenditure patterns, have either the highest or lowest income elasticities. For each of these extreme food types, the LA-AIDS income elasticities are biased towards the overall mean elasticities.

Since these extreme goods are those most affected by changes in real incomes and welfare, it is worrying that these are precisely the goods are modeled badly. Serious questions should be raised about whether real welfare, and hence true food security, is being appropriately modeled. Consequently, a search for the likely causes of these income-related biases has been a compelling issue for the FPSA activities.

Several approaches were attempted to overcome these apparent weaknesses. Linear approximations of a "Quaids" specification – one that estimates quadratic income elasticities – yielded slightly different results, and some new anomalies, but did not fix the problems with the overall income gradients. Other analyses based on pooled cross-sectional and time-series data were also explored. In other explorations, fixed-effects regressions on '93, '96 and '99 kabupaten-level aggregate data were ill behaved and were discarded. Other

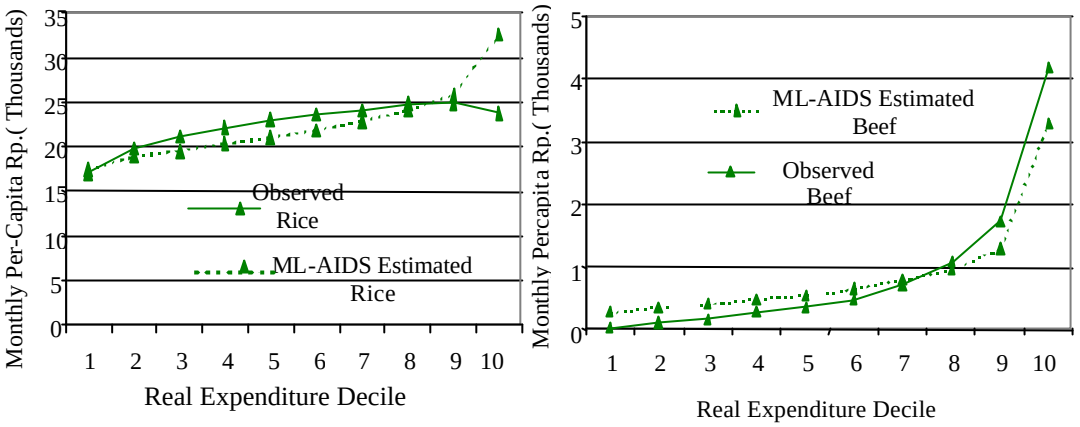
aggregations – using provincial by urban-rural by income quintile fixed effects regressions were much better behaved; yet the apparent income bias with the extreme commodities persisted. One particular set of activities drew substantial input from a commissioned study. Though it did not resolve the puzzle, the exercise deserves a special discussion.

With the exception of rice, it is notable that the remaining extreme goods are not normally consumed on a weekly basis. For example, only 19 percent of households consumed chicken during the week prior to the '99 Susenas survey. Even fewer consumed the other (non-rice) extreme foods. Since the econometric literature suggests that a censoring bias arises if many respondents report zero consumption, a set of project activities sought to appropriately adjust for the effects of the censoring bias in household-level analyses of demands. To do this, a commissioned study used substantial input from an economist from the MoA DG for livestock who had recently written a PhD thesis on censoring bias corrections. He produced a draft report that provided estimates of the demands for these "luxury" foods (Hutabarat, 2002.) He also helped develop the software needed to estimate these models on the larger set of commodities, including the inferior foods. While important analytic lessons were learned in this process, censoring correction did not fix the apparent under-estimate of luxury food income elasticities, nor the over-estimates for inferior goods.

Most recently, several sets of estimates – ones that simultaneously estimate a price index along with the demand parameters (dropping the Stone price index common to the linear approximation models) – suggest a solution to this bias. Maximum likelihood estimates of 17-equation models (which omit several of the smaller food items) produce income elasticities for luxury goods near 2.0, and for other grains and tubers that are negative. But these maximum likelihood estimations face severely binding computing constraints. Models using aggregations of 13 commodities require nearly 24 hours to converge, even when estimated using aggregate, rather than individual data. Those based on 17 commodities require weeks to converge. The 21-commodity model requires months, and none has converged yet.

Preliminary LA-AIDS estimates, in which the Stone price indices are replaced with indices estimated from a 13-equation ML-AIDS model, are displayed in Figure 2. These estimated Engel slopes are clearly much closer to the apparent cross-sectional patterns, though some bias remains. For rice there is a clear issue related to curvature as well (a problem that cannot be accommodated with linear Engel functions implied in the standard AIDS specification) but the overall slope is clearly much closer to the observed. Some of the remaining problems may be resolved by specifying a quadratic income term, and by estimating the full 21-equation maximum-likelihood model. But these estimates are still being processed.

Figure 2. Observed and ML-AIDS Estimated 1999 Per-Capita Rice and Beef Expenditures



Modeling Food Demands: A Special Study of Fish Demands

An additional commissioned demand study, which is also especially promising, but also still unfinished, examines the unique characteristics of fish and seafood demands. These are especially interesting for several reasons. First, while there is a high degree of substitutability in demand for a wide range of fish, availability differs substantially by geographic region. Some fish are only found in the seas surrounding the eastern islands. Over time, selective species depletion, or associated harvest regulations, dramatically alter supplies, forcing substitution of other species. In a similar vein, aqua-culture is providing an increasing portion of the demand for Indonesian fish and seafood. And the changing nature of aquaculture – including costs of inputs, crop failures, and changing technologies – is altering supplies, which have important implications for domestic food markets. Consequently, understanding the substitutability among fish types is an important policy question. Unlike the full demand systems, there is relatively little literature available to guide the exercise.

This study – which is being done in coordination with similar analyses in other countries – has had to establish a rational grouping of fish. This grouping accounts for both the important biological differences in species, as well as key demand considerations that determine the palatability of alternatives. A preliminary set of results has been presented in an FSA sponsored workshop, but additional work is still needed to complete this activity.

Application to Forecasting Food Demand

Among the various uses of the estimated demand systems one of the most visible is the application of their parameters to forecasts of food demands. These forecasted demands use predicted population and income growth, and, if relevant, forecasted changes in relative prices, combined with income and price elasticities from the estimated system to forecast final consumer food demands. But multiple data sources should be used to aggregate food consumption. While SUSENAS household survey data provide reasonable information on direct food consumption (that which is prepared at home,) the SUSENAS is less useful for

estimating indirect food consumption (processed foods, or those which are prepared outside the household.) This is partly because the quantities of pre-prepared foods – especially those consumed outside the household – are not very reliably collected in the SUSENAS, but also because the SUSENAS surveys do not identify the proportions of either pre-prepared or processed foods derived from specific food sources (e.g. rice.) The Indonesian Input-Output (I/O) tables use data from additional sources, such as annual surveys of medium and large-scale industrial firms, and occasional surveys of smaller food vendors to fill in these gaps.

The details of the methods used for forecasting demands for rice and corn are presented in Erwidodo, et al. (2001) and Erwidodo and Pribadi (2002), respectively. These methods use data from household SUSENAS surveys to estimate and forecast both direct consumption of rice and corn, as well as the I/O tables to estimate and forecast indirect consumption. Direct demand forecasts use parameters from the most appropriate AIDS demand models, combined with assumptions about changes in prices and incomes to forecast per-capita consumption. For direct consumption forecasts, demand parameters estimated with the SUSENAS data are combined with assumed population and income growth (which vary by urban and rural areas), and annual price growth to project direct consumption demands. I/O tables from 1995, as well as food balance sheets from multiple years are used to estimate rice and corn "losses" to processing and as seed inputs. The shares of consumption in intermediate demands from the 1990 and 1995 I/O Tables are used to extrapolate the likely corresponding shares into the future.

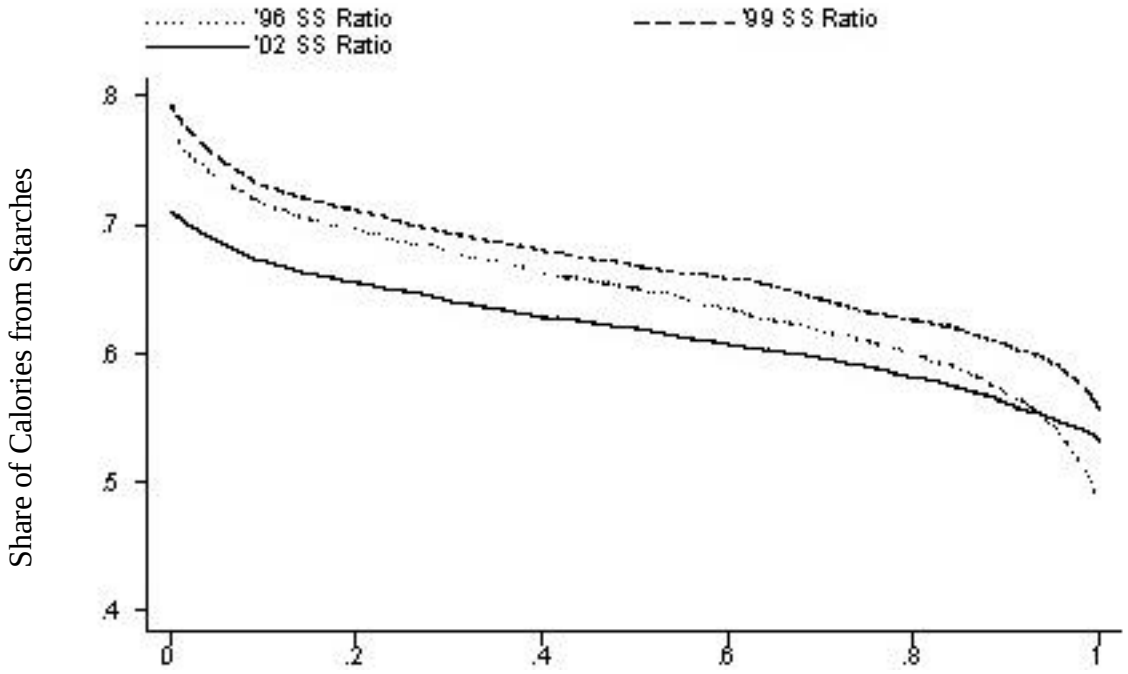
SSR: Improving Measures of Nutritional Welfare

A range of measures are commonly used to monitor food security and the adequacy of diets. But whether we use household expenditure/consumption-based measures, or individual anthropometric outcomes, the existing measures all have their own particular limitations. The FPSA activities explored a number of measures directly related to the quality of foods consumed by households that avoid some or many of these limitations. One in particular, the starchy staple ratio (SSR,) turned out to be a remarkably sensitive measure of dietary improvements, as well as a very robust indicator of historical patterns of improvements. The SSR is defined as the proportion of calories consumed from starches (grains and tubers.) Like many other measures of nutritional outcomes, there is a strong, predictable relationship between household expenditures per capita, and the SSR. But unlike expenditure-based measures (such as poverty lines), this measure does not require arbitrary decisions about the cost of a target consumption basket. And unlike anthropometric outcomes, the SSR is relatively un-influenced by environmental and health factors that can affect nutritional development. While these latter factors are important for ensuring nutritional welfare, they can obstruct policy analysts' views of the specific effects of food prices and incomes on nutritional outcomes.

The story revealed by the SSR is an interesting one, particularly over the period 1996-2002. Figure 3 summarizes the evolution of the SSR over this particularly volatile period. The dotted 1996 line, which plots locally weighted average SSRs across per-capita expenditure percentiles, demonstrates the decline of SSRs (i.e., the variety and quality of caloric sources increases) as incomes increase. The upward shift to the 1999 dashed line reveals the magnitude of the financial crisis impacts on the quality of nutritional intake. Across all

levels of income, the average quality of nutritional intake deteriorated, as households shifted to diets with relatively more starches. In 1999 it is an interesting anecdote that the reduction in dietary quality was more severe among the wealthy than among the poor.

Figure 3. Indonesian Starchy Staple Ratio, 1996, 1999 and 2002



The shift from 1999 to 2002 reveals two especially surprising results. The first is the magnitude of the shift. This improvement in nutritional quality is about as large as that experienced over any other three-year period in recent history. While this is broadly consistent with the outcomes suggested by various expenditure-based poverty measures, it stands apart from the poverty measures, partly due to the magnitude of the improvement, and partly because this is based on direct consumption measures, so it is less likely to be considered an artifact of its own construction. The second surprising result is the change in the distribution of nutritional welfare suggested by these indicators. The crisis caused the quality of the diets of the wealthy to decline by more from 1996 to 1999 than those of the poor over the same period, leading to a more equal distribution of nutritional welfare. But subsequent improvements from 1999 to 2002 were not simply a return to old consumption patterns. Instead, over the period 1996 to 2002, the poor experienced *very* large improvements in nutritional welfare, while the wealthy experienced at most marginal improvements.

The FPSA supported a number of activities associated with improved measurement of nutritional welfare. Perhaps even more compelling than the SSR findings were the results of real food analyses undertaken in late 2003. These indicated that food consumption improvements from 1999 to 2002 more than compensated for the losses experienced early in the crisis. More interestingly, they occurred in the form of increased consumption of higher value foods, such as soy products, prepared foods, eggs, chicken and vegetables, and at the expense of starches. These changing patterns of food consumption were partly the result of

increasing incomes, but they were also influenced by the increased price of rice relative to other foods. And these recent improvements in consumption occurred despite margina declines in caloric intake.

These findings have had significant policy impacts. LIPI, Indonesia's equivalent of the National Academy of Sciences, holds a national workshop on food and nutrition every five years (the *Widakarya Nasional Pangan dan Gizi* – WPNG) to establish national nutritional guidelines and policies. Based on the strength of these nutritional findings, the WPNG substantially revised their caloric intake guidelines, reflecting these revised patterns of food intake.

Food Production

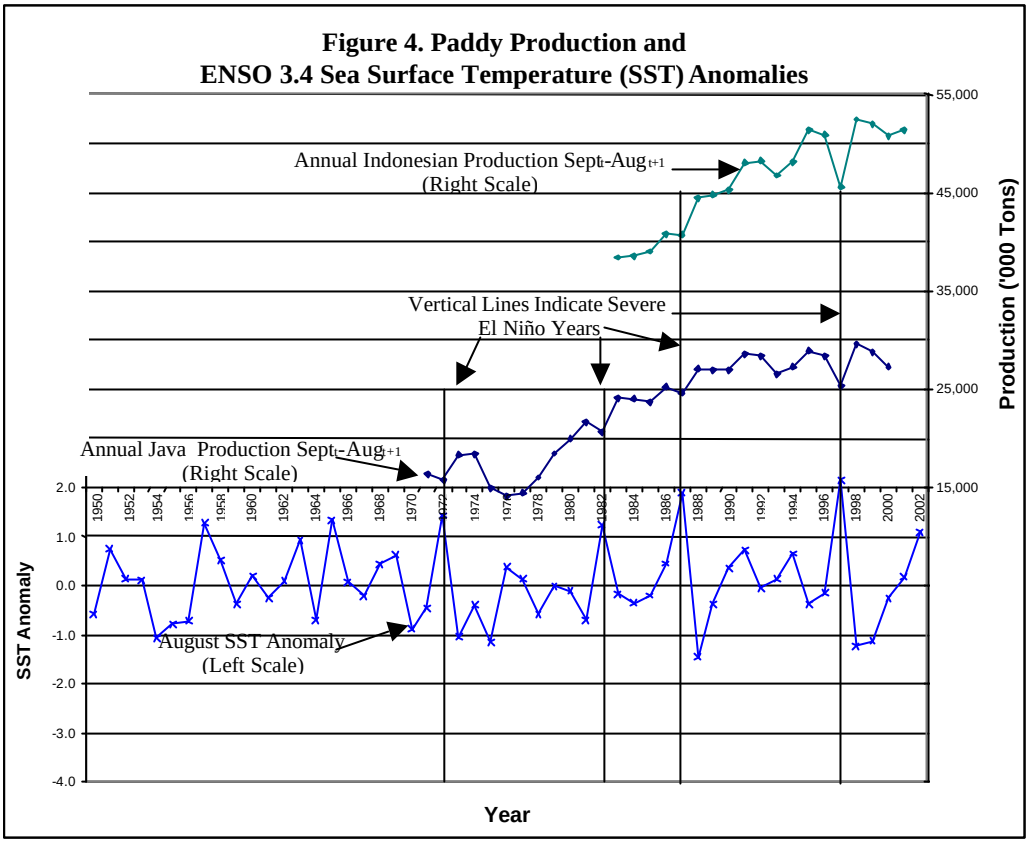
In the area of food supply, the opportunities for substantial innovations are relatively limited. The MoA and BPS have extensive experience, and well-established methods for estimating and promoting food crop production. Consequently, this project's major food supply effort has been to integrate timely, and scientifically sound forecasts of El Niño-related production shocks into the FSA's routine activities.

Work carried out by FPSA team associates Roz Naylor, Walter Falcon and colleagues has established a predictable impact of occasional El Niño events on Indonesian food crop production. Figure 4 displays the time-pattern of the ENSO 3.4 SSTA[16] as well as corresponding paddy production statistics. ENSO events coincide with four of the six major Java paddy production shortfalls occurring over the past 30 years, and two of the past three Indonesian shortfalls in the last 20 years. More significantly, *every* high ENSO 3.4 SSTA (i.e., above 1.0) in the past 30 years has led to drought-induced shortfalls. During the last year of FPSA, the Falcon-Naylor team extended their ENSO model to the provincial rice bowls of Indonesia where 90 percent of inter-annual changes in paddy production are caused by ENSO events. The ENSO econometric models, based on a crop-year basis (September – August) also proved extremely robust in quantifying climate-production linkages. This model now measures ENSO effects on rice production in Indonesia – nationally and regionally – and on world prices using the August sea surface temperature anomaly (SSTA) as the primary gauge of climate variability. The estimates show that for each degree © change in the August SSTA, there is a 1,318 thousand metric ton effect on paddy production in Indonesia and a $23/metric ton change in the world rice price.

The FPSA project has worked closely with FSA staff to enable them to use this model. During the past two years, FPSA staff has collaborated with their counterparts from downloading the August SSTA statistics from the US National Oceanographic and Atmospheric Administration's website to running the models and establishing forecasts from the ENSO data. The FSA team used updated version of the Naylor-Falcon model to forecast the impact of a modest 2002 moderate El Nino as well as the September 2003 updated model, projecting impacts on rice production which proved remarkably accurate.

[16] The ENSO 3.4 SSTA is a measure of mid-Pacific Ocean sea-surface temperature anomalies (SSTA) that is a particularly robust marker for El Niño Southern Oscillation (ENSO) events.

Figure 4. Paddy Production and ENSO 3.4 Sea Surface Temperature (SST) Anomalies



Short-Term Policy Support Activities

The policy support activities focused on immediately pressing policy questions can be conveniently divided among activities that respond to predictable needs, and those that respond to one-time, or unique policy questions. Those that respond to predictable needs are particularly interesting, since the methods and findings should provide a background to future similar questions.

Government food crop procurement budgets trigger a regular, annual debate, both within the MoA, and among interested ministries, about appropriate agricultural prices. While this is clearly an on-going debate, the annual budgetary implications domestic rice prices for government procurement of subsidized rice, for example, forces a resolution of the debate each year, before the rice procurement budgets can be finalized. And since the domestic procurement price and the domestic price of imported rice should be jointly determined, tariffs and procurement price decisions are linked in this debate. In the past 18 months, similar debates have focused on rice, corn and sugar price policies.

The FSA is in a unique position of wearing two different hats in these debates. Wearing the hat of a MoA directorate, it represents the concerns of farmers' and related stakeholders, who support policies that would benefit food producers. But the other hat, representing its food security responsibilities to the public (through the president – who is the ex-officio chair of the FSA), also represents the concerns of food consumers. As a result, the policy debate within the FSA should appropriately reflect the broader policy debate throughout Indonesia.

The FSA contributes substantively to these debates. Within the FSA the debate is data-driven, with a relatively technical focus. In these debates, the FPSA has repeatedly responded to requests by the MoA and by the head of the FSA to comment on appropriate price and trade policies.

The following is a partial list of the studies contributed by the FPSA to several of these recurring policy debates. As several of papers use similar methods and data sources, and the methods are discussed as a group.

- *Who gains and who loses: Welfare effects of increasing the rice import tariff*
- *An analysis of tariffs on imported corn*
- *An analysis of the government purchase price [GPP] of gabah and rice tariffs*
- *Getting the sugar policy right*
- *Effectively implementing the government paddy purchase price*

Methods

Simulations of consumer and producer surplus, using alternative domestic crop price assumptions, and based on estimated consumer demand and producer supply functions provide the theoretical underpinning for several of these studies. Consumer demand function parameters are taken from the FPSA estimated food demand parameters. Supply functions are taken from current Indonesian literature.

Another commonly used analytic method is the farm profit function, which is estimated assuming the production input and output relationships described by the 1998/9 farm cost survey, supplemented with updated input prices and simulated producer prices. In these analyses, profits are calculated as a percentage of the value of production.

Findings and Impacts

Based on the analyses, several sets of findings have been put forward. These findings, buttressed by the underlying empirical results have been influential in shaping the debate, and ultimately policy implementation. Several of the key findings are summarized below:

- High rice tariffs would be counter-productive and add substantial costs to the economy, particularly the poor – *including many rice farmers who are net-rice consumers*.

- The welfare effects of increased rice tariffs proposed by some within the MoA would not be distributed equally. Net rice producing farmers would have been the gainers, as they would capture around 65 percent of total producer surplus, with 35 percent captured by processors and traders. The main losers would be the poorest net rice consumers. They would bear 62 percent of total consumer losses.

- Rice farming at prices current in July 2002 was profitable, as it contributed a net profit of 25-28 percent of the gross return (25 percent in Java; 28 percent in outer islands.) A net profit of 25 percent was considered reasonable, and was used to help identify an optimal tariff and GPP.

- Corn has both a comparative and competitive advantage, suggesting that high corn tariffs are not advisable, unless used to stabilize large unexpected world price shocks.

- An important side benefit of this work is that Erwidodo developed a simple "partial welfare" model, in which first-order welfare impact estimates are derived from food crop demand and supply elasticity estimates. While these models omit the likely general equilibrium effects on product input markets, it is a practical and well-understood model. This model was applied in dose coordination with Hermanto and his staff, who now use this model regularly to assess alternative food price, marketing and trade policies.

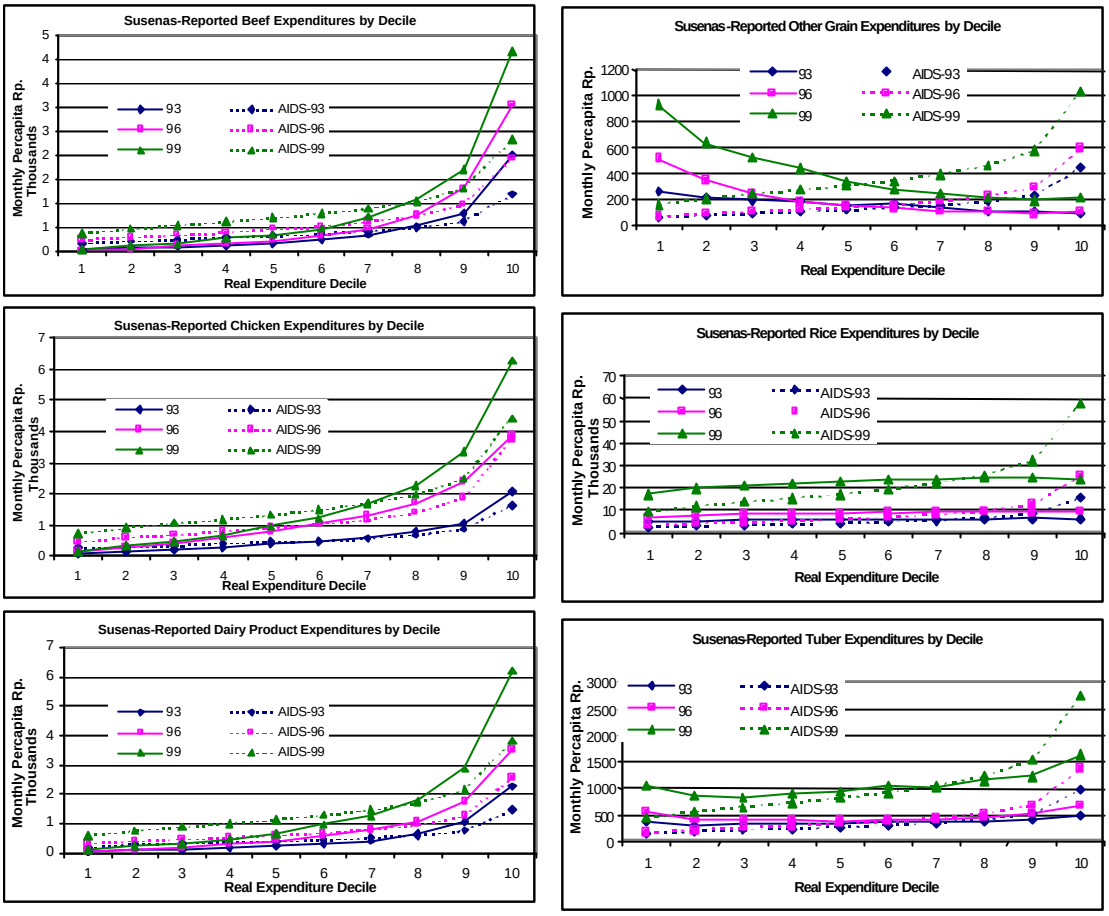
- Proposals by sugar producers to increase sugar tariffs were reviewed, but were not recommended. Theoretically, increased tariffs would generate large *deadweight losses* to the economy; and empirically they do not effectively protect domestic producers. High tariffs trigger illegal trading and smuggling, hurting both consumers and producers while benefiting only a few traders and rent seekers.

- A policy mix of moderate sugar tariffs and direct price subsidies for producers was recommended as a more reasonable approach than the sugar manufacturers' proposal. A direct producer price subsidy (which can be regarded as "*a price deficiency payment*") does not distort domestic prices, so the only harm to consumers is through its fiscal effect. It encourages domestic production and increases producer incomes. This policy mix effectively protects domestic producers without distorting domestic markets.

- A direct price subsidy to sugarcane farmers is relatively easy to implement, as sugarcane has few marketing outlets (a limited number of sugar mills). In this sense, sugar differs from rice, which has diverse and scattered market outlets. The total cost of the sugar producer subsidy is approximated by multiplying estimated sugar production by the unit subsidy. To do this properly, reliable data and information on estimated production figures in each mill are critical.

Key impacts of several of these studies has been to ensure that within the MoA, proposals for protection of domestic producers have been substantially moderated to levels that are acceptable to other related ministries. Most notable among these impacts was the reduction of early requests from within the MoA for rice tariffs of Rp.700 to more broadly acceptable levels of Rp.550.

Figure A1. Observed vs. AIDS-Predicted "Extreme" Expenditures, 1993, '96 and '99



This figure compares the 1993, 1996 and 1999 actual household expenditure patterns for selected foods across income deciles with those predicted by the corresponding LA-AIDS income elasticities. It demonstrates that LA-AIDS estimated income elasticities are much lower than observed patterns for "luxury" foods, and much higher than observed patterns for "inferior" foods.

Food Policy Impact on Nutrition

Origins

The Project's Nutrition Component had its immediate origins in a target of opportunity that presented itself through coordination with USAID/Indonesia's Health Office's work with Helen Keller International (HKI). USAID had, independently of FPSA, been funding a large-scale nutritional surveillance system being implemented by HKI. The data collected through this effort provided FPSA a unique opportunity to address the household-level nutrition linkages to the broader food policy agenda. FPSA thus undertook an informal partnership with HKI through which we have shared data and collaborated on its analysis.

Issues Addressed and their Relevance

The first issue that we addressed under this component was simply to assess the nutritional impact of Indonesia's drought and financial crisis of 1997/98. This subject had been addressed in several previous studies, all of which relied on more limited data sets and concluded that the nutritional consequences of the crisis had been quite limited. The analysis made possible with the HKI survey data, however, provided a much more detailed picture both in terms of the frequency of observation and the range of indicators available. In particular, collaborative research between FPSA and HKI uncovered substantial declines in child micronutrient status during the crisis.

This initial study, the findings of which are detailed below, raised several key questions. While average child micronutrient status declined during the crisis, the effect was undoubtedly more severe in some households and less severe in others. What, then, are the household-level determinants of child micronutrient status? FPSA analysts hypothesized that mothers' specific knowledge of nutrition, as opposed to formal schooling or even income, might be critical in leading to improved child micronutrient status. This hypothesis followed from the understanding that foods' micronutrient qualities are largely "invisible." That is, mothers cannot *see* the vitamin and mineral content of eggs – they have to *know* about that content and its importance to their children's development. And, if maternal nutrition knowledge is a critical determinant of child micronutrient status, how does it work? What is the mechanism through which such knowledge actually shapes outcomes? In this regard, we hypothesized that the effect was through budget allocations and food demand parameters.

Our initial concentration on the role of maternal nutrition knowledge in shaping child nutritional outcomes also led us to consider whether the benefits were apparent in the long run, or whether maternal nutrition knowledge was primarily a tool for short-run coping. We have also begun to address the question of whether the specific nutrition message that was extended to mothers in Central Java has yielded benefits to mothers' own nutritional status, or whether benefits have been limited to their children.

The question of child micronutrient status is particularly salient for Indonesia. This is the case because more "visible" forms of child under nutrition are relatively uncommon – at least by South Asian standards. In rural Central Java (the focus of our studies to date) the prevalence of severe child wasting, for instance, is only 6 percent. Severe stunting is more

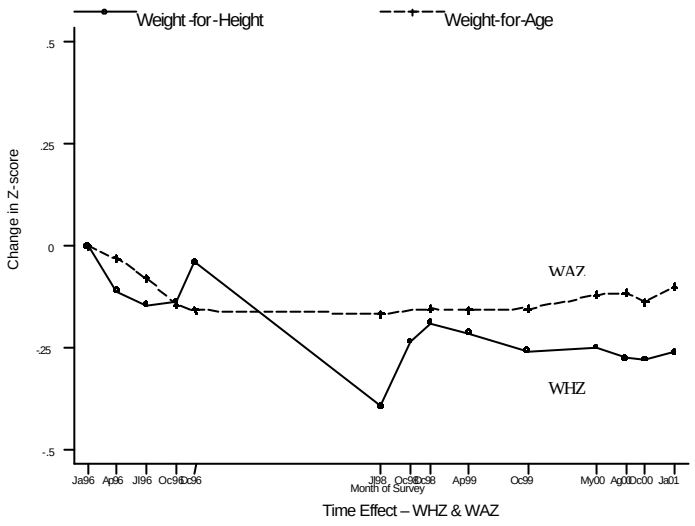
prevalent, affecting approximately one-third of children. Yet, iron deficiency anemia is both the most subtle and the most pervasive problem: approximately one-half of the children in rural Central Java are anemic. While children who are stunted have some possibility of "catching up" in growth later, severe iron deficiency in young children is associated with permanently impaired cognitive development, as well as increased rates of morbidity and mortality. FPSA's concentration on these issues is thus well justified.

Major Findings

Child Nutrition during the Crisis

Indonesia's economic crisis resulted not only in widespread macroeconomic devastation, but also doubled the cost of living for rural families. The consequent effect on poverty, though a subject of ongoing controversy, was also severe. The best estimates suggest that the headcount index of poverty increased from 7% to 20% during the peak of the crisis in 1998. The impact of these events on child nutrition, however, was more subtle.

Figure 1 tracks changes in mean weight-for-age (WAZ) and weight-for-height (WHZ) z-scores in children under five years old over the course of the crisis.[17] The dates at which these observations occur (along the horizontal axis) reflect the timing of the 14 rounds of household surveys on which the analysis is based. The trend for each of these anthropometric indicators is normalized to zero in the first survey round and each subsequent change is measured relative to that baseline.



WAZ is the most commonly used indicator of child nutritional status, and is probably also the least rapidly responsive indicator to changes in diet. It is clear from Figure 1 that child WAZ was essentially unaffected by the crisis. This suggests that households on average maintained their children's gross caloric intake, despite rapid increases in food prices.[18]

The picture begins to change, however, when we consider WHZ, which is more responsive than WAZ to changes in diet. The trend for WHZ reveals a more negative picture of the effect of the crisis on child nutrition. In this case, mean WHZ declined by over one-third of a standard deviation during the height of the crisis (between December 1996 and July 1998).

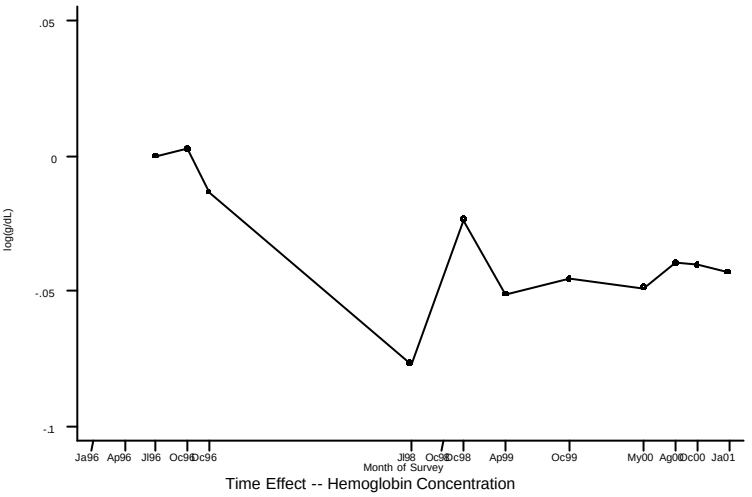
[17] Methodological details for the cohort decomposition underlying the analysis in this section are presented in Block, et. al. (2002).

[18] There is anecdotal evidence that this was accomplished, in part, by mothers diverting their own rice consumption to their children during the crisis. See the series of crisis bulletins by Helen Keller International.

This change is both statistically and biologically significant, reflecting an increase in the prevalence of wasting, which doubled from 6% to 12% of children during that period.[19]

Blood hemoglobin concentration provides a yet more revealing picture of crisis impacts -- one that reveals effects on dietary *quality* in addition to quantity. The peak crisis period in Indonesia was accompanied by substantial declines in household consumption of eggs and dark green leafy vegetables -- foods that are important sources of iron and other micronutrients. Decomposing trends in children's hemoglobin concentration reflects the expected consequence for micronutrient status.

Figure 2 shows the time path of child Hb (in logarithms) over the course of the crisis. The decline in mean child hemoglobin concentration from December 1996 to July 1998 was 6.1% (or 0.32% per month). In absolute terms, this corresponds to a decline of 0.68 g/dL over the entire period, which is greater than one standard deviation for the full sample of those cohorts. This decline represents an increase in the prevalence of anemia from its baseline of nearly 50% to over 70% over that period. Average child Hb tended to stabilize at a post-April 1999 average that was 0.5 g/dL lower than the level in the initial survey round.



Time Effect -- Hemoglobin Concentration

Indonesia's macroeconomic crisis thus had substantial microeconomic (even microscopic) effects. Families sacrificed to maintain their children's caloric intake (e.g., rice consumption); yet, under the circumstances something had to give, and what gave was consumption of high quality micronutrient-rich foods. This choice is reflected in substantial increases in the prevalence of iron deficiency anemia among children in rural Central Java during the peak crisis months. This finding speaks to a broader issue.

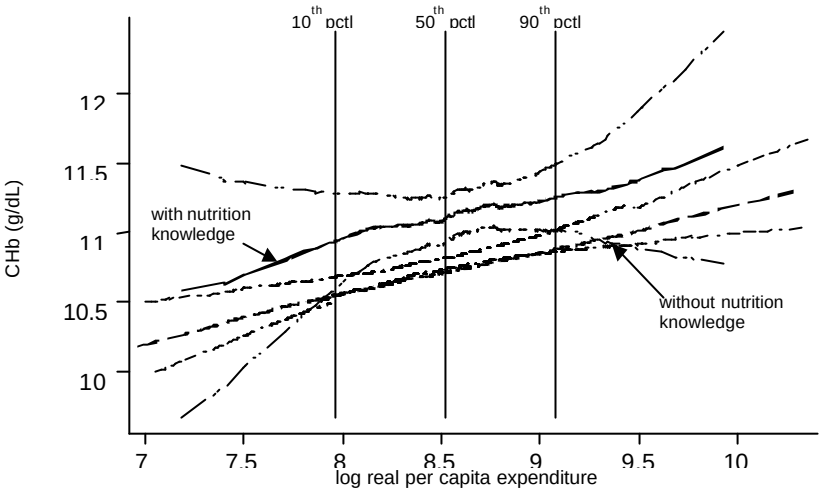
Nutrition Knowledge, Schooling, and Child Micronutrient Status

The extent to which micronutrient malnutrition is automatically ameliorated by income growth is unclear. Several studies have asserted that expenditure elasticities for *nutrients* may be close to zero, despite significantly higher expenditure elasticities for *food* as a result of consumer preferences for higher quality calories as income rises.[20] The implications of such substitution, particularly substitution towards red meat, are potentially positive with respect to iron deficiency anemia. Yet, substitution to meat typically occurs at relatively high levels of income, and may thus be too remote a solution for those at the lower end of the expenditure distribution.

[19] Wasting is defined as being beyond 2 standard deviations below the international mean of weight-for-height.
[20] Behrman and Deolalikar, 1987; Behrman and Wolfe, 1984; Pitt and Rosenzweig, 1985; Bouis and Haddad,1992; Subramanian and Deaton, 1996).

Thus, the search for other key determinants of child micronutrient status is critical. Maternal education, in particular, has played a central role in empirical studies of the demand for child health (almost universally defined by height-for-age). Many studies have found a strong positive association between maternal education and child height-for-age.[21] Yet, the "hidden" quality of micronutrient content in food suggests that improved intake of micronutrient-rich foods may depend importantly on consumers' nutrition knowledge in particular. Indeed, it is especially relevant to know whether maternal nutrition knowledge dominates formal schooling as a determinant of child micronutrient status. Evidence from rural Central Java indicates that it does.[22]

Figure 3 illustrates this point by tracing the relationship between child hemoglobin concentration and real household expenditures per adult equivalent, distinguishing between the children of mothers with and without nutrition knowledge.[23] The results suggest that at every level of per capita expenditure, mothers with nutrition knowledge demand greater micronutrient status in their children than do mothers without nutrition knowledge. At the sample median, the margin is approximately 0.4 g/dL – an increase sufficient to raise nearly 25% of anemic children in the sample to the 11.0 g/dL cutoff for anemia. The difference between outcomes for those with and without nutrition knowledge is not a function of expenditure levels, and the confidence intervals do not over lap for the middle eight deciles of the expenditure distribution.



While these results establish a reasonably strong reduced form relationship between maternal nutrition knowledge and child micronutrient outcomes (proxies by hemoglobin concentrations), they shed no light on the *mechanisms* through which nutrition knowledge operates to produce those outcomes.

The consumption of iron-rich foods is clearly critical to hemoglobin concentration (Bhargava, Bouis, and Scrimshaw, 2001). Thus, the logical place for an economist to look

[21] Behrman and Wolfe (1984, 1987), Barrera (1990), Alderman and Garcia (1994), Lavy, et.al. (1996), among others.

[22] This evidence is presented in full detail in Block (2002a).

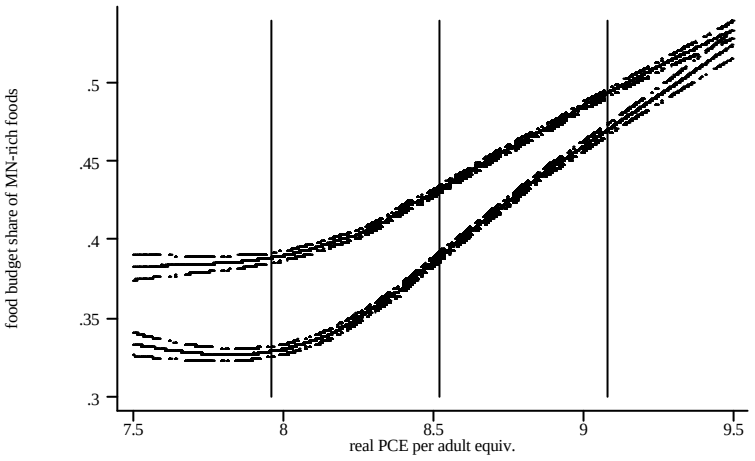
[23] The definition of nutrition knowledge adopted for this analysis is based on mothers' knowledge of the benefits of vitamin A-rich foods for their children. Mothers were asked to list those benefits of which they were aware. There were nine predetermined correct answers. The survey data include for each respondent whether or not she mentioned each of the nine correct answers. To construct the nutrition knowledge proxy, I count for each respondent the proportion of correct answers given from among the nine possibilities. To split the sample, as in Figure 3, two or more correct answers are required to be said to have nutrition knowledge. This accounts for approximately 13% of mothers sampled.

for a mechanism through which nutrition knowledge contributes to child micronutrient status is in its effect on the allocation of household expenditures and on demand parameters. Does maternal nutrition knowledge condition these parameters?

The Effect of Nutrition Knowledge on Food Budget Allocation and Demand

Once again combining non-parametric and traditional regression analysis, we find evidence that maternal nutrition knowledge strongly conditions the allocation of household food expenditures as well as the underlying demand parameters.[24] The household survey data from rural Central Java show that households with and without nutrition knowledge do not differ in their total food budget share (as a function of income).[25] Households at the 10th percentile of per capita expenditure allocate approximately 75% of total expenditures to food; this budget share falls to 60% at the 90th percentile of expenditures. Yet, the allocation of those similar food budgets differs considerably between the "knowledge" and "non-knowledge" households.

Figure 4 traces the share of food budgets allocated to micronutrient-rich foods as a function of real expenditures per adult equivalent, distinguishing between households with and without nutrition knowledge.[26] It is clear that households of mothers with nutrition knowledge devote larger shares of their food budget to micronutrient-rich foods. This difference is a declining function of per capita expenditures, but is large at the lower end of the distribution, and remains statistically significant (as indicated by the 95 percent confidence intervals) throughout the distribution. It is also clear that nutrition knowledge substitutes for income in driving the demand for micronutrient-rich foods: the mean budget share for the knowledge group at the 10th percentile of the expenditure distribution is not attained by the non-knowledge group until they reach the sample median expenditure level.[27]



If households with nutrition knowledge allocate substantially larger shares of their food budgets to micronutrient-rich foods while their total food budget share is not different from

[24] Detailed results are provided in Block (2002b).

[25] The criteria used to define nutrition knowledge in this section differs from that used in the previous section. I now define nutrition knowledge by whether or not mothers knew the appropriate age at which to introduce complementary feeding foods to their infants. This is a lower hurdle than applied in the case of knowledge of vitamin A. Approximately 55% of mothers knew the appropriate age (i.e., 4 months).

[26] "Micronutrient-rich foods" is taken here as a composite of beef, chicken, vegetables, milk, eggs, fruit, and fish. Block 2002b provides a similar analysis for eggs in particular.

[27] As in Figure 3, the apparent effect of nutrition knowledge in Figure 5 may be confounded with the effect of formal schooling. Yet, even more than before, limiting the sample to mothers with secondary education leaves the picture in Figure 5 largely unchanged.

that of non-knowledge households, then what is it that the knowledge households are *not* buying as intensively? The answer is rice.

These results have direct implications for understanding the impact of the Indonesian economic crisis on child nutrition. Recall that the most severe impact was not on gross caloric (e.g., rice) intake, but rather on the consumption of micronutrient-rich foods. The crisis-driven decline in child hemoglobin concentrations (Figure 2) reflects changes in mean over time. Yet, this implies that some children were more severely affected than the mean, and others less so. What are the household characteristics associated with different outcomes? The results presented above establish a relationship between maternal nutrition knowledge and child hemoglobin outcomes, and suggest that it is through its effect in conditioning food budget allocations and demand parameters that nutrition knowledge works to contribute to improved micronutritional outcomes. These issues are of primary importance in a context in which the poorest families allocate 75% of the total income to food, 40% of their total income to rice, and in which rice prices tripled over a period of 18 months.

The ability to cope with rapidly rising staple food prices may be the central benefit of nutrition knowledge in the context of Indonesia's crisis. The cross-price elasticity of demand between micronutrient-rich foods and rice thus becomes a central concern. Estimation of a demand function for micronutrient-rich food yields point estimates for the income elasticity, along with the own- and cross-price elasticities of demand.[28] Does nutrition knowledge alter these parameters?

FPSA research finds that the most striking difference between knowledge and non-knowledge households is precisely in the sensitivity of their micronutrient expenditures to increases in the price of rice. Various approaches to estimating those parameters yield essentially the same result: households without nutrition knowledge significantly reduce their expenditures on micronutrient-rich food when rice prices increase, while households with nutrition knowledge do not change their micronutrient expenditures as a function of rice prices. FPSA analysis has thus established the importance of maternal nutrition knowledge in determining child micronutrient outcomes.

FPSA Outreach Program

[28] Full results for the estimation of demand functions, as well as additional non-parametric results, are presented in Block, 2002b.

Objective and Structure.

The goal of the FPSA Outreach Program is to improve the quality of food and agricultural policy analysis at the regional and local levels in Indonesia. A two-tiered program of instructional workshops and practical applications is designed to achieve that goal by upgrading the analytical capabilities of current and future regional policy analysts. The initial intervention is a series of workshops and follow-on research projects for faculty who teach agricultural economics or economics in regional universities. During 2002, Scott Pearson and Sjaiful Bahri presented two-week workshops intended to create regional networks of faculty instructors and researchers in Java, Eastern Indonesia, and Sumatra/Kalimantan. Each workshop consisted of lectures/discussions and computer tutorials that introduced techniques of policy and project analysis within the framework of the Policy Analysis Matrix. Faculty participants then competed for small follow-on research grants that permit practical application of the techniques.

The second tier of the program is a series of one-week workshops that will be taught by the participating regional university faculty in Bahasa Indonesia for local policy analysts. The lectures and computer applications in these second workshops will focus specifically on the needs of local analysts to explain the scope and limits of regional food and agricultural policy and to elaborate techniques to carry out policy and project analysis. Carl Gotsch, Pearson, and Bahri have developed a broad range of teaching materials to be used in both kinds of workshops. PowerPoint presentations with elaborate notes, linked readings on food and agricultural policy analysis, computer tutorials with detailed manuals, and suggestions for designing research proposals, projects, and papers are available on the outreach portion of the project website (www.macrofoodpolicy.com). Supplemental CD-ROMs contain videos of Pearson's lectures and instructor copies of teaching materials not easily downloadable from the website.

Lectures in Two-week Workshops.

In 2000 and 2001, the outreach activities of the FPSA project focused on one- or two-day seminars in leading regional universities, such as IPB in Bogor and Gadjah Mada in Yogyakarta, to discuss project research on current food and agricultural policy issues. The current program of two-tiered workshops began taking shape in mid-2001. Experimental one-week workshops were held during August-September 2001 at Sam Ratulangi University in Manado, Gadjah Mada University in Yogyakarta, and Brawijaya University in Malang. During those initial workshops, the need for a complete range of teaching materials on policy analysis became apparent. The instructional materials now available on the project website or on supplemental CD-ROMs were developed between October 2001 and April 2002. The videos of Pearson's lectures were taken when Pearson was a guest lecturer in the USAID-sponsored MA program for faculty from Indonesian universities at Georgia State University in February 2002.

The lecture program contains twelve lectures on agricultural policy analysis. Pearson and Gotsch modified materials, including PowerPoint lectures and computer tutorials, which they had earlier developed when they taught a Masters level course in applied developmental

economics at the Food Research Institute, Stanford University during the first half of the 1990s. While experimenting with the content of the FPSA program, Bahri added substantially to the materials available in the computer tutorials. The instruction begins with a lecture that introduces a comprehensive framework for agricultural policy analysis consisting of objectives, strategies, policies, and constraints. The two following lectures present the Policy Analysis Matrix (PAM), conceptually and empirically, and show how it can aid the analysis of regional policies and projects. Then three lectures deal with product markets, covering price determination and the gains from trade, policies that raise product prices, and policies that lower product prices. Next are two talks that make the critical linkages between micro-economic and macro-economic variables; one looks at policies and failures in factor markets (for labor, capital, and land), and the other examines the importance of exchange rate policy for food and agriculture. The ninth and tenth lectures deal with central applications of PAM analysis – an introduction to PAM-based project appraisal, and how the PAM approach can deal with environmental externalities. The penultimate talk is a synthesis and summary that shows how PAM analysis complements standard partial equilibrium analysis within an integrated framework for policy analysis. The last talk introduces how participants can communicate PAM results to policymakers and their technical staffs – by writing convincing policy papers and by presenting effective seminars.

Pearson and Bahri taught the first of the three planned workshops for regional university lecturers at Padjajaran University, Bandung in May 2002. Twenty-two faculty members in agricultural economics or economics from twelve regional universities on Java, both public and private, attended that workshop. The instructional vehicles included lectures, discussions, teaching demonstrations, computer tutorials, field trips, presentations by participants (in English, using Powerpoint), instruction in writing research proposals, and planning of future research. A central lesson from that workshop was the desirability of designing simplified teaching materials aimed specifically at the second tier of one-week workshops for local policy analysts.

A two-week workshop, held at Sam Ratulangi University in Manado in July 2002, was the second of three teaching seminars to introduce the Policy Analysis Matrix (PAM) approach to lecturers in Indonesia's regional universities. The Manado workshop comprised 23 agricultural economists and economists from 11 universities in eastern Indonesia – 6 faculty members from North Sulawesi, 4 from Papua, 1 from East Kalimantan, and 2 each from South Sulawesi, Central Sulawesi, Southeast Sulawesi, NTB, NTT, and Maluku. The course focused on teaching PAM concepts and practical applications in analyzing agricultural policies and projects, introduced procedures for writing research proposals and carrying out applied research, and discussed how to simplify PAM teaching for future regional workshops for local policy analysts. The modified materials taught in that workshop (PowerPoint lectures, computer tutorials, selected readings) are all available on the FPSA project website.

Following the tragic events in Bali in mid-October, Pearson was forced to make an early departure from Indonesia and thus could not participate in the third two-week workshop, which was scheduled for the third and fourth weeks of October in Lampung, for 23 faculty from 12 universities in Sumatra and Kalimantan (other than East Kalimantan). In Pearson's absence, Bahri taught an abbreviated, one-week workshop in Banda Lampung emphasizing the basic concepts of the PAM approach and their application through a computer tutorial.

The group then rescheduled the second week of the workshop for February 2003 at which time both Pearson and Bahri completed the full two-week program for the Sumatra and West Kalimantan participants. The final two-week workshop for the 4th network group took place in Makassar in October, 2003. Again, following the Marriott bombing, Pearson was not able to be on site in Makassar but participated by internet from his U.S. base. Finally, the total number of participants in the University outreach network by this time totaled 104 lecturers representing 45 regional universities from Aceh to West Papua.

Prior to teaching the two-week workshops, Pearson and Bahri traveled to the host universities to meet with the rectors and their deans, explain the purposes of the outreach program and its potential impact in their regions, and review organizational arrangements and teaching and computer facilities. During each of the workshops, Pearson also met with high-ranking provincial officials and their staffs and presented a two-hour public lecture that introduced the use of PAM in regional agricultural policy analysis to policy makers, members of university faculties, district officers (from BAPPEDA and the Dinases), and the media.

Research Grants for Network Participants.

The Outreach activity had a small grants program to enable several faculty members in the regional university network to carry out research to improve their understanding of PAM analysis. Each grant was for about $5000, and researchers select topics dealing with aspects of agricultural production in their home regions. The primary purpose of the research program was to deepen the ability of the lecturers to understand and carry out policy and project analysis. These professionals are the principal providers of consulting services in doing analysis in the regions, in their university classes they are the teachers of future local policy analysts, and they agreed through their participation in this FPSA-sponsored program to hold regional 3- or 5-day workshops in which they will assist current policy and project analysts to upgrade their skills. Undertaking applied research is essential for understanding the strengths and limitations of PAM analysis of food and agricultural policies and projects.

The first two grants were awarded after the experimental workshop held in Manado in August 2001. Lecturers from Sam Ratulangi University are carrying out parallel studies of cloves and coconuts in North Sulawesi. Following a lengthy process of revising their proposals and field research designs, they have completed their fieldwork and written several drafts. Staff from FPSA have provided detailed comments on all phases of their work. Pearson and Bahri worked with both research teams in Manado in July in off-hours from the two-week workshop.

The participants in the May workshop, held in Bandung, submitted a total of 11 research proposals. Budget constraints permitted the funding of 7 of these proposals: soybeans in Blitar (Brawijaya University); soybeans in Jember (Jember University); tobacco in Jember (Jember University); broilers in Tasikmalaya (Siliwangi University); onions in Brebes (Sebelas Maret University); beef in Bandung (Padjadjaran University); and seed potatoes in Bandung (Padjadjaran University and Garut University). The Manado group submitted a total of 7 proposals of which 4 were funded: rice in Minahasa (Sam Ratulangi University); rice in South Sulawesi (Hasanuddin University); soybeans in NTB (Mataram University);

and soybeans in NTT (Nusa Cendana University). With the final two network groups Lampung and Makassar, nine additional grants were competitively awarded.

These field research reports, twenty-two in total number, proved to be one of the best mechanisms for members of these research teams to apply the PAM techniques in a wide diversity of commodities and field situations. Pearson in particular, but also Bahri and Gotsch, devoted a tremendous amount of excellent time and energy in reviewing all aspects of the field research efforts. From design of the policy and research issues to address with field data to analysis of the data and proper write-up of research results this process proved extremely useful for nearly all participants.

Follow-on Three-day Workshops.

The Jember 3-day workshop in October 2002 was designed to be the first meeting of the Java-based faculty members who participated in the Bandung two-week PAM workshop in May. The two Bandung participants from Jember University, who were principally responsible for organizing the workshop, put together a group of 15 faculty from Jember University and from other universities located in Jember who wanted to learn the PAM approach to agricultural policy and project analysis, and they asked if that group could receive special tutoring from Bahri and also attend the sessions for the Bandung group. Bahri thus went to Jember two days early and taught that group the basic PAM concepts and demonstrated the main computer tutorials from the project website. That satellite group attended all of the regular sessions of the workshop and many of its members are expected later to join in organizing workshops for regional policy analysts. Members of that group also hope to participate in future two-week workshops, compete for follow-on research grants, and become regular members of the FPSA research network.

The major item on the agenda for the Bandung group during the October 2002 meeting in Jember was a critical review of progress in the research projects that the FPSA is funding. The main purpose of these grants was to provide participants with the opportunity to solidify their understanding of PAM analysis by carrying out field-based studies. One person from each research team gave a PowerPoint presentation that discussed the policy issues being addressed in the study, the plan of research, problems encountered in fieldwork of computer analysis of data, interpretation of preliminary results, and expected policy impacts of the eventual research findings. Pearson and Bahri gave detailed commentaries on successes and, especially, on problems. The participants were generous and helpful in making comments and suggestions to one another. This exercise, which started as a mid-course review, thus ended as an effective teaching experience. A key lesson from the three-day, follow-on workshop in Jember was the desirability of holding regular meetings with network participants to assess progress and problems in their research and their teaching of PAM-based policy and project analysis.

A second central goal of the Jember workshop was to discuss how to organize and teach future workshops for regional policy analysts aimed at local government analysts. After the Bandung workshop in May, Gotsch and Pearson had added a new section on regional workshops to the Outreach portion of the project website. The Jember participants worked through all of these new materials – a trimmed down set of six key lectures that the

participants can adapt for their own PAM teaching at regional workshops, computer tutorials designed for use in those workshops, and a special "workshop reader" that contains about 50 pages of essential reading on PAM and project analysis for busy policy analysts. Gotsch also developed and placed on the project website an additional demonstration lecture and computer tutorial on how to apply the PAM in Benefit-Cost analysis. The participants agreed that these new materials were especially effective in assisting their teaching of local policy analysts. Similar follow-on three-day workshops were held during FPSA's last year in each of the regions and involving each of the geographic networks. These workshops included discussions focused on successes and problems in carrying out policy research and in teaching policy and project analysis in regional workshops for local policy analysts and in university courses

The National Outreach Conference

In late January, 2004, the national conference for 75 members of the network was held in Bogor. Various research groups presented PowerPoint presentations of their field research results which were then discussed among the group as to lessons learned from the entire perspective of the Outreach program. A subsequent product from these discussions and from the entire experience of the applied field research studies included a comprehensive "Lessons Leraned" manual prepared by Pearson and Gotsch. A special session focused on ideas from network members on the desirability and options for sustaining the network following the close-down of the FPSA program. They developed a strategy for this purpose. One day of the conference was dedicated to presentations by key Indonesian agricultural policy makers and FPSA team members from the Jakarta-Bogor area. These presentations and subsequent discussions focused on the development of key policy initiatives during the period of the FPSA program, results and challenges for the future. This program was opened by the Minister of Agriculture, the Deputy Chairman of BAPPENAS for Environment and Agriculture, and the Deputy Director of USAID.

The final product from the FPSA university outreach program is a teaching and research manual which will be distributed to universities with economics and agricultural economics faculties throughout Indonesia, largely through the network members. *Applications of the Policy Analysis Matrix in Indonesian Agriculture*, written by Scott Pearson, Carl Gotsch and Sjaiful Bahri, includes the twelve lectures covering PAM, the lessons learned manual, eight of the best case studies/field research reports, plus a computer tutorial. The book will be available in both Bahassa Indonesia and English and we expect it to be widely used in the teaching of agricultural policy in universities throughout Indonesia.