

WORKING PAPER NO. 4

Indonesian Food Policy Program

Website: www.macrofoodpolicy.com

An Approach to Macro Food Policy

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

MARCH 2001

An Approach to Macro Food Policy

Table of Contents

I. Strategic Vision	1
A. Food Security	1
B. A Rural-Oriented Development Strategy	3
II. Defining the Problems	6
A. Agricultural Productivity	7
B. Sustainability	8
C. Rural-Urban Relationships During the Structural Transformation	9
III. Issues and Guiding Principles	11
A. Diversification	11
B. Market Orientation and Commercialization	13
C. Public-Private Relationships for a Dynamic Rural Economy	16
<i>The Role of Markets</i>	16
<i>The Role of Government</i>	18
<i>Creation of Human Capital</i>	18
<i>Technology Generation</i>	19
<i>Infrastructure and the Integration of Markets</i>	21
<i>Macroeconomic Stability</i>	23
IV. Policy Analysis	24
A. The Changing Structure of the World Rice Market	25
B. Rice Prices and Poverty Alleviation	28
C. Nutrition and Household Welfare	32
D. Farm Incomes and the Rural Economy	36

Appendixes

Appendix I	A Structural Model of the World Rice Market Table 1 and Figure 1
Appendix II	Impact of Alternative Rice Tariffs Table 1 and Table 2
Appendix III	Nutrition Monitoring Data, Helen Keller International
Appendix IV	Incomes from Rice Production in Five Kabupatens Table 1, Table 2, Figure 1 and Figure 2

An Approach to Macro Food Policy

I. Strategic Vision

Macro food policy has three components that, in combination, ensure the country's food security: farm incomes at adequate levels, consumers with access to enough nutrients, and the poor linked into rapid economic growth. A dynamic rural economy is the key to integrating all three components. Food policy analysis is the process of identifying the policies in all sectors needed to create such rural dynamism and to incorporate the poor into its benefits. In particular, the analysis examines links between the macro economy and the rural economy and then traces the impact of changes in both sectors on the poor, especially via changes in food production, consumption, and prices.

This "macro" perspective on the food economy helps integrate Indonesia's food security at the household level with national food markets. Food security at both levels enhances the prospects for rapid economic growth, poverty alleviation, and broad-based participation by citizens in higher living standards. No country has been able to sustain the process of economic growth without first solving the problem of food security, or in Robert Fogel's term, the "escape from hunger." Rapid economic growth that reaches the poor is part of this solution, but specific attention to food security is also needed to accelerate and sustain the process.

A. Food Security

The close historical connection between improvements in food security and alleviation of poverty guides the search for government interventions that improve the degree of food security at both the household and national levels. To miss this link by designing food security strategies independently of growth strategies aimed at reaching

the poor is to miss much of the synergy possible from a coherent macro food policy. Alternatively, failure to establish this link from the macro side will cause the country to miss many growth opportunities.

For the purposes of government policy, food security can be thought of as a continuous spectrum – from the micro perspective of nutritional well-being of individuals all the way to the macro perspective that assures regular supplies of food in national, regional, and local markets. The challenge, and one important objective of food policy, is to create an environment where access to purchasing power, nutritional knowledge, and health care within each individual household assures adequate demand for food in those markets, thus guaranteeing food security at both ends of the micro-macro spectrum. Creating (and sustaining) food security at both the micro and macro levels is a complicated task for government as it attempts to create the type of open, market-oriented economy that seems most likely to generate rapid growth and alleviation of poverty.

Food security depends on the successful coordination and integration of three policy arenas – rapid growth in the macro economy, poverty alleviation through rural economic growth, and dynamic stability of the food system. The complexity for food policy arises because each of these three topics is linked causally to the other two through market and behavioral mechanisms. Rapid growth in the macro economy must be designed to reach the poor. Otherwise, poverty alleviation is delayed and more direct, short-run interventions to reach the poor, such as the targeted rice distribution program (OPK), will not be sustainable in the long run. Similarly, raising poor households above the poverty line does not guarantee their food security if food supplies disappear from markets or prices rise beyond their means.

Indonesia has an impressive record over the past 30 years of integrating these three policy agendas. Income distribution improved (at least from 1970 to 1995) during a

quarter century of extremely rapid growth in average incomes per capita. BULOG stabilized the domestic rice economy by keeping prices on the long-run trend of prices in the world market. The financial crisis that started in 1997, and especially the political revolution that started in May 1998, have called into question both the strategic approach and the institutions that generated this record.

However, these challenges are not new. Even by the mid-1980s, the rice-oriented approach to food security was being questioned and the “high-cost” economy in the agro-industrial sector had been identified as a major impediment to greater value added from Indonesia’s comparative advantage in commodity production. By the early 1990s, BULOG was being urged to reconsider its role in the rice economy, to allow a greater role for market forces, and to be more concerned about targeting rice subsidies regionally and to victims of natural disasters and crop failures. Most of the reforms now being proposed for the food sector have their origins in problems identified a decade or more ago.

B. A Rural-Oriented Development Strategy

There is widespread agreement that a rural-oriented development strategy, at least for the first decade of the 21st century, will be the key to linking rapid growth to poverty alleviation. Both Indonesia’s own experience and comparative lessons from the rest of East and Southeast Asia show conclusively that growth of the rural economy helps the poor more than growth in the urban industrial sector and that such growth also contributes to more rapid growth in the overall economy. The question is how to do it, especially now that rice is no longer the engine of growth in rural areas. From the point of view of food security, the issue is how opportunities for the rural economy to grow will influence the

stability of the food economy and the importance of continued food subsidies targeted directly to the poor.

The trade-offs are crucial and the institutional mechanisms for coping with them are unclear. For example, can food security be maintained for small rice farmers by protecting them from imports? Are more profitable cropping systems, or off-farm employment, available to supplement the income from rice farming? Can rice prices be stabilized by government procurement during the main harvest if the only purpose is to supply the OPK program? Is stability threatened by the fact that rice trade is in the hands of commercial traders, whose profitability depends on price margins and price variability? Can individual households build the assets and knowledge required to cope with instability in the food system on their own? Or will poor households continue to require targeted subsidies to ensure that they do not fall below the poverty line in times of scarcity, even though they are able to participate in a rapidly growing market economy?

These are very difficult questions and the main institution used historically to address them, BULOG, is now facing considerable restructuring—financially, legally, and managerially—with substantial changes in its terms of reference. But the policy dilemma remains: if stabilizing the food economy is an important element of food security, how can it be accomplished?

A partial resolution of this dilemma is to focus BULOG's logistical operations on targeted poverty alleviation. Given the continued importance of rice to the poor, both in income generation for rice farmers and as food intake by consumers, the OPK program offers an opportunity to target rice procurement during the harvest season in the major surplus areas, thus raising market prices to farmers, and then to deliver this rice in poor regions or directly to poor consumers. One complication, noted in the press as well as

observed from field research, is that OPK deliveries in rural areas can depress local rice prices and displace small-scale traders.

Furthermore, the OPK program is not a mechanism for “protecting” the poor from the substantially higher rice prices that would result from the imposition of high tariffs on rice imports. Any effective tariff above ten percent eliminates the real income transfer to the poor from the OPK program, thus making them worse off (because of the higher market prices for the non-OPK rice purchased by the poor). In the longer run, continued protection of Indonesia’s rice farmers will keep them in an occupation with little opportunity for rapid income growth. The point of a more open trade regime is to encourage the movement of resources into areas of Indonesia’s long-run comparative advantage. Maintaining *high* protection for rice farmers impedes this goal in two ways – by distorting the allocation of resources directly, and by contributing to the continuation of a high-cost economy, thus reducing investments in the agro-industrial sector and other sectors because of the impact on wages of high rice prices.

Ensuring Indonesia’s food security will not be easy, but the country does have substantial experience, much of it quite positive and successful, in coordinating and implementing the complex array of policies that bring it about. New political institutions, much more decentralized decision-making, and more publicly-accountable financial mechanisms mean the lessons from historical experience must be re-examined to make them relevant to future challenges. But no society reinvents itself overnight, and some continuity is not just inevitable, but desirable as well. The challenge is to re-ignite growth in the rural economy. Such growth will require a combination of short-run and long-run measures. In the short run, switches to higher valued crop and livestock systems and better integration of commodity and factor markets are feasible. In the long run, growth in the rural economy will depend on development and application of new technology that

raises productivity. Such growth will be the quickest and surest path to food security and poverty alleviation.

II. Defining the Problems

Indonesia was a leader in the agricultural revolution that swept through East and Southeast Asia after the mid-1960s. The living standards of most Indonesian people have improved dramatically, despite the setbacks from the Asian financial crisis. Far fewer people are trapped in poverty than in the mid-1960s, food security is enhanced by surpluses of rice available in regional markets, economies have become highly diversified as the manufacturing sector has outgrown the agricultural sector, and export-oriented companies are competitive in international markets. Throughout the region, and including Indonesia, governments are becoming less involved in day-to-day production, regulation, and control of their economies. Instead, they are increasingly focused on providing a stable macroeconomic and legal environment in which the private sector is the engine of growth.

These changes are welcome, but they complicate the tasks of policymakers as well. Now it is even more difficult to design and coordinate relationships among sectors so that the growth process is rapid, equitable, and sustainable. The complexity is especially clear in the example of food security, which now requires an integration of macroeconomic policies that affect the speed of economic growth, sectoral policies and institutional changes that affect the distribution of that growth, and implementation of food distribution and stabilization schemes that guarantee continued access to food by the poor.

Underneath this complexity are three basic issues that require research and analysis: (1) how to raise productivity in agriculture per hectare and per worker, (2) how

to sustain that productivity in the future, and (3) how to ensure that the productivity of the rural labor force and its per capita income keep pace with productivity and per capita income in the urban sector. It is no coincidence that all three issues revolve around productivity. Higher productivity is the only way to achieve and sustain higher living standards in the long run, and even this will be inadequate without rural land consolidation because small-scale farmers with less than 0.3-0.4 hectares cannot survive even when their productivity is high.

Income transfers, whether through price policy or direct government subsidies, do not build the economic foundation to support broad-based increases in welfare. Food policy thus must stimulate increases in productivity in the economy, especially the rural economy. Concern for the short-run food intake of the poor, and their nutritional well-being, is also critically important. But analysts must not lose sight of the vehicles that will solve the problem of poverty, and they all involve higher productivity of resource use in the economy. Income transfers within a fixed economic pie are not a sustainable solution to poverty or food security, a point as valid in 2001 as when Professor Emil Salim made it in 1969.

A. Agricultural Productivity

Indonesia has a particularly difficult task in raising agricultural productivity after the significant gains from the first “green revolution.” Rice yields have stagnated for a decade, and there is only limited evidence of gains in other crops or in the livestock sector. What will be the sources of growth for the higher yields that will form the basis of a second “green revolution?” Fertilizer and labor are already used very intensively, so new biological technologies and improved management of all inputs at the farm level will be needed for the next round of productivity gains. Both the technologies and the

management techniques will have to be fine-tuned to local environments, thus putting great stress on the central research centers to develop locally appropriate varieties and cultivation practices from the basic scientific breakthroughs that are promised by IRRI and other centers in the CGIAR system. In the first instance, this need for technologies to fit local environments might correspond with government efforts to decentralize political decision making and resource management. But the human and scientific resources to implement such an effort are inadequate at the moment, and it will take time to build the local institutions that can carry out these tasks. Thus productivity gains from new technologies will be mostly in the medium to long run.

B. Sustainability

Closely connected to the problem of how to raise agricultural productivity is the issue of how to sustain the increases. Almost every component of modern agriculture raises concerns: the possibility that soil fertility is declining, lower efficiency of conversion of fertilizer into useful output, reduced biodiversity and long-run problems of managing pests, weeds, and diseases in highly productive ecosystems, and growing instability of weather and rainfall patterns—possibly a function of global climate change. Sustainability is an issue with little integration of good science with sound economics and policy analysis. But meeting the challenge will require precisely this integration because sustainability must satisfy three criteria simultaneously: environmental, economic, and political.

C. Rural-Urban Relationships During the Structural Transformation

The third basic issue involves the relationship between the rural and urban economies during the process of industrialization. In all successful economies, incomes earned from farming tend to lag behind those earned in other occupations because labor

productivity increases as workers shift from agriculture to manufacturing or the modern service sector—the structural transformation. In Indonesia, there has been a growing spread between the wages earned by unskilled agricultural workers and new entrants into labor-intensive manufacturing sectors such as garments and electronics. Until the financial crisis in the late 1990s, rice growing was kept highly profitable through extensive fertilizer subsidies, virtually free irrigation water, BULOG's price stabilization program, and a well-developed rural infrastructure that ensured low marketing margins for rice. These benefits did not extend as fully to other crops or products with higher value added. Investments in rural education and health helped build human capital, but asset accumulation by farmers has been limited and small farm size is the major cause of rural poverty.

The challenge is to modernize Indonesian agriculture, diversify away from its heavy dependence on rice, integrate the sector more fully into the industrial sector, especially through greater processing activities, and still keep rural incomes high enough to avoid rapid migration of workers to cities. This challenge is not unique to Indonesia. It is the heart of the tension generated by all successful structural transformations. But often the political pressures to resolve the tension can distort policy making and cause massive budget losses, burdens on consumers, and conflicts with trading partners. A food policy that finds a way to help farmers cope with the transition from a poor and rural economy to a rich and urban economy would pay very high dividends.

Policy making during the structural transformation thus becomes the organizing framework for food policy analysis. The advantage of this perspective is the need to keep long-run objectives and economic forces in focus, at the same time that short-run crises receive urgent attention. For example, even as the government attempted to solve the problem of low prices for rice farmers during the first harvest of the new millennium, the

structural transformation had already reduced the significance of rice to the national economy, to consumers, and even to rural incomes. The majority of rice-producing families now earn more income from non-rice sources, including non-farm sources, than they do from producing and selling rice. Growing rice is a source of income competitive with non-farm wages for only a small share of rural households (see Table 2 in Appendix IV), and the proportion will fall quickly in the future. If efforts to raise incomes of rice farmers are not consistent with these longer run forces, the efforts will at best be expensive palliatives that slow down the movement of resources to higher paid alternatives. At worst, they will bankrupt the government and cost it all its political credibility

Successful food policy seeks more efficient paths. Although the path followed by the Indonesian food economy over the next decade and beyond will depend on responses to specific challenges and opportunities, any successful path will involve greater diversification of agricultural production and consumption, continued commercialization and market orientation, and a healthy balance between the roles of the public and private sectors. At the core will be the welfare of the rural household. Mechanisms to enhance asset accumulation, including land consolidation and larger farm enterprises, will be needed for those households that remain competitive as agricultural producers. More effective rural credit systems will help this process, but institutional changes in land tenure are also likely to be needed. The key to the process will be a focus on raising the incomes of rural households, not just rice farmers.

III. Issues and Guiding Principles

It is understandable that a newly democratic Indonesia is determined to find more effective paths to the rapid alleviation of poverty and to speed the inclusion of previously

excluded communities into a more just and broad-based economy. The only question is how to do that within a sustainable institutional and economic framework. Freedom is not just a political reality; it carries important economic dimensions as well. History has shown that competitive markets are the only institution able to accommodate the simultaneous demands for political and economic freedom. This lesson and others from modern economic history provide important guidelines on the issues that Indonesian food policy analysts will face and the approaches that are worth consideration.

A. Diversification

Diversification of agricultural production and food consumption is part of the long-run structural transformation and the role agriculture plays in it. This long-run force notwithstanding, and despite longstanding concerns about an over-reliance on rice and despite all past efforts to diversify the Indonesian diet, rice remains the overwhelming source of food for the average Indonesian. Indeed, the most recent food balance sheet shows that more than half of calories and over 40 percent of protein for an average Indonesian still are supplied by rice. As the economy recovers from the financial crisis, and incomes again rise at a rapid rate, this dependence on rice will slowly fade, just as it has in other wealthier Asian societies. The food patterns of consumers in these societies point the way to future changes in Indonesia as affluence spreads and the population is increasingly urbanized. These are the two key forces – income growth and urbanization – that speed diversification of the diet and, through demand and efficient market linkages, diversification of agricultural production. Both are driven by basic macroeconomic trends and the structural transformation.

Wealthier and more urbanized Indonesian consumers will demand much greater variety from their food stores and restaurants. This variety will come in the form of many

different commodities, including exotic fruits and vegetables, and in different forms of the same commodity. Potatoes, for example, will be available in markets in fresh form, as potato chips, as frozen French fries, and in pre-cooked dinners. Variety will also include the location where meals are eaten, and more dining outside the home will continue to stimulate entrepreneurs to find out what these consumers want to eat. Convenience will also be an element of diversity, as time becomes a more valuable commodity. Fast food and prepared meals, in restaurants, small *warungs*, and in the home, will increasingly serve this demand for convenience.

As part of the diversification of the diet, consumers will demand higher quality foods from the market. This quality has both an economic and nutritional dimension. Although many nutritional scientists worry about the nutritional quality of the Western diet, high in sugar, saturated fats, sodium, and preservatives, major nutritional gains were made in the past century, especially as livestock products provided much more accessible micronutrients. Diets of educated consumers are becoming more health conscious, and Indonesian consumers will increasingly follow these trends as incomes and education levels continue to improve.

The economic dimension of higher food quality is already reflected in Indonesian food markets. Within any category of food, better quality is reflected in improved grades and standards and higher prices paid by consumers who value greater flavor, freshness, better appearance, or more hygienic packaging. Diverse quality, whether in variety and milling standards for rice, an array of sizes, packaging and freshness for fruits and vegetables, or cuts and tenderness of meat, enhances consumer welfare when informed decisions are based on full information and appropriate price differentials. Major changes will be needed in the next decade as the food marketing system copes with the technology,

grades and standards, and information systems required to provide consumers with the higher, and more diverse, qualities of food they will demand.

Dietary diversification will also reflect a heightened concern among more affluent consumers for food safety. All countries need a safe supply of food. The questions for food policy analysts are “how safe” and “how much will it cost to make it that safe.” Increasingly affluent and educated consumers will want those questions answered.

Food safety involves more than testing the food supply for contaminants and establishing technical tolerances for action. Many economic issues involving food safety are also important. The costs of compliance with food safety regulations, and the costs of testing, must be balanced against the economic and health gains to the population. The field of risk assessment with respect to food safety can become highly politicized, as the current debate over genetically modified (GM) foods in Europe and the United States indicates. The potential depth of political reaction can be significant if food dangers are detected publicly before government inspectors have discovered a problem or acted on it. Maintaining a balance between costs and benefits of regulating food safety will be a difficult task for Indonesia’s food safety agency.

B. Market Orientation and Commercialization

During the New Order, the government intervened heavily in the food economy. It invested in roads, irrigation systems, agricultural research stations and extension facilities, fertilizer subsidies, and the institutional capacity to stabilize rice prices. Government policy protected Indonesian farmers from foreign supplies of sugar, soybeans, and maize. Consumers were forced to pay high prices for wheat flour products, thus reserving more of the domestic food market for Indonesian rice farmers. Supplies of meat, cooking oil, and even *cabe merah* were monitored carefully, and BULOG did not hesitate to step into

these food markets if supplies were disrupted and prices seemed too high. For virtually all significant food commodities, traders, to be successful in business, usually had to keep a close eye on what the government was doing. Privileged traders often had inside knowledge about government plans, creating monopoly rents and distorted investments..

In a larger and more diverse Indonesian food economy, driven by increasingly wealthy and educated consumers, a democratic and transparent government will want to phase out this degree of control over food marketing because it will not be necessary or desirable. Improved transportation networks, faster and more accessible communication systems (including e-mail and the Internet), greater openness to foreign competition, and more assertive consumers empowered by NGOs and greater political voice will combine to make the Indonesian food economy far more market-oriented and self-regulating through the forces of competition. This increased market orientation will be reflected in three separate ways.

First, agriculture will become more commercially oriented as farmers grow less for direct subsistence consumption by their own households and grow more in response to market opportunities that offer higher incomes. Marketing systems will be needed that connect consumer demand for higher quality foods and greater diversity with farmers who are eager to meet that demand by growing higher valued products. Such marketing systems cannot be built or controlled by government agencies. Not only will the food economy be more market oriented, the private sector will make nearly all the investments and carry out most of the activities that take the economy in that direction. Multiple taxes on market activities – an unintended result of the early stages of decentralization – would slow down this process significantly, and condemn farmers to poverty.

The second dimension of greater market orientation will be increased international trade in food and agricultural commodities. This trade will flow in both directions.

Indonesian consumers will want regular access to food products not easily or cheaply available from domestic producers – wheat products, temperate fruits and vegetables, and processed foods. At the same time, foreign consumers will want more of the many specialized foods available in Indonesian markets. Meeting the cost competition and quality challenges from foreign competitors in these markets will require continued investments in processing and storage technology, market research, and regular supplies of raw materials. But in a deregulated environment where domestic processors face a level playing field, there is ample evidence that the balance of trade in the food and agricultural sector will continue to be highly favorable to the Indonesian balance of payments and to its food security. Certainly, Indonesia's food security will not depend on year-to-year levels of rice imports.

The third aspect of increased market orientation for the food economy in the 21st century will come from the government itself, as it continues to deregulate the Indonesian economy, including the food and agricultural economy. Economic growth can only be brought back to satisfactory rates by lowering the cost structure of the Indonesian economy. This goal will be achieved through continued efforts to end market controls at national and local levels that now cost producers and consumers hundreds of millions of dollars each year, while improving quality and safety standards. These steps will also create tens of thousands of new jobs, many of them in the food processing industries that gain access to raw materials and inputs at competitive prices. In turn, these industries will then be able to penetrate export markets with Indonesian agro-industrial products. A greater market orientation for the food economy, while partly a natural and inevitable result of economic growth and the structural transformation, will also be consciously stimulated by government policies and pro-competition activities.

C. Public-Private Relationships for a Dynamic Rural Economy

Sustainable poverty alleviation and food security at the household level can only be achieved through long-term growth of income. In turn, income growth must be based on increases in productivity, and productivity growth will rely on a dynamic rural economy. The diversity of the rural economy requires that productivity growth occur not only in agriculture, but also in industry, trade, and services, because all of these sectors account for a substantial share of income in rural Indonesia. However, agriculture does have a special role to play in jump-starting the process of economy-wide growth, especially in the current Indonesian economy. Furthermore, cross-country comparative research has shown that growth in the agricultural sector contributes more to poverty alleviation than does growth elsewhere in the economy, as long as both sectors are growing rapidly.

The Role of Markets

Creation of a dynamic rural economy can only occur in a market driven environment. Government has a key role to play in fostering growth, but government cannot be the main engine of productivity growth in rural areas. This lesson has been learned many times over, often at great cost. The rural economies of the former Soviet Union and Eastern Europe were grossly inefficient and did not serve to improve the living standards of their people. Government monopolies on trade in agricultural products inevitably harm farmer interests, as is clearly shown by the Latin American and African experiences with commodity boards. In Indonesia, local and national monopolies enjoyed by special interest groups (either inside or outside government) have produced the same result – less choice and lower living standards for farmers.

Fortunately, there are many positive lessons as well. Productivity growth in agriculture surged when China abandoned its control of the rural economy in 1978. As

Vietnam began to introduce market-oriented reforms in agriculture in 1989, productivity growth accelerated so quickly that Vietnam moved from being a rice importer to the world's second-leading rice exporter.

Recent history has shown conclusively that a network of well-functioning and efficient markets is the only mechanism that allows rural citizens to realize their full potential as productive members of society. Governments cannot directly make farmers productive because agriculture is exceedingly complex, heterogeneous, and risky. Farmers operate in a constantly changing physical and economic environment that requires a wealth of micro-level information for efficient decision-making. The amount of information required makes it impossible for government bureaucrats to design sensible micro-level interventions. Farmers must be free to make these choices, both on grounds of economic efficiency and because freedom itself is an important component of human welfare. Farmers should not be told what to grow, when to grow it, or to whom to sell it. Only the farmers themselves have the ability to make such decisions efficiently and in their own interests, but only if they have access to communications and appropriate information. Traders should not be told with whom they can buy and sell, and rural banks should not be told to whom to lend money or on what terms.

The Role of Government

Within a framework where economic decision makers are free to make choices based on their own knowledge and conditions, the role of government in providing information remains critical. In addition, government investments that allow markets to function efficiently are essential to fostering a dynamic rural economy, especially in agriculture. But the government role also spans a wide range of other activities, from macroeconomic policy at the national level to providing immunizations to poor children in remote areas. The key areas where government must provide support to the rural

economy are growth-oriented economic policies and macroeconomic stability, the generation of new technologies and their extension to farmers, the creation of human capital, and the provision of infrastructure. All are essential components of a dynamic rural economy. Large gains in agricultural productivity come from such public investments, which create new wealth for all members of society to share. Gains in productivity do not come from changes in price policy (e.g., tariffs) that merely shift income from one group in society to another. From society's point of view, income transfers do not contribute to productivity gains, in contrast with the provision of public goods, which are designed to stimulate such gains.

The guiding principles underlying all of these government activities must be to increase the range of informed choices available to rural inhabitants and to improve the people's ability to act on the available choices within a relatively stable environment. Adherence to these principles is the surest path to sustainable poverty alleviation.

Creation of Human Capital

A key role of the government in developing a dynamic rural economy is the creation of human capital through the provision of education and the improvement of health care. These investments improve the welfare of rural citizens directly through improved life expectancy and a better quality of life. Indirectly, they are keys to increasing productivity, the foundation of a dynamic rural economy that is the only route to food security and poverty alleviation. Workers who are not knowledgeable and healthy cannot participate effectively in the development process and choose how best to contribute productively to society.

Education and health care in rural areas are particularly important because poverty in rural areas is higher than in urban areas. Furthermore, research has shown that rural education has more beneficial effects on the growth process than does education in urban

areas. Rural health care is also more important because rural labor is more physically demanding than urban labor and health risks are often more serious..

Indonesia has made much progress in both education and health. For example, less than 10 percent of the Indonesian population was enrolled in primary school in 1950, but by 1987 universal primary enrollment had been achieved. The key task ahead will be to continue this progress in a more decentralized environment with ample government support from the center down to the kabupaten level. Higher quality education, the achievement of universal secondary education, and better quality, more affordable health care should be the next set of targets. The economic crisis cannot be allowed to reduce investments in these key areas, or else ordinary Indonesians and the economy will suffer substantial and lasting damage.

Technology Generation

Technology is needed to increase productivity in rural areas. Provided the government does not force farmers to use them, new technologies also give farmers and producers a wider range of choices. In rural industry, trade, and services, much of this new technology comes from the private sector, and the primary role of the government is to avoid impeding this process with unnecessary rules and regulations. Even in agriculture, often the best thing the government can do is to remove obstacles to dissemination of private sector research, as with hybrid corn seed.

In other areas, however, the government must play a more positive role, because the private sector will not undertake the necessary research if it cannot capture enough of the financial returns from the innovations to earn high returns on the research investments (many of which are not successful). Rice is a homozygous self-pollinating crop that breeds true and is easily multiplied by farmers. Private rice seed producers can reap few of the financial benefits from any seed improvements they create.

In such a circumstance, the task of providing improved rice seed to farmers falls largely to the public sector research system, which will need adequate funds to develop rice varieties that have higher yields, are well adapted to local environments, and possess better eating quality. This process is equally important for other crops, so that farmers can diversify out of rice and consumers can eat foods with more protein and micronutrients than rice alone can provide. Research is also critical for the development of knowledge-intensive agricultural technologies such as integrated pest management that protect the environment and contribute to farmer profits. The research system should aim to give farmers a wider range of choices about what crops or varieties to grow, how to grow them, and how to profit from them.

In many countries public sector agricultural research has made important contributions to productivity growth, with rates of return on investment often much higher than the social opportunity cost of capital. Malaysia's agricultural research system has made tremendous progress in oil palm and rubber, for example. In Indonesia, the agricultural research system has created many rice varieties that are planted by farmers throughout the country. Even before the monetary crisis, rice pesticide sales declined during the 1990s due to the efforts to develop integrated pest management strategies. Yet many challenges remain. Rice yields have been virtually stagnant for the past decade, and research institutions do not receive the support necessary to make Indonesian agriculture internationally competitive and allow it to contribute to improved rural welfare. This challenge will be particularly difficult in the new decentralized environment, because good research institutions need a critical mass of highly trained personnel that cannot be provided at the provincial (much less the kabupaten) level.

Infrastructure and the Integration of Markets

The provision of infrastructure widens choices for rural dwellers, including the

poor. Better roads allow the landless access to a wider range of employment and higher wages through opportunities for migration, and they offer farmers a greater choice of where to market their produce. One study of a group of 45 farmers in a Philippine village well served by infrastructure found that they sold their output to 37 different traders! Such competition makes it impossible for traders to take advantage of farmers. Roads also give private firms more freedom to choose their location, allowing the decentralization of industry away from urban areas and providing rural inhabitants with more job choice in rural areas without the need to resort to migration. Rural electrification provides rural citizens access to more information that allows them to participate in the modern economy. In general, physical infrastructure such as roads, ports, and communication networks cause production and marketing systems to become more integrated and function more effectively, providing the base upon which an efficient rural economy can be built. One reason why Thailand has a dynamic rural economy that can compete in a wide range of international markets is the dense road network that connects agricultural production areas with consumption centers and export markets.

Marketing systems need to be predominantly or completely in the hands of the private sector, because only private marketing agents have the necessary detailed knowledge of both producers and consumers. Nevertheless, there is a major role for government in providing the infrastructure that allows the private sector to perform its services efficiently. While the private sector should not be prevented from building infrastructure, it cannot be relied upon exclusively to perform this task because it typically does not have the ability to capture all the returns from such investments. Thus, it is incumbent upon the government to undertake many of these investments in public goods.

In addition to integrated markets for commodities and raw materials, such as fertilizer, efficient and well-functioning rural credit markets are also important if farmers

are to be able to reduce the impact of risk and have an effective instrument for asset accumulation. The most important role that government can play in integrating rural credit markets is to ensure macroeconomic stability, which reduces risk and uncertainty and thereby lowers costs in the financial system. If the government does intervene directly in credit markets, it should be on a commercially profitable basis, as the rural branches of BRI currently operate. Although it was once dependent on subsidies, even the widely acclaimed Grameen Bank in Bangladesh now operates largely on a commercial basis. These successful rural credit programs stand in contrast to the hundreds of failed schemes around the world that doled out subsidized credit to farmers, little of which was ever repaid.

Indonesia has made much progress in the construction of physical infrastructure. Compared to Nigeria, another oil producer, Indonesia invested much more money in roads and irrigation that benefited rural inhabitants. But much remains to be done, because many areas are not well served by infrastructure, especially off Java. Government policies are also important in integrating markets. Decentralization must not allow provincial and local governments to institute taxes and regulations that impede the movement of commodities across internal borders. Such policies, if allowed to continue and strengthen, will cause stagnation in the rural economy and prevent the continuing economic unification of Indonesia.

Macroeconomic Stability

Macroeconomic stability is essential to long-term poverty alleviation in rural areas far from the Central Government in Jakarta. Sustained increases in labor productivity require the accumulation of more physical and human capital per worker. Without a stable real exchange rate and a low rate of inflation, this investment will not be forthcoming, and there will be inadequate job creation in urban and rural areas to absorb a

growing labor force with aspirations for a better life. A stable macroeconomic environment is essential for the creation of more job opportunities that mean more choices for rural citizens – farmers, traders, and workers in small-scale factories. This increased range of employment choices is the foundation of a dynamic rural economy.

A series of linkages thus connect economic growth to poverty alleviation and food security. Food policy is the conceptual framework used to identify these linkages and, through policy design and implementation, establish their smooth connection and functioning. There are five key steps in this relationship: (1) from macro food policy to investment in infrastructure (through the identification of public goods needed by the poor); (2) from public investments to improvements in rural factor markets; (3) from well-functioning rural markets to a dynamic rural economy; and (4) from there to rural poverty alleviation. In the context of stable food markets, (5) raising rural households above the poverty line guarantees them food security.

These linkages can be fully established only through a long-term process of economic growth and structural transformation. But much can be done to help the poor and to improve their food security in the meantime. Targeted food subsidies, public works employment schemes, and health and nutrition interventions can be part of an intermediate social safety net. Nevertheless, the long-run welfare of the poor depends on raising the productivity of their labor through employment opportunities generated by a rapidly growing economy. For the next decade and beyond, many of these opportunities can be generated in rural areas through appropriate policy design and public investments. That is the ultimate goal of Indonesia's macro food policy.

IV. Policy Analysis

Many food policy issues have arisen in the short time that Indonesia has had a democratically elected government. One purpose of this Working Paper is to present a

framework and strategic vision in which such issues should be considered and a set of guidelines that identifies approaches to the analysis. The actual analysis will be driven by specific demands of the day. To illustrate how such analysis might be conducted, four key dimensions of macro food policy are discussed below: (1) the changing structure of the world rice market and the likely world price for rice facing Indonesia in the next several years; (2) the complicated connections between rice prices and poverty alleviation; (3) how nutritional status is affected by macroeconomic variables; and (4) what has happened to incomes of rice farmers during the financial crisis. (Additional details of each analysis are available in the Appendices and from the BAPPENAS food policy team).

A. The Changing Structure of the World Rice Market

World rice prices have plunged in the past five years. The price of 25 percent broken, FOB Bangkok, declined from about US\$360 per ton in November 1995 to just US\$150 per ton late in 2000. In real terms, this represents a decline of 63 percent. Such a large percentage decline is unprecedented in the post-war history of the world rice market, with one exception. From 1981-86, real prices fell 66 percent, marking a transition from thirty years of high and often unstable prices (averaging more than US\$860 per ton in constant 2000 US\$) to a period of ten years when prices were relatively stable and averaged about US\$330 per ton. Prices did not recover the last time they declined so precipitously on the world market. Just because prices are so low today does not mean there is a high probability that they will rebound to US\$300 per ton or more.

The large decline in prices from 1981-86 was caused by several factors. First, Indonesia's achievement of self-sufficiency meant the exit of the world's largest importer from the world market. Second, a devaluation of the Thai baht and elimination of the export tax made rice production more profitable in the world's largest rice exporter. Third,

a spurt in Asian rice production (especially in China, India, Indonesia, and Vietnam) sharply increased rice supplies per capita.

The circumstances in the late 1990s are eerily similar. First, after importing 6 million tons in 1998, Indonesia greatly reduced its exposure to the world market in 1999 and 2000. The reasons are different this time (a recovery in production from the El Niño drought, a sharp depreciation of the exchange rate, and a tariff on rice), but the consequences are the same: lower world prices. Second, the Thai baht was devalued during the Asian financial crisis. Third, rice production has surged recently in Bangladesh, Vietnam, Pakistan, and India. In the four years from 1995 to 1999, production increased 28 percent, 21 percent, 29 percent, and 11 percent respectively in these four large countries. Much of this recent surge was underpinned by public and private investments in water control. For example, the proportion of irrigated area in Bangladesh was just 25 percent in the early 1990s, but it is now more than half due to the expansion of shallow tubewell irrigation by the private sector. Vietnam has recently invested heavily in constructing sluice gates to control salinization and new canal systems to increase rice area in the Mekong Delta.

The recent overall increase in production for Asia as a whole was not as large as it was from 1981-86. But widespread economic growth in Asia since that time has caused many consumers to diversify their diets away from rice according to Bennett's Law. This transition reduces demand growth for rice and makes it more likely that rice prices will decline in response to a given increase in production.

Given these circumstances, what is the world rice price likely to be in the near to medium term? One approach to answering this question is to construct and estimate a structural model of the world rice market. The above discussion motivates the choice of three independent variables to explain the real world price of 25 percent broken:

Indonesian imports, the value of the Thai baht relative to the US dollar, and per capita rice production in nine key large developing Asian countries.

A model incorporating these variables explains 67.6 percent of annual price changes (for the price of 25 percent broken), quite high explanatory power for a model that explains annual changes in prices (see Appendix I). Because of the special interest in the impact of Indonesian imports on the world market for rice, two specifications of this structural model were tested. Columns 3 to 5 in the table in Appendix I show that the model is more precise when Indonesian imports are specified as a share of the total world market for that year than when the absolute level of imports is used to create the independent variable. The predictive results of the two specifications are similar. For example, in both specifications the sharp increase in Indonesia's rice imports in 1998, to just over 6 million metric tons, caused the world price for 25 percent broken to increase by about US\$60 per ton. The subsequent drop in Indonesian imports in 1999 and 2000 caused world prices to drop by more than US\$50 per ton.

The figure in Appendix I shows how well the model tracks world prices from 1988 to 2000. The model tracks quite well, and it captures the large decline in prices that began in 1996, including the sharp drop in the average price in 2000 to about US\$170 per ton. In the near term, it is hard to find support for higher rice prices. There is still currency weakness in Indonesia and the Philippines that reduces demand for imports, and oil prices are unlikely to increase much above current levels (meaning no surge in demand from the Middle East). Stock levels are high in the main exporting countries, prompting Thailand and Vietnam to get in a downward bidding war in March, 2001 for a large export contract to the Philippines. For the moment, there are no abnormalities in weather conditions that might presage a strong El Niño event. In the medium term, it is also hard to find support for high prices. Myanmar and Cambodia are still largely absent from the export market,

but both countries have large export potential in the future. If these countries return to the world market in a big way, prices could fall even further.

The one countervailing factor is the long-term slowdown in yield growth that has occurred throughout Asia. This phenomenon has been most pronounced in countries like Indonesia and the Philippines that were among the first to embrace the modern varieties of the Green Revolution. In both of these countries, rice yields are no higher today than they were ten years ago. If yield growth continues to decelerate throughout Asia, and does so faster than population growth, then per capita production will probably begin to decline and this may cause rice prices to rise. At the moment, though, it seems unlikely that these forces are strong enough to cause a large sustained increase in the price of rice on world markets.

B. Rice Prices and Poverty Alleviation

Rice is the most important commodity in Indonesia, especially for the poorest members of society. It is not surprising that the level of rice prices is the single most important determinant of poverty at the household level in the short run. In the long run, rice prices also exert significant influence on poverty alleviation by conditioning the rate of and sectoral contributions to the structural transformation.

In the short run, the effect of rice prices on the poverty of individual households hinges on the household's status as a net buyer or seller of rice. High prices clearly benefit net sellers of rice, and the larger are net sales the larger are the benefits. Low prices benefit net buyers of rice, especially those who do not produce any rice at all. This is the classic food price policy dilemma, and it is never a problem that is easily resolved. The problem is complicated by rural households that own small quantities of land producing rice but yet are net deficit as rice producers. The land owned may be the most

important asset controlled by such households and its value will be influenced by the price of rice. Thus some net-deficit households may conclude that their welfare is positively affected by higher rice prices.

To understand how rice prices affect poverty in the short run, households must be divided into net buyers and net sellers of rice. Urban dwellers are all net buyers of rice. This group includes the wealthiest members of society, but wealthy households are only a small fraction of urban households. In addition to the urban middle class, there are large numbers of urban poor. Rice accounts for a substantial portion of total expenditures of these poor households. In normal times (pre-crisis), rice constitutes 20 percent of total expenditures for the poorest quarter of urban households. For the poorest 5 percent, this share rises to 25 percent (but it was even higher at the peak of the crisis).

The share of the population living in urban areas is also growing over time, another manifestation of the structural transformation. During the 1990s, the level of the rural population was virtually stagnant, but the urban population grew at a rate of about 4.5 percent per year. Because of this differential population growth, the share of the poor that reside in urban areas is likely to grow over time as well.

Although the relative importance of the urban poor is growing, the majority of the poor reside in rural areas and will for a long time to come. In rural areas, the most important productive asset is land, and land ownership is a key determinant of both wealth and whether any particular household is a net buyer or seller of rice. On Java, 45 percent of all rural households do not own any land. While not all of these households are poor, the majority of them are in the lower rungs of the income distribution. Another 20 percent of rural households own less than 0.25 hectare of land, which is just enough to provide the average per capita consumption of rice for a family of five (if all the land is planted to rice and not to other crops). Together, these two groups account for nearly two-thirds of rural

households on Java. By and large, they are much poorer than farmers with larger amounts of land, and they are not likely to be net sellers of rice. *For these households, two-thirds of the rural population, lower rice prices mean higher real incomes and less poverty.*

Indonesian landowning rice-surplus farmers are not wealthy in absolute terms, but in relative terms most of these households would fall in the middle (third) quintile of the overall income distribution. On Java, only one-third of rural households own enough land to produce a surplus of rice for a family of five. These are clearly not the poorest of the poor. In fact, the image of abject poverty is of someone without enough food to eat. Almost by definition, this is not a farmer with enough land to sell surplus rice to the market. It is also important to realize that even land-owning, rice-surplus farmers do not generate all of their family income from rice. A decline in rice-based income does not lead to a proportional decline in household welfare even for these households.

The debate over the rice tariff in Indonesia provides a stark illustration of these realities. Based on a figure of 46 million Indonesians below the poverty line in December 1998, with the rice prices prevailing at that time, a 15 percent decline in rice prices would have lifted 10 million people above the poverty line almost immediately. (In Appendix II, see Table 1 for a summary table of these results and Table 2 for the detailed calculations and assumptions underlying the results). A 25 percent decline in rice prices (due to a zero tariff) would have lifted 14 million people above the poverty line. Neither of these policies would require any government subsidies. No other policy instrument or government program could produce such a dramatic impact on poverty at such little cost.

But rice prices are important for poverty alleviation not only in terms of their short-term direct effects on the poorest segments of the population. In addition, they play a key role in the structural transformation, both within the agricultural sector and for the economy as a whole. Within the agricultural sector, lower rice prices encourage rice

farmers to diversify their cropping pattern by making rice less profitable to grow and by making it cheaper to buy rice from the market. These ex-rice farmers then begin to produce other crops such as fruits and vegetables or raise livestock, allowing consumers to diversify their diets and increase their intake of high-quality proteins, vitamins, and minerals, which are crucial for the reduction of malnutrition. Crop diversification is occurring to some extent in Indonesia, although not very rapidly. In 1984, when Indonesia temporarily achieved self-sufficiency in rice, 41 percent of all cropped area was planted to rice. Today, the share is 38 percent, a relatively small change over a period of 15 years of rapid economic growth. By contrast, rice as a share of total cropped area in Malaysia declined from 25 percent in 1972 to 13 percent in 1998. Artificially high rice prices will impede the diversification process unnecessarily.

Rice prices also play a key role in the structural transformation of the broader economy. Low rice prices allow real wages to be higher for employees without any increase in the nominal wages paid by employers in the high-productivity industrial and service sectors of the economy. In conjunction with other factors, this combination of low nominal wages and high real wages stimulates the job creation and economic growth that are necessary for sustainable poverty alleviation. Excessively high rice prices will cause workers to demand higher wages, as has happened in the Philippines, where domestic rice prices have been well above world market prices for the past 15 years. These demands on the part of workers are entirely legitimate, but their higher wages discourage investment, both domestic and foreign. The end result is a slowdown of the productivity growth that is essential for poverty alleviation.

If there are so many benefits to low rice prices, why not drive prices well below market levels to create even more of these positive effects? *Artificially* low food prices have been tried as a development strategy in many countries, for example in Egypt, China

before 1978, and the former Soviet Union, but they have always failed. Such a strategy reduces farmers' incentives to produce, hindering long-term productivity growth in the agricultural sector. Perhaps as important, a low-price strategy results in substantial fiscal costs to the government. These costs then divert scarce government resources from being used to provide the public goods necessary to create a dynamic rural economy, such as roads, education, and agricultural research. There are also efficiency losses to keeping domestic prices substantially below the trend in world prices.

What is the optimal level of rice prices? For rice importing countries, research has shown that maintenance of domestic rice prices above world prices by perhaps 10 percent may be optimal in terms of maximizing the multiplier effects from increased agricultural incomes, while minimizing the impact on poverty in the short run (see Table 1 in Appendix II). However, any large, sustained deviation of domestic prices from world prices in either direction will lead to substantially sub-optimal outcomes.

An alternative way to ask the question is in terms of the balance between domestic rice production and consumption. If domestic prices are kept close to world prices, will Indonesia sacrifice self-sufficiency in rice? Self-sufficiency is a worthwhile objective if it is achieved because of high productivity, as happened in 1984. However, self-sufficiency in any commodity is of dubious value if it is caused by higher prices that result in adverse effects on poverty. For Indonesia to be self-sufficient in rice without hurting the poor, the path is through agricultural research and productivity growth, not from policy-induced higher prices. The world rice market is substantially more stable now than it was in the 1970s and early 1980s, and supplies are much more readily available from a variety of exporters, so the justification for self-sufficiency as a defense of Indonesia's food security is weaker today. The rapid escalation of domestic rice prices in 1998 was due to the

macro crisis (specifically, the large depreciation of and wide fluctuations in the exchange rate), not because the world market was short of rice.

C. Nutrition and Household Welfare

With more than half of calories provided by rice on a daily basis to the average consumer, the link between rice prices and the number of poor individuals—those unable to consume the recommended level of 2,100 kilocalories per day—is clear. But both the level and variability of rice prices have wider and more subtle effects on food consumers, and many of these effects can be measured through careful nutrition surveillance. Indonesia is fortunate to have a large-scale and highly sophisticated nutrition surveillance program underway, conducted by Helen Keller International (HKI) in collaboration with the Ministry of Health. The program began in 1995 in rural Central Java and has since been extended to six other rural areas and four urban areas (see *Indonesia Crisis Bulletin*, “Nutrition Surveillance: How does it work?” HKI Technical Programs Series, February, 2000).

Nutrition problems can be divided into two broad categories: problems with macronutrients—calories, protein, and fat—and problems with micronutrients such as iron, Vitamin A, and zinc. In general, poverty causes inadequate intake of macronutrients (food). If food shortages last only briefly, they cause weight loss (wasting), with few apparent health consequences. If food shortages are chronic or occur during critical growth periods in infancy or early adolescence, growth of stature is impaired (stunting). The best measure of the nutritional status of a population, especially of children, is “height-for-age,” a measure of stunting. This measure correlates closely with food intake when health status and genetic makeup are considered.

Micronutrients are more complicated. They are often relatively scarce in common staple foods. Rice, for example, provides ample calories and significant protein, but is a poor source of iron, Vitamin A, and even Vitamin B if the rice has been milled without parboiling. Day-to-day variations in micronutrients do not cause serious health problems as long as the average is adequate, because the body has significant short-run storage capabilities. But chronic shortages of any of the essential micronutrients eventually do cause serious nutritional problems—anemia from iron deficiency, xerophthalmia from Vitamin A deficiency, and many others. Micronutrient deficiencies have been linked to profound long-term welfare consequences—low birth weights and high infant mortality rates, “failure to thrive” during infancy and eventual stunting, reduced learning capacity, and blindness, for example. In rich countries, most micronutrient deficiencies have been overcome either through consumption of a high-quality diet containing animal products or through fortification of milk, wheat flour, salt, and many processed foods. In Indonesia and many other developing countries, inadequate diets caused by poverty and lack of knowledge have led to serious micronutrient deficiencies.

Even under normal circumstances the shortages of micronutrients would attract the attention of food policy analysts, who would try to design efficient fortification vehicles, nutrition intervention programs, and health care initiatives (especially for infants and pregnant and lactating mothers) to cope with these deficiencies. In the aftermath of the financial crisis in Indonesia, however, micronutrient deficiencies seem more widespread and connected to broader food policy variables such as the foreign exchange rate, rice prices, and rural incomes. Data from the HKI/Ministry of Health Nutrition Surveillance Program indicate that several of these linkages are highly important in quantitative terms, significant in statistical terms, and amenable to policy interventions. The logic of these

linkages, a preliminary look at the quantitative relationships, and suggestions about policy approaches are outlined below.

Macro food policy variables impact micronutrient intake and resulting health outcomes through three primary mechanisms—relative price effects, changes in real incomes because of changes in rice prices, and changes in income-earning opportunities outside the household. In the context of the monetary crisis, the initial impetus for all three mechanisms was the rapid deterioration of the value of the rupiah (or hyperdepreciation, as the literature is now terming the episode) from December 1997 to September 1998. The price of tradable goods in domestic markets rose sharply as a consequence, although the policy-influenced price of rice lagged behind the exchange rate until mid-1998. Higher rice prices had two consequences, a real income effect felt especially by poor consumers who were spending up to 40 percent of their income on rice, and a relative price effect, as some food commodities, especially cassava, became cheaper in comparison to rice.

With substantial time to adjust and when changes are small, both effects would lead to a reduction in the consumption of rice. During the monetary crisis, however, changes in relative and absolute prices, and in nominal incomes, were very large and the time to adjust was short. Consequently, consumers did not alter their consumption of staple foods a great deal. Some protection of calorie intake by increasing cassava consumption is apparent from the data from rural Central Java – to offset a small decline in the consumption of rice. But consumers tried to maintain their rice intake to the extent possible despite higher prices, even though this caused a very sharp increase in the share of rice in total expenditures. Something else had to “give” in the budget. In particular, most consumers sacrificed purchases and intake of high-value foods such as meat, eggs,

fats and oils, and fresh fruits and vegetables—all important sources of micronutrients or dense calories needed to protect the weight of pregnant and lactating women.

The consequences of these sharp changes in dietary intake, all caused by price changes that were induced by the financial crisis, were significant changes in the nutritional status of women and children. Although the data analysis is just beginning, the results indicate a powerful impact on such crucial variables as weight of mothers, anemia and stunting in infants and very young children, and sharply reduced intake of Vitamin A. Graphs 1-3 in Appendix III illustrate several of these effects and show the apparent correlation with real rice prices, egg prices, and prices for vegetable oil.

Three mechanisms are being investigated – direct price effects driven by changes in the exchange rate, changes in real income caused by changes in the rice price (because rice is such a large share of the budget), and changes in real household expenditures as income sources responded to the macro crisis. The hypothesis proposed here is that highly unstable rice prices, driven in this instance by the macro crisis, have direct and indirect effects on dietary patterns and especially on micronutrient intake. In turn, serious and sustained shortfalls in micronutrients affect health and nutritional status in important and quantifiable ways. As the research progresses, these quantitative links will allow food policy analysts and nutritionists, working collaboratively, to design appropriate interventions to prevent or mitigate the deficiencies.

These interventions might be as direct as fortification of key foods, vitamin supplements, or health interventions at clinics or in schools. Alternatively, the most effective interventions might be something as seemingly remote as efforts to stabilize the exchange rate or the price of rice. This is a clear example of the need for food policy analysts to maintain a macro perspective while addressing the micro outcome of the food economy at such a critically basic level as the nutritional status of women and children.

D. Farm Incomes and the Rural Economy

Even before the financial crisis, concerns were widespread over incomes earned from agriculture in general and from rice-farming in particular, as the structural transformation put pressure on agricultural profitability. The availability of inexpensive rice in world markets has kept competitive pressures on Indonesian farmers despite import controls by BULOG and, more recently, the rice tariff, although the depreciated rupiah has provided a substantial buffer from the full decline in world prices (see Figure 1 in Appendix IV).

To investigate these concerns and provide an empirical foundation for the rice price policy debate, a special data collection effort has been organized through the BAPPENAS food policy research project. A fieldwork unit at the Center for Agro-Socio-Economic Research (CASER) in Bogor has been conducting field investigations since September 1999. The work includes extensive research visits to five different sites that are major rice growing areas in Indonesia – Majalengka (West Java), Klaten (Central Java), Kediri (East Java), Agam (West Sumatra) and Sidrap (South Sulawesi). Characteristics of farms with moderate control of irrigation water in the wet season of 1999/2000 in these sites are shown in Table 1 of Appendix IV. These sites match those used in collecting data for a previous rice study undertaken in 1987-89 by the Food Research Institute, Stanford University (see Pearson, et. al., *Rice Policy in Indonesia*, Cornell University Press, 1991). This comparability will allow, when the research is complete, an examination of trends in productivity and income-earning potential between the late 1980s and the early 2000s. The numerous research visits are designed to cover different growing seasons with repeat visits as needed to revise questionnaires, obtain supplemental information, and interview enough farmers so that the data obtained will give an accurate picture of the rice economy.

The specific data being collected focus on the costs and returns from growing rice. These costs include the land rents that must be achieved for rice to be competitive with alternative crops, the wage rates that must be paid to attract workers to stay in agriculture instead of moving to off-farm employment, and the interest rates needed to obtain working and investment capital for rice farmers. If these factors are provided by the farm household itself, the land, labor and capital returns are included in farm income. But since these factors have alternative uses in rural areas, their returns should not be included in the “pure” profits from rice cultivation (i.e., returns to “management”) that determine whether it is efficient or not.

The efficiency of the rice sector, however, does not rest entirely with on-farm productivity. It also depends on the efficiency and margins in the post-farm gate sector of the rice marketing chain. Therefore, the data collection effort includes the prices paid throughout the chain so that margins of these post-farmgate participants can be calculated and analyzed. To assess the operation of rural markets, further information on the labor, land, and credit markets is sought to assess how well those markets function in practice and in response to the recent monetary crisis.

The results from the first year of field research cover the main 1999/2000 rainy season crop as well as the following dry season crop in 2000. Several important conclusions emerge. First, as shown in Tables 1 and 2 of Appendix IV, rice farming is profitable in all five kabupatens. For land-owning farmers, income from rice cultivation during the wet season—and excluding the returns from factors owned by the farm household—was as low as Rp876,000 per household in Klaten, where the farmgate price was Rp850 per kg for GKP—wet paddy in the farmer’s field. At the same time, incomes from rice cultivation during the wet season were as high as Rp1,616,000 per household in Sidrap, where the farmgate price was Rp825 per kg for GKP. However, these economic

returns were only 19.3 percent of household income in Klaten, up to 39.9 percent in Sidrap. When returns to owned factors were included, rice income accounted for just over half of total household incomes in all five kabupaten.

Although they represent earnings for only one season, these incomes from growing rice are not very high—only \$200 to \$300 per hectare when factor returns are included, and few farmers own as much as one hectare. It is no surprise that most rice farmers seek additional household incomes, both on and off the farm. The importance of these incomes—60 to 80 percent of the household total when incomes to factors of production owned by the household that are used to grow rice are not counted as part of rice income-- shows just how far the structural transformation has progressed in rural Indonesia.

The farmgate price that generated these incomes ranged from Rp800 to Rp850 per kg for GKP during the wet season harvest in 2000. As Figures 1 and 2 in Appendix IV show, these were very low prices compared with the official floor price of Rp1400 per kg for GKG at the time, which corresponds to a GKP-equivalent floor price of Rp1020 per kg.

However, these prices were *not* low in real terms relative to prior years when the floor price was successfully defended. For example, the average real floor price from 1978 to 1988 was about Rp825 per kg, equivalent to just Rp602 per kg for GKP. It was about Rp 950 per kg from 1989 to 1997, equivalent to Rp694 per kg of GKP. After 1997 the floor price was not defended successfully, mostly because it was set much higher than prices in domestic and foreign markets. Most observers feel that the actual prices farmers did receive in 2000 during the main harvest were significantly lower than necessary because of BULOG's failure to procure much rice during the harvest and because rice traders lacked access to adequate credit to replace public buying on short notice. As it was, the farm prices for rice in the wet season harvest of 2000 were 33 to 41 percent

higher in real terms than the floor price from 1975 to 1988 and 15 to 22 percent higher than the floor price from 1987 to 1997.

A major implication of the CASER team's research results is that rural poverty is not caused primarily by low rice prices—because prices have not been low by historical standards—but by small landholdings and limited off-farm earning potential. The latter income source, in particular, is helped more by lower rice prices than by higher rice prices. The extent of rural diversification, especially on Java, seems now to have reached the stage where increases in rice prices no longer help *either* the distribution of rural incomes or rural dynamism. Although this hypothesis needs continuing research by the team, the implications if it is right are profound for future rice policy.

In particular, if rural factor markets are working reasonably efficiently, as CASER field research suggests (see Working Paper No. xxy), an opportunity exists to stimulate the process of rural diversification by encouraging farmers to diversify out of rice into higher valued cropping and livestock systems and to seek employment in small and medium enterprises (SMEs) in the rural economy. Market-driven land consolidation, mostly through the rental market in the short to medium run, will permit remaining rice farmers to increase their incomes as the size of operational units increases. No doubt this diversification process will require government assistance during the adjustment period, and medium-term loans to overcome capital constraints on breaking into new activities may be the most effective instrument to provide this assistance. Although direct producer subsidies to encourage diversification would be appropriate in theory, they would be extremely difficult to implement with existing institutions.

All four policy analyses conducted by the BAPPENAS food policy team point toward a window of opportunity to use low prices for rice in world markets to reduce the level of poverty, improve nutritional status through the linkage to micronutrients, and

provide the food security in rural areas that would significantly speed the structural transformation by making diversification much cheaper and less risky. If the price of seizing this opportunity is direct assistance to rice farmers to cushion the costs of adjustment, it is likely to be a price well worth paying. Working out the details of implementation will be complex. But with the strategy set, this task would be the logical next agenda for the CASER team in collaboration with the BAPPENAS food policy team.

A Structural Model of the World Rice Market

The structural model built to explain changes in world rice prices uses three explanatory variables: Indonesian rice imports, the value of the Thai bath relative to the U.S. dollar, and per capita rice production in nine large developing countries in Asia (see note one in the table in this Appendix). Indonesian imports are likely to have a contemporaneous effect on world prices. In contrast, the value of the Thai baht is likely to affect the world price with a one-year lag in order to allow time for a domestic supply response by farmers to affect Thai exports. Finally, rice production in the nine Asian countries seems likely to affect prices on the world market with lags of one and possibly two years.

Because population growth is the main source of demand growth in the Asian rice economy, production was normalized by population, i.e. per capita rice production was used as the independent variable. This normalization keeps the demand curve fixed and allows estimation without resort to a system of simultaneous equations. It should be noted that net trade in rice for the group of nine countries included is a very small percentage of total production.

The model was initially estimated with annual data in first differences over the period 1983 to 2000, and the parameter estimates are reported in columns one and two in the table (data constraints currently prevent estimation with a longer time series). All estimated coefficients are of the expected sign and have relatively low p-values. Furthermore, the model explains 67.6 percent of annual price changes (for the price of 25 percent broken), quite high explanatory power for a first difference model. The magnitude of the coefficient estimate for the variable measuring net Indonesian imports

implies that an increase in Indonesian imports from one year to the next of one million tons is associated with an increase in world prices of US\$10 per ton, other things equal. The magnitude of the coefficient on the value of the Thai baht implies that a depreciation of the baht by 10 percent in year t is associated with a decline in world prices of US\$20 per ton in year $(t+1)$. The coefficients on the two lags of per capita production imply that an increase in per capita production of 1 kg paddy per capita in year t is associated with a decline in prices of US\$4 per ton in year $(t+1)$ and a further US\$6 per ton in year $(t+2)$. Current per capita production is approximately 170 kg paddy per capita. Finally, the estimate of the constant is statistically equal to zero, implying that there is no drift in prices over time that is not accounted for by structural variables.

Because of the special interest in the impact of Indonesian imports on the world market for rice, an alternative specification of this structural model was also tested. Columns 3 to 5 in the table in Appendix I show that the model is more precise when Indonesian imports are specified as a share of the total world market for that year and the independent variable is the first difference of this share. The predictive results of the two specifications are similar.

Further research on this model is planned, especially efforts to extend the time series data on a comparable basis back to the 1970s are even to the 1960s.

Dependent Variable : First Differences in Real Rice Price in World Market

Independent Variables :	Price Series				
	IMF 100 B Year (84-00)	USDA 25 Year (84-00)	TS 25 Year (88-00)	TS 25 Year (88-00)	TS 25 Year (88-00)
Constant	-3.44 (0.40)	1.10 (0.12)	3.13 (0.31)	2.72 (0.29)	2.81 (0.29)
FD1PCP	-3.23 (1.48)	-4.07 (1.81)	-8.37 (2.71)	-8.00 (2.79)	-8.84 (3.16)
FD2PCP	-4.30 (2.03)	-6.01 (2.75)	-2.93 (1.00)	-2.99 (1.11)	-
FD1 Baht (ln)	-188.1 (2.06)	-218.4 (2.31)	-155.2 (1.50)	-161.7 (1.69)	-173.4 (1.80)
FD ISA Imp.	12.54 2.53	9.87 (1.93)	10.88 (1.98)	-	-
FD ISA Imp. SH	-	-	-	328.0 (2.45)	295.3 (2.23)
R ²	0.626	0.676	0.708	0.751	0.712
R ² adjusted	0.501	0.568	0.561	0.626	0.616

FD1PCP = First Differences of per capita rice production in 9 important Asian countries, lagged one year. The nine countries are China, India, Indonesia, Bangladesh, Vietnam, Thailand, Myanmar and the Philippines

FD2PCP = FD1PCP, lagged a second year

FD1 Baht (ln) = First Differences of log of real Baht/USD exchange rate, lagged one year

FD ISA Imp. = First Differences of Indonesian rice imports

FD ISA Imp. SH = First Differences of Indonesian rice imports as a share of total world rice trade

Predicted and Actual World Rice Prices (25% broken)



Table 1. Impact of Alternative Rice Tariffs

	Tariffs rates:			
	<u>Zero</u>	<u>10%</u>	<u>25%*</u>	<u>40%</u>
<i>Retail rice prices:</i>				
% change at different tariffs (Jakarta retail, base Dec. 1998)	-25%	-15%	0	+15%
<i>Rice Farmer Profits:</i>				
% change from 1996, pre-crisis peak	+19.4%	+41%	+73.5%	+105.9%
<i>Movement above Poverty Line:</i>				
<u>Million</u> of people moving up from poverty (Base: Dec. 1998, 46.1 million in poverty)	+14	+10	+4	-2
<i>Income Change due to Reduced:</i>				
<i>Rice Prices:</i> Multiplier effect in Rupiah per capita per year	9,700	14,900	0	-14,900

* Current effective rate due to a specific tariff of Rp430/kg.

Notes:

Except for the poverty numbers, which are from SUSENAS, data shown here are explained in detail in the accompanying table and discussion of assumptions. The poverty numbers are calculated from a table prepared by the Harvard International Institute for Development project based (in 1998) in the Ministry of Finance.

For comparison of the significance of rice to the poor, a 100 percent increase in the price of kerosene would increase the number of individuals below the poverty line by 2.4 million. A 40 percent decrease in the price of rice (returning rice prices to roughly the same level in real terms as before the financial crisis) would raise 16.2 million individuals above the poverty line.

Table 2. Impact of Various Rice Tariffs on Producer and Consumer Welfare, by Quintile.

	Income Quintiles, from poorest to richest					
	I	II	III	IV	V	Avg.
Share of Income	0.06	0.12	0.16	0.22	0.44	
Per Capita Income, US \$	225	450	600	825	1,650	750
Per Capita Income, 000 Rp	1,525	3,150	4,200	5,775	11,550	5,250
Per Capita Expenditures, 000 Rp	945	1,890	2,520	3,465	6,930	3,150
Rice Consumption						
-- kg / year	135	157.5	165	157.5	135	150
(share, %)	18	21	22	21	18	
-- kg, Rp/kg	2,000	2,250	2,500	2,750	3,000	2,500
-- Expenditure, 000 Rp	270	354.4	412.5	433.1	405	375
Rice Expenditure as a Share of :						
-- Per Capita Income (PCY)	17.1	11.3	9.8	7.5	3.5	7.1
-- Per Capita Expenditures (PCE)	28.6	18.8	16.4	12.5	5.8	11.9
Total Rice Consumed, MMT	5.4	6.3	6.6	6.3	5.4	30.0
Share of Rice Purchased, %	100	33	-227	33	100	
Amount of Rice Purchased, MMT	5.4	2.1	-15.0	2.1	5.4	
Rice Area Harvested, Million ha	0	1.4	7.2	1.4	0	10.0
Rice Produced, MMT	0	4.2	21.6	4.2	0	30.0
Rice Income, Trillion Rp (12/99)	0	6.72	34.56	6.72	0	48.0
Per Capita Rice Income, 000 Rp	0	168	864	168	0	
--as a share of total income	0	5.3	20.6	2.9	0	4.6
Net Income Change at Various Tariffs on Rice Imports (000 Rp/cap)						Total gain or loss
0 % Tariff (-25% price change)						
Consumer gain	67.5	88.6	103.1	108.3	101.3	
Minus farmer loss	0	52.5	270.0	52.5	0	
Minus trader loss	0	2.0	8.0	30.0	53.8	
Equals net gain or loss	67.5	34.1	-174.9	25.8	47.5	0
10% Tariff (-15% price change)						
Consumer gain	40.5	53.2	61.9	65.0	60.8	
Minus farmer loss	0	31.5	162.0	31.5	0	
Minus trader loss	0	1.0	5.0	18.0	32.4	
Equals net gain or loss	40.5	20.7	-105.1	15.5	28.4	0
25% Tariff (0% price change)						
No change	0	0	0	0	0	0
40% Tariff (+15% price change)						
Consumer gain	40.5	53.5	61.9	65.0	60.8	
Minus farmer gain	0	31.5	162.0	31.5	0	
Minus trader gain	0	1.0	5.0	18.0	32.4	
Equals net gain or loss	-40.5	-20.7	105.1	-15.5	-28.4	0
Multiplier Impact from Net Income Change, by Tariff Level (000 Rp/capita)						
(Expenditure Multiplier)	2.0	1.8	1.6	1.4	1.2	
0% tariff	135.0	61.4	-279.8	36.1	57.0	9.7
10% tariff	90.0	37.3	-168.2	21.7	34.1	14.9
25% tariff	0	0	0	0	0	0
40% tariff	-90.0	-37.3	168.2	-21.7	-34.1	-14.9

Assumptions for Table 2

1. Income quintiles each contain 20 percent of the population, or 40 million individuals if total population is rounded to 200 million. The first quintile is made up mostly of rural landless and urban poor households, the second quintile is rice-deficit farmers and urban near-poor, the third quintile is surplus rice farmers, the fourth quintile is the rural wealthy and urban workers, and the fifth quintile is upper income urban households. Obviously, there is some blurring of occupations and rural-urban location across all the quintiles, but this categorization is useful to have some sense of the "representative agent" in each quintile.
2. Share of income accruing to each quintile is taken from recent SUSENAS reports, with the share of the bottom quintile reduced to 0.06 from its pre-crisis level of about 0.08.
3. Per capita incomes in late 1999 are assumed to be \$750, which is Rp5.25 million at an exchange rate of Rp7,000 per USD, the mid-point of the range assumed for the budget. Per capita expenditures are assumed to be 60 percent of per capita income, to be consistent with SUSENAS-based poverty lines.
4. Rice consumption is 150 kg per capita per year (taken from representative food balance sheet data), implying a total consumption of 30 million metric tons (mmt). These are "round numbers" used for convenience. The distribution of rice consumption by quintile follows SUSENAS results, with the bottom 20 percent of the income distribution consuming 18 percent of total rice consumed, the next quintile consuming 21 percent, and so on.
5. The average price of rice for purchase at retail is Rp2,500 per kg, but the poor pay only Rp2,000 per kg while the rich pay Rp3,000 per kg. Total expenditures on rice are obtained by multiplying the per capita consumption times the retail price. Rice expenditures as a share of per capita income range from 28.6 percent for the poorest quintile to just 3.5 percent in the highest quintile, with the national average being 7.1 percent.
6. Both the top and bottom quintiles are assumed to purchase 100 percent of their rice, the second and fourth quintiles are assumed to purchase one third of their rice from the market, and the third quintile of rice surplus farmers thus supplies all the rice needed to balance the rice market. Accordingly, the rice surplus is 15 mmt supplied from the third quintile, which balances the total market demand from the other four quintiles. Thus the "marketed surplus" is 50 percent, in line with estimates from the field.
7. Total rice area harvested is assumed to be 10 million hectares, with an average yield of milled rice of 3 metric tons (mt), so total production equals 30 mmt, the same as total consumption. Rice imports can be added to this model by building in losses for waste and seed use from domestic production, or by adding a separate consumption category. The basic results in terms of distributional impact of changes in the rice tariff are not affected either way.
8. Rice income is calculated from representative farm data reported by BPS. At the price structure used as the base in this model (December, 1999), each hectare of rice harvested generates Rp. 4.8 million in farm income. Rice acreage is distributed across quintiles two, three, and four in such a way that a representative farm household in quintiles two and four has access to 0.175 ha of non-irrigated rice land (with a single crop of rice each year), whereas the typical rice-surplus household in quintile three has access to 0.45 ha of irrigated rice land (which is double-cropped with rice). These assumptions can be compared with the CASER data in Appendix IV.

The resulting levels of rice production and rice-based income are shown in the table for each relevant quintile. Even in quintile three, which contains the rice surplus households, rice income is only 20.6 percent of total household income. For the economy as a whole, rice-based farm income is only 4.6 percent of total income (which is consistent with the macro-level data that value-added from rice farming is less than five percent of total GDP). Rice based farm income is a function of rice prices received by farmers according to spread sheet calculations based on the BPS farm model (attached).

9. Net income change as a function of level of rice tariff is calculated assuming that rice production and consumption do not change in the short run. Since the elasticities of supply and demand are quite small in the short run, this simplifies the calculations without being seriously misleading. Thus a 25 percent decrease in the rice price, roughly the expectation if the import duty were zero and there was complete free trade in rice, would lower rice expenditures for consumers by 25 percent. The same decrease in rice price would drop income for rice farmers from Rp. 4.8 billion per hectare to Rp. 3.3 billion. Traders are also assumed to face losses if the profitability of rice farming drops, so that total gains to consumers of the price decrease are exactly matched by losses to rice farmers and traders. Thus no "efficiency gains" are included in these calculations to reflect the benefits from trade. Although individual quintiles have large gains and losses when rice prices change, the net direct gain or loss for society as a whole is always zero.
10. An argument is made, however, that increases or decreases in incomes also have multiplier effects, and these vary by income class. Additional income in the hands of the poor has more impact than spending by the rich because the poor tend to consume more goods with a high "labor content," and also because their consumption bundle is less import-intensive. An expenditure multiplier of 2.0 is assumed for income changes in the lowest quintile. The multiplier declines smoothly by income class, until it is just 1.2 in the top quintile. Adding up the net multiplier impact by income class to a total for the economy produces the results in the right hand column of the table. The totals are small in relation to the entire economy (less than one percent of per capita income), but reach their maximum benefit when the rice tariff is set at 10 percent. A tariff that raises prices above their current levels will reduce social welfare, according to these calculations.

FIGURE 1

Nutrition Monitoring Data, HKI

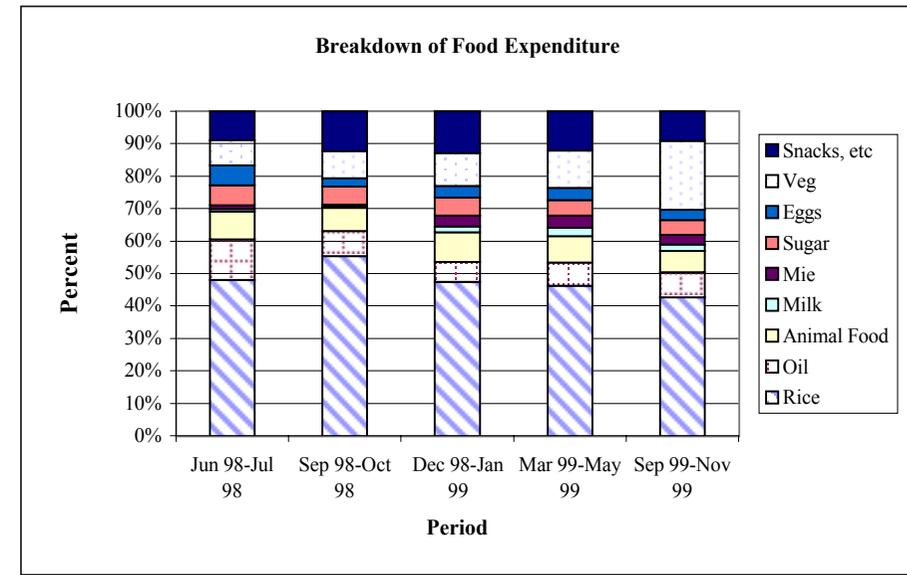
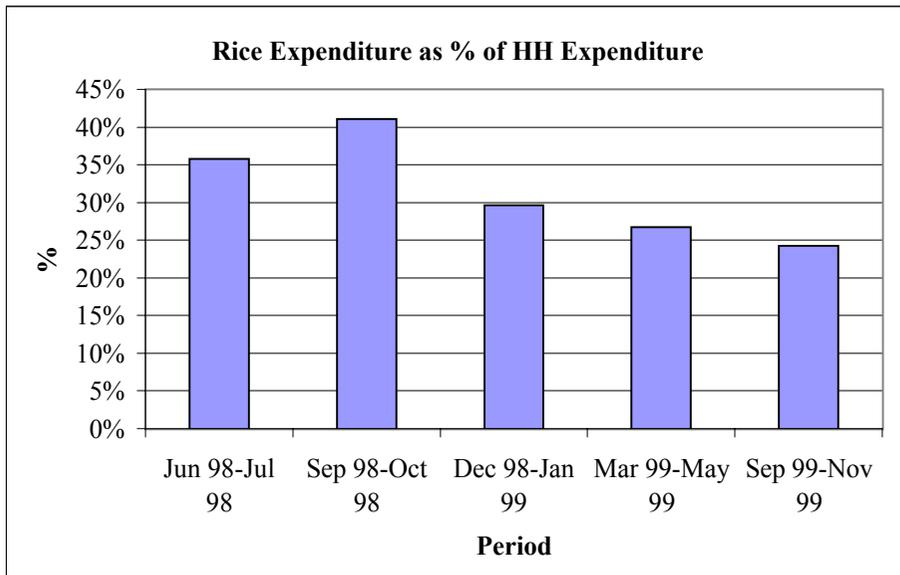
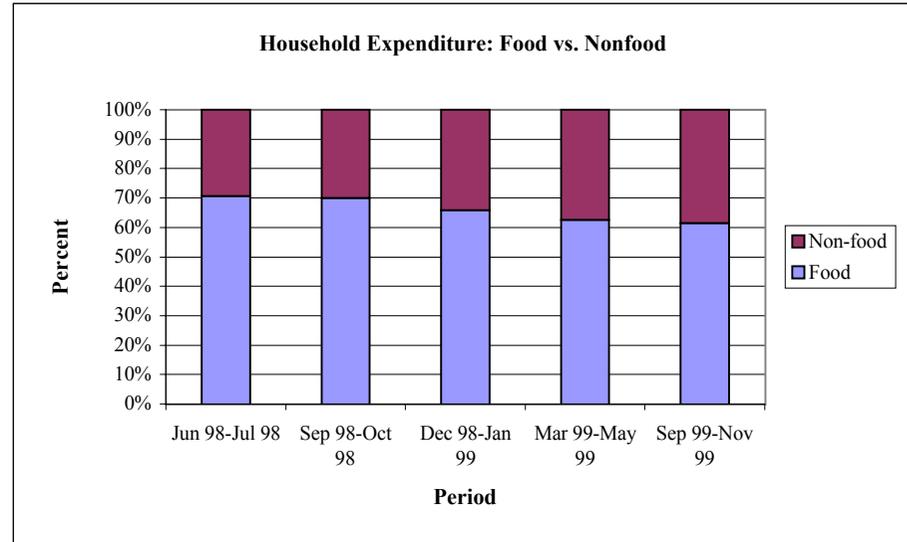
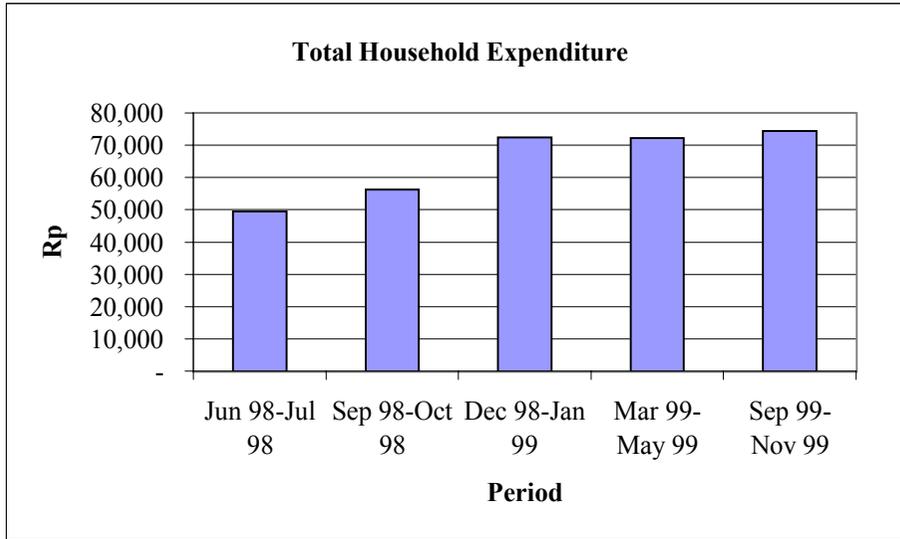


FIGURE 2

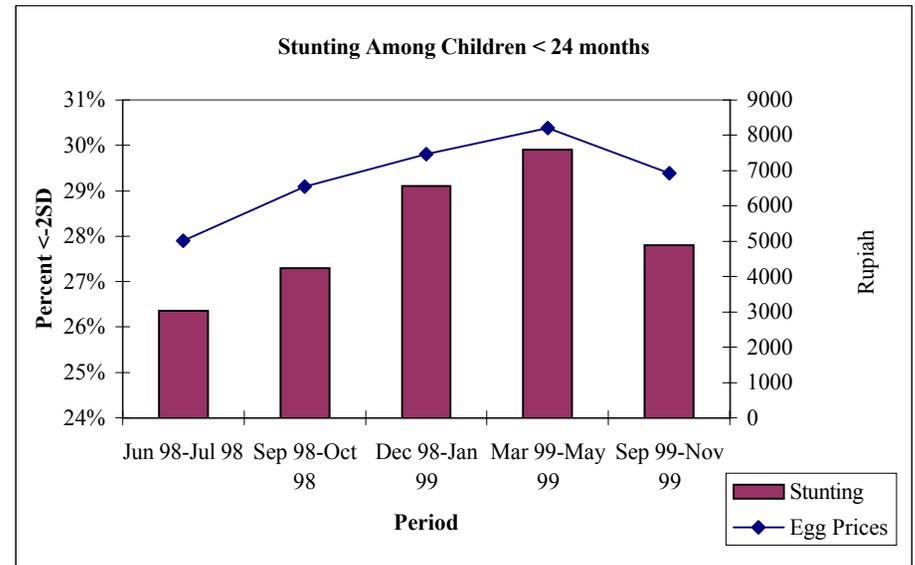
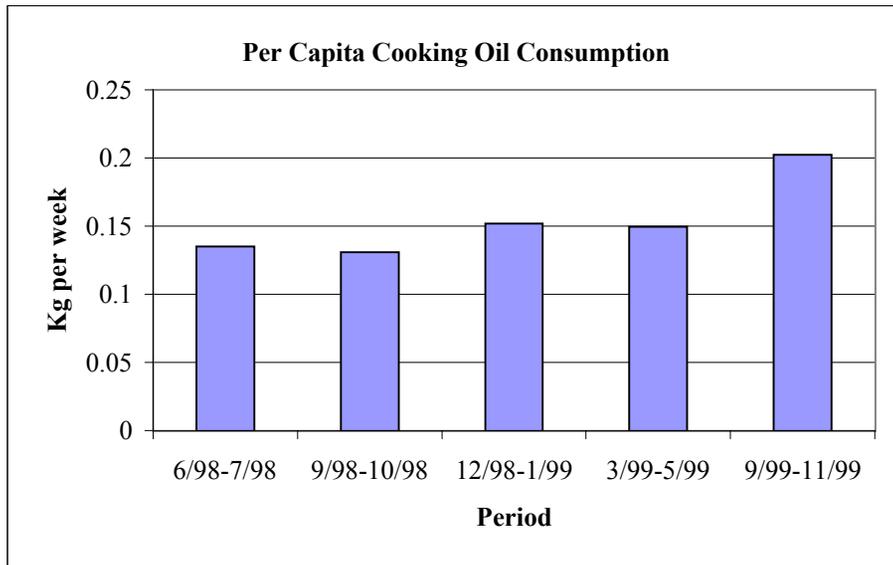
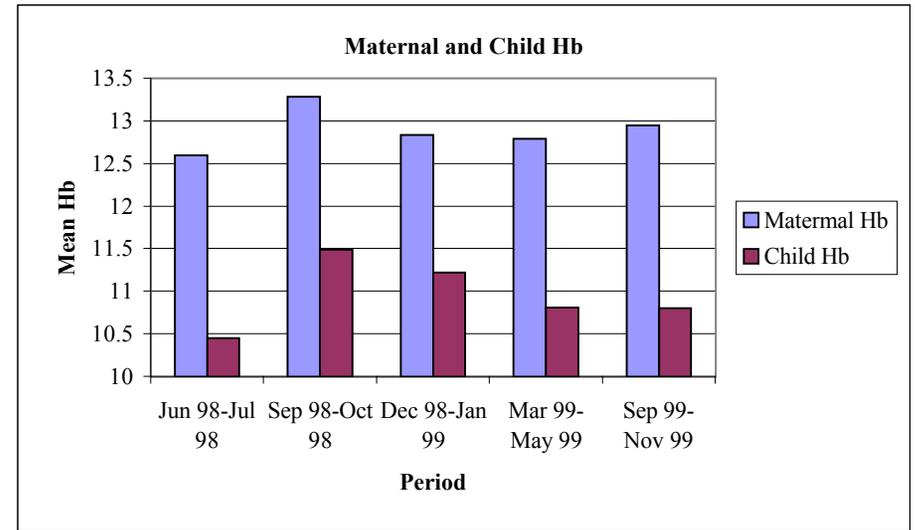
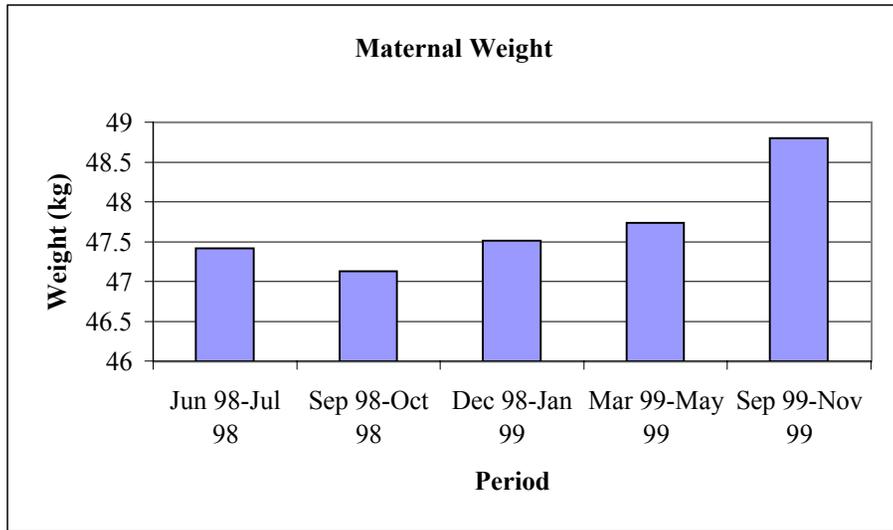


FIGURE 3

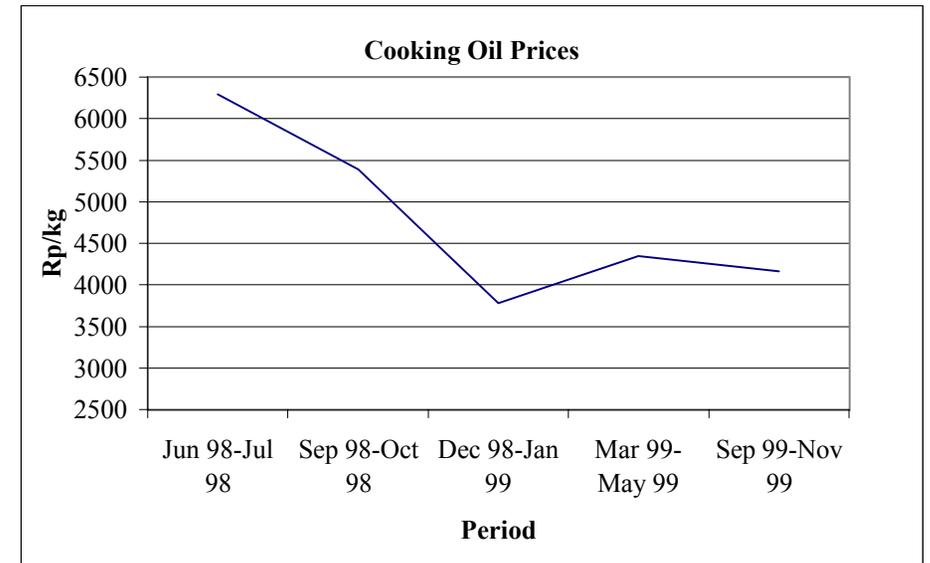
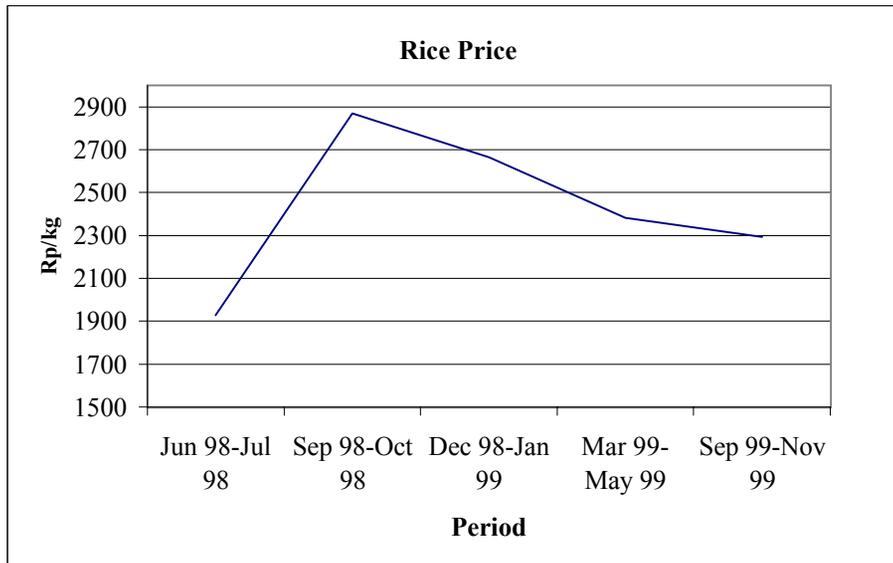
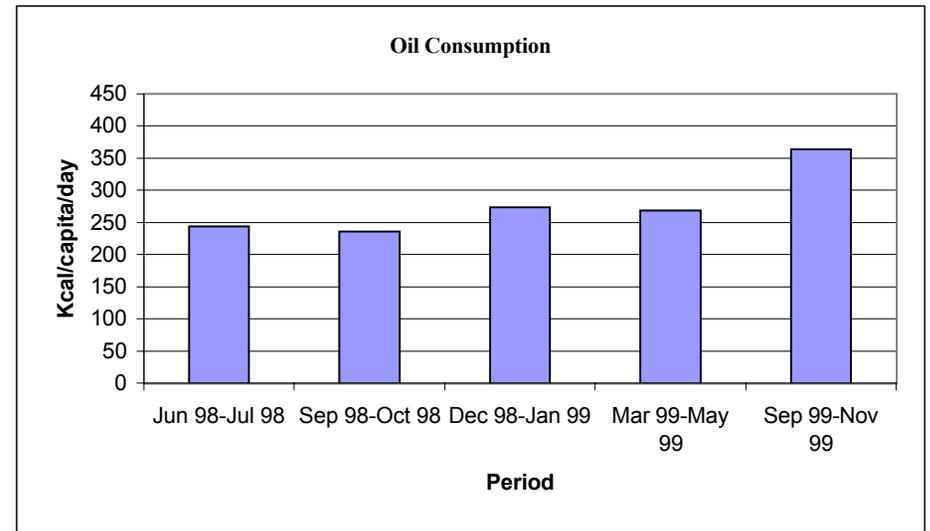
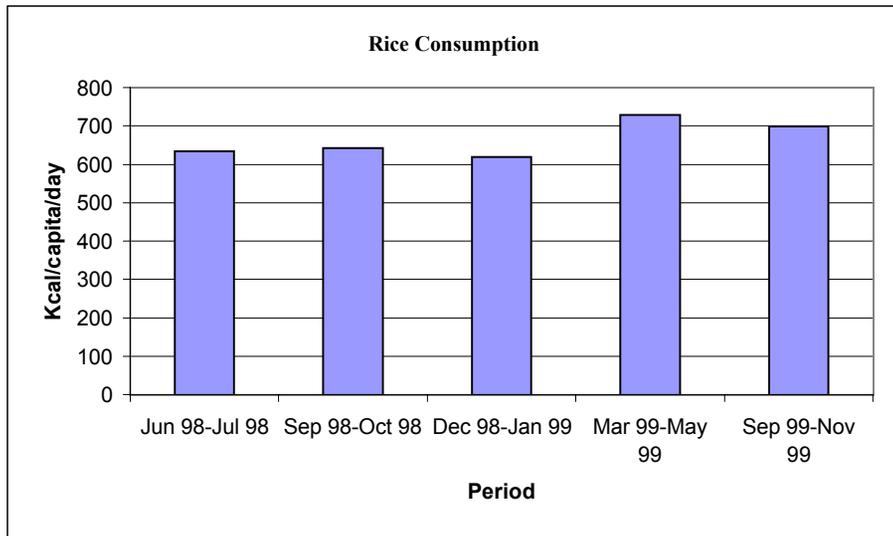


Table 1: Characteristic of Rice-Growing Research Areas with Moderate Water Control, Wet Seasons 1999 - 2000

	Kediri, E. Java	Klaten, C. Java	Majalengka, W. Java	Sidrap S. Sulawesi	Agam, W. Sumatra
Rice Production					
Quantity (ton GKP/ha)	5.43	4.38	5.22	4.49	4.98
Price (Rp/kg)	800	850	850	825	850
Gross Revenue (Rp.000/ha)	4,341	3,719	4,437	3,701	4,230
Costs of Rice Production, (Rp 000/ha) (Share of gross revenues in parenthesis)					
Agro-inputs, Rp 000	773	710	808	544	473
(share)	17.8	19.1	18.2	14.7	11.2
Fertilizers, Rp 000	573	513	568	315	343
(share)	13.2	13.8	12.8	8.5	8.1
(kg/ha)	476	462	456	264	268
Others, Rp 000	200	201	240	229	131
(share)	4.6	5.4	5.4	6.2	3.1
Labor, Rp 000	1,202	677	1,637	888	1,176
(share)	27.7	18.2	36.9	24.0	27.8
Family, Rp 000 (imputed)	173	276	194	182	275
(days)	TBD	TBD	TBD	TBD	TBD
Hired, Rp 000	1,029	394	1,442	707	901
(days)	TBD	TBD	TBD	TBD	TBD
Capital, Rp 000	243	268	311	233	173
(share)	5.6	7.2	7.0	6.3	4.1
Land rent, Rp 000	1,633	1,534	1,247	1,344	1,644
(share)	37.6	41.3	28.1	36.3	38.9
Rice income, Rp 000					
Landless rice farmers, Rp 000/household					
Rp 000/ha	661	804	629	874	1,037
(share)	15.2	21.6	14.2	23.6	24.5
Operational size of rice farming	TBD	TBD	TBD	TBD	TBD
Land-owning rice farmers, Rp 000/household					
Rp 000/ha	2,294	2,338	1,876	2,218	2,681
(share)	52.9	62.9	42.3	59.9	63.4
Operational size of rice farming	TBD	TBD	TBD	TBD	TBD

Table 2 Rice Farm Household Incomes in Five Kabupatens, Moderate Water Control System, Wet Season, 1999 - 2000

	Kediri			Klaten			Majalengka			Sidrap			Agam		
	(Rp.000)	Landless (%)	Landowner (%)	(Rp.000)	Landless (%)	Landowner (%)	(Rp.000)	Landless (%)	Landowner (%)	(Rp.000)	Landless (%)	Landowner (%)	(Rp.000)	Landless (%)	Landowner (%)
I Agricultural sector															
1 Rice farming *)	1,410	55.3	33.7	876	29.1	19.3	1,218	54.4	34.9	1,616	59.7	39.9	1,256	36.7	24.8
2 Other food crops farming	70	2.7	1.7	334	11.1	7.4	131	5.8	3.8	0	0.0	0.0	200	5.8	4.0
3 Estate crops	0	0.0	0.0	0	0.0	0.0	20	0.9	0.6	50	1.8	1.2	0	0.0	0.0
4 Livestock	150	5.9	3.6	40	1.3	0.9	40	1.8	1.1	190	7.0	4.7	0	0.0	0.0
5 Fisheries	0	0.0	0.0	205	6.8	4.5	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
6 Skilled farm labor	165	6.5	3.9	87	2.9	1.9	0	0.0	0.0	0	0.0	0.0	60	1.8	1.2
7 Unskilled farm labor	44	1.7	1.1	43	1.4	0.9	0	0.0	0.0	150	5.5	3.7	40	1.2	0.8
8 Others	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Agricultural sector sub total	1,839	72.2	44.0	1,585	52.7	34.9	1,409	62.9	40.4	2,006	74.1	49.5	1,556	45.5	30.7
II Non agricultural sector															
9 Industry	0	0.0	0.0	48	1.6	1.1	220	9.8	6.3	205	7.6	5.1	430	12.6	8.5
10 Trading	360	14.1	8.6	60	2.0	1.3	458	20.4	13.1	120	4.4	3.0	800	23.4	15.8
11 Services	155	6.1	3.7	938	31.2	20.7	57	2.5	1.6	0	0.0	0.0	333	9.7	6.6
12 Non-agric. Labor	194	7.6	4.6	120	4.0	2.6	60	2.7	1.7	375	13.9	9.3	300	8.8	5.9
13 Asset renting out	0	0.0	0.0	77	2.6	1.7	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
14 Others	0	0.0	0.0	180	6.0	4.0	36	1.6	1.0	0	0.0	0.0	0	0.0	0.0
Non-agric. Sub total	709	27.8	17.0	1423	47.3	31.3	831	37.1	23.8	700	25.9	17.3	1863	54.5	36.8
Landless total income	2,548	100.0	60.9	3,008	100.0	66.2	2,240	100.0	64.2	2,706	100.0	66.8	3,419	100.0	67.5
15 Land rent	1,633		39.1	1,534		33.8	1,247		35.8	1,344		33.2	1,644		32.5
Land owned total income	4,181		100.0	4,542		100.0	3,487		100.0	4,050		100.0	5,063		100.0
Land owned (ha)	0.590			0.272			0.284			2.682			0.340		

Note: *) Rice farming income is from all land, not only selected sample cultivated land

Figure 1. Real Rice Prices, Jan. 1996 - July 2000 (all prices adjusted to wholesale level in Jakarta)

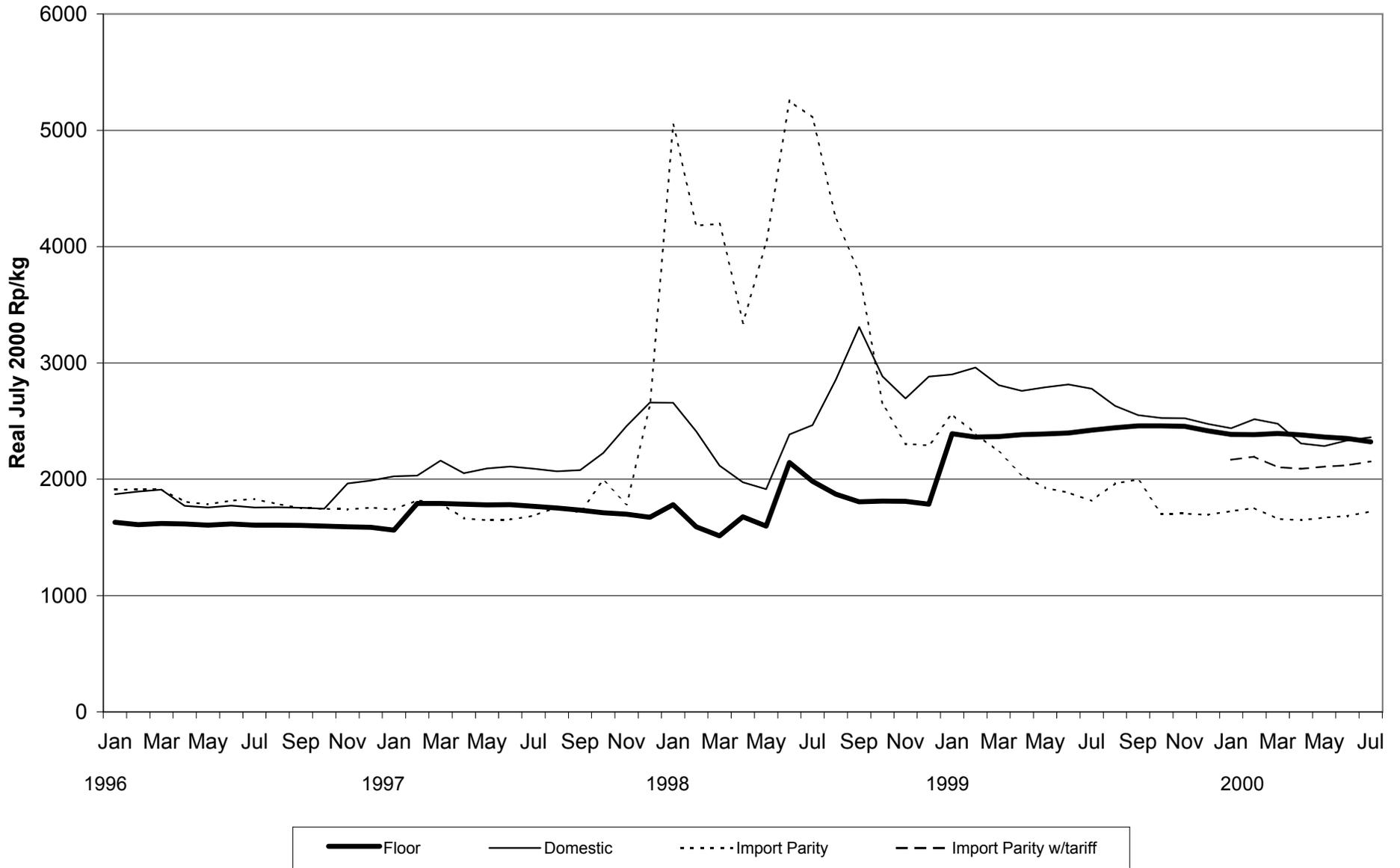


Figure 2. Real (Inflation-Adjusted) Floor Price (GKG Terms), 1973 - 2000

