ROUND TABLE
INDONESIAN AGRICULTURAL DEVELOPMENT
FOR REPELITA V

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Edited by

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Jakarta, Indonesia
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FOR REPELITA V

FOREWORD

Each of the five year plans in Indonesia have involved a considerable amount of preparatory work to establish the framework for budgeting and policy directions that are sought in each Repelita. This preparatory work usually spans two years or more and attempts to assemble as much evidence as possible on the economic environment likely to occur during the next planning period. For Repelita V, 1989/1990 to 1993/1994, the preparations for the agricultural sector are of critical importance to Indonesia and the overall plan.

The decline in oil prices in 1985/1986 has sharply lowered the prospective budgets that can be expected for the next Repelita. The achievement of rice self-sufficiency in the mid-1980s presents an increasingly difficult situation to maintain. Finally, the emergence of a multiple objective policy set for the agricultural sector along with the lower development budgets available during Repelita V imply new and different policy instruments which will need to be designed to keep the agricultural sector on a continuing growth path. This evolution toward multiple policy objectives, sharply limited budgets to pursue agricultural development, and the pursuit of a diversification policy while maintaining rice self-sufficiency along with the fast growth of tree crop, livestock, and fisheries production has presented particularly acute issues that must be resolved before establishing the parameters and guidelines for the fifth five year plan.

While considerable efforts are being made within the Ministry of Agriculture in preparing for the Repelita V, there is also a large body of information and evidence being assembled by research groups within Indonesia and abroad which is of considerable importance for the Repelita preparations.

One of the problems faced in trying to make use of various studies of the agricultural sector is their use of different assumptions, different data sources, different methodologies reported at different times and levels, making it difficult to adequately reconcile the often conflicting findings and information arising from the studies. Similarly, it is rare that the researchers and policy makers are provided with an opportunity to come together to explore the evidence and information that collectively results from all of the works on the Indonesian agricultural sector.

With these considerations, it was decided to hold a working Round Table to discuss and debate the many issues facing agricultural development in Indonesia. The intention was to seek a broad participation from Indonesian and overseas scholars who have been involved in agricultural development in Indonesia over a long period of time. Also, the intention was to examine the broad directions for policy to sustain the sector's growth. This volume contains the summary papers prepared during the Round Table on Indonesian Agricultural Development in Jakarta, 11-20 November 1987. Several background papers were also prepared for the Round Table. Abstracts of these background papers have been included in this monograph. These papers are expected to be the initial entries in a Working Paper Series being established in the Ministry of Agriculture.

The objectives of the Round Table were:

(1) to bring together the leading researchers involved in the analysis of policies and directions for various issues or components of the Indonesian agricultural sector,

(2) to assemble as much information as possible from completed and on-going studies of the Indonesian agricultural and food sector to serve as the basis for discussions at the Round Table; some of this information was circulated to participants prior to the Round Table;

(3) to resolve through debate and discussion the conflicting evidence and information relating to the issues facing the sector during the next Repelita;

(4) to consolidate the information and evidence for presentation of the policy options and directions available during the next Repelita to senior officials and advisors;

(5) to establish a common understanding among researchers in Indonesia and abroad of the priorities for further research to support the continuing work needed in pursuit of the next Repelita, i.e., a research agenda.

The background papers, abstracted at the end of this volume, were designed around the following topics:

(1) Supply and Production of Food in Indonesia,
(2) Domestic and International Food Demand,
(3) Agricultural Product Markets,
(4) Progress in Biological Technology for Agriculture, and
(5) Farm Inputs and Extension.

The three summary papers prepared during the Round Table in this volume are:

(1) Long Term Issues in Indonesian Agricultural Development,
(2) Economic Issues in Repelita V, and
(3) Incentives, Research and Extension in Repelita V.

I want to thank USAID for the support through the Agricultural Planning Project and the Secondary Food Crops Development Project to conduct this exercise. Also, the World Bank contributed directly by providing the time of two consultants throughout the Round Table. My thanks go also to the Asian Development Bank, the Food and Agricultural Organization of the United Nations and the United Nations Development Programme for their interest and contribution to the debate. Finally, I want to thank the senior officials in the Ministries of Agriculture, Trade and Finance and Science and Technology, Bappenas, LIPI and Bulog who contributed so generously with their time and thoughts about the road ahead.

The broad participation, the willingness and desire to fully explore alternatives and options in the developmental process for the agricultural sector and the sensitivity to the particular

conditions facing Indonesia generated the inspiration for all of us throughout the Round Table. The difficult task of refining and implementing the ideas and strategies proposed during the Round Table lie ahead of all of us.

Dr. Sjarifudin Baharsjah
Secretary General
Ministry of Agriculture
Jakarta, Indonesia

December 1987

PROGRAM

ROUND TABLE ON INDONESIAN AGRICULTURAL DEVELOPMENT

PREPARATION FOR REPELITA V

JAKARTA

11-20 NOVEMBER 1987

November 10, Tuesday

Arrival of Participants and Registration at Hotel Indonesia, Jakarta.

November 11, Wednesday

Place	Irian Room, 15th floor, Hotel Indonesia
Theme	Macro Economic Scenario
Subject	Indonesia: Past and Future Sources of Growth and the Role of Agriculture
Author	Boediono
Chairman	Soetatwo Hadiwigeno
09:00-12:30	Presentation and Discussion
12:30-13:30	Lunch
13:30-15:00	Discussion
15:00-17:00	Agricultural Planning, Repelita V Murasa Sarkaniputra
17:00-18:00	Wrap up: Douglas D. Hedley

Resource Persons: A.T. Birowo, Nicholas Hughes, Douglas D. Hedley, Scott R. Pearson, Martin Hanratty, H.S. Dillon, Irshadul Haq, Mubyarto, C.G. Swenson.

November 12, Thursday

Place	Irian Room, 15th floor, Hotel Indonesia
Theme	Supply and Production Systems in Indonesian Agriculture
Subject	Supply and Production of Agricultural Products in Indonesia
Authors	Donald Mitchell and Dibyo Prabowo
Chairman	A.T. Birowo
08:00-09:00	Consultant Working Session
09:00-10:45	Consultation with D.G. of Food Crops Promotion, Muin Pabinru and Secretary of the Bimas Agency, Dudung Abdul Adjid
10:45-11:00	Break
11:00-12:30	Consultation with D.G. of Livestock Promotion, Erwin Sutirto
12:30-13:30	Lunch
13:30-15:00	Consultation with D.G. of Fisheries Promotion, Kusno Rahardjo
15:00-15:15	Break
15:15-16:45	Consultation with D.G. of Estate Crops Promotion, Rachmat Subiapradja
16:45-17:00	Wrap up: Scott R. Pearson

Resource Persons: A.M. Satari, Chairil Anwar Rasahan, Jajah O. Koswara, Scott R. Pearson, Douglas D. Hedley, Agus Sunyoto, Nicholas Hughes, Mubyarto, C.G. Swenson, A. Rivai Husein, Rusdian Lubis, Irshadul Haq, Joanne Hale, Sulbiyati Subroto.

November 13, Friday

Place	Irian Room, 15th floor, Hotel Indonesia
Theme	Demands and Markets for Agricultural Commodities
Subject	Domestic and International Demands for Agricultural Products
Authors	Stanley R. Johnson and Achmad Suryana

Subject	Agricultural Markets: International, National and Regional Development
Authors	Steven R. Tabor and Lutfi Ibrahim Nasoetion
Chairman	H.S. Dillon
08:00-08:30	Consultants Working Session
08:30-10:00	Consultation with Bulog, Chrisman Silitonga
10:00-10:15	Break
10:15-12:00	Consultation with D.G. of Research and Development, Ministry of Trade, Suhadi Mangkusuwondo
12:00-13:30	Lunch and Friday Prayers
13:30-15:00	Consultation with FAO and UNDP, Hans A. Dall
15:00-15:15	Break
15:15-17:00	Consultation with Winrock International, Douglas D. Hedley
17:00-18:00	Wrap up: Stanley R. Johnson

Resource Persons: Nukman Halim Nasution, Dorodjatun Kuntjorojakti, Budiman Hutabarat, Rusdian Lubis, Sukirman, H.S. Dillon, Scott R. Pearson, Douglas D. Hedley, C.G. Swenson.

November 14, Saturday

Place	Irian Room, 15th floor, Hotel Indonesia
Theme	Research, Technology and Extension
Subject	Progress in Biological Technology for Indonesian Agriculture
Authors	Barry Nestel and Edi Guhardja
Subject	Farm Inputs and Extension
Authors	John Russell and Faisal Kasryno
Chairman	Ibrahim Manwan
08:30-10:00	Consultation with the Agency for Agricultural Research and Development, Paransih Isbagio
10:00-10:15	Break
10:15-11:45	Consultation with the Agency for Education, Training and Extension, Soedradjat

11:45-13:15	Consultation with USAID, Robert Rucker
13:15-14:15	Lunch
14:15-15:45	Consultation with World Bank Geoffrey B. Fox, Chief, Agricultural Office in Indonesia. Consultation with Resident Mission of ADB: Antonio Perez
15:45-17:00	Wrap up: Barry Nestel

Resource Persons: M.P.S. Tjondronegoro, Mubyarto, Lukman Sutrisno, M. Amin Aziz, Irshadul Haq, Douglas D. Hedley, C.G. Swenson, Margono Slamet, H.S. Dilion, Dady Ganda, Jusuf Jakub, Joanne Hale.

November 15, Sunday	Open
November 16, Monday	Consultant Working Session Irian Room, 15th floor, Hotel Indonesia
November 17, Tuesday	Consultant Working Session Irian Room, 15th floor, Hotel Indonesia
November 18, Wednesday	Consultant Working Session Presidential Suite, 7th floor, Hotel Indonesia
November 19, Thursday	Round Table Presentations

Place	Orientale Room, 8th floor, Hotel Indonesia
Chairman	Secretary General, Sjarifudin Baharsjah
09:00-09:15	Opening by the Secretary General
09:15-09:30	Outline of the Round Table by the Director of the Bureau of Planning

09:30-12:00	**Long Term Issues in Indonesian Agricultural Development** by Douglas D. Hedley, Stanley R. Johnson and Dibyo Prabowo
12:00-13:00	Lunch
13:00-15:00	**Economic Issues for Agriculture in Repelita V** by Lutfi Ibrahim Nasoetion, Steven R. Tabor, Achmad Suryana and Donald O. Mitchell
15:30-15:45	Break
15:45-15:15	**Incentives, Research and Extension for Agriculture in Repelita V** by Edi Guhardja, Faisal Kasryno, Barry Nestel and John F.A. Russell
17:15-17:30	Wrap up: Douglas D. Hedley Closing: Secretary General
19:30-21:30	Dinner hosted by Secretary General

November 20, Friday

Place	Irian Room, 15th floor
Chairman	Soetatwo Hadiwigeno
09:00-10:00	Consultant Working Session: Final Report

ROUND TABLE

INDONESIAN AGRICULTURAL DEVELOPMENT

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LONG TERM ISSUES

IN INDONESIAN AGRICULTURAL POLICY AND PLANNING

Douglas D. Hedley, Stanley R. Johnson and Dibyo Prabowo

I. INTRODUCTION

This paper synthesizes information and analysis drawn together during the Round Table on Indonesian agricultural preparations for the fifth Repelita regarding longer term issues. The horizon or time frame utilized in the paper is ten to fifteen years, taking Indonesia into the first years of the twenty-first century. Agriculture has been a major component of growth in the past twenty years in Indonesia and must continue to play a significant role in the overall performance of the economy. This prominence of the agricultural sector[1] underlies the necessity of taking a longer term perspective within which the short and medium term policies must be found.

Three long term performance criteria that will dominate policy setting across all sectors of the economy in the long run are (a) income growth and poverty alleviation, (b) employment growth, and (c) regional development. All three of these performance criteria impinge importantly on the agricultural sector since more than half of the labor force of the nation is in the rural/agricultural sector. Also, agricultural production represents approximately one-quarter of the GDP and hence the agricultural sector must continue to play a major role in improving the economic performance as reflected by the longer term criteria.

[1] The "sector" is taken to mean the food crops, tree and estate crops, livestock, fisheries sub-sectors.

The paper begins with an examination of the transition underway in the Indonesian economy. As a point of departure, the past longer term change in the economy and for agriculture is examined. Second, the paper explores income growth and poverty alleviation, employment growth and regional development as longer term performance criteria relative to present economic situation and in the context of anticipated economic reforms. Finally the paper identifies the principal areas within which new directions must be found and broad policy suggestions for addressing the problems that these three fundamental performance criteria pose.

II. THE INDONESIAN ECONOMY IN TRANSITION

With a real growth rate of about 7.7 percent annually for the past twenty years, the Indonesian economy has been in a continuous state of transition (Boediono 1987, Hedley 1987a, Hedley 1987b and Tabor 1987). The rapidity and extent of recent and foreseen change and the very different, underlying circumstances facing Indonesia in agriculture and other sectors make it important and useful to view the prospective policy changes in the context of continuing rapid transition. Essentially, the Indonesian economy has been transformed from a very low income nation to a fast growing middle income nation in the past two to three decades. These changes have brought forward different sets of problems and developmental processes that increasingly need to be addressed. All of the discussion at the Round Table has focussed on the need to shift policy from one of fostering the first stages of development in a nation to the complex interactions of policies across sectors and with the international economy.

Much of the policy surrounding the agricultural sector has grown up over the past twenty years based on high and rising public expenditures fueled by revenues from the petroleum sector. The sharp drop in petroleum prices and the equally sharp fall in governmental revenues available for public sector support beginning in the 1980s and particularly since 1985 is a key aspect of the transition underway. Looking ahead, it is unlikely that petroleum based revenues will recover to the state of dominance in governmental budgets enjoyed in the previous 20

years. Also, adjustments in currency exchange rates in the past two years have markedly increased the debt service ratio in Indonesia. Prudent management of the debt exposure over the past several years argues against serious concern over the present debt service ratio. Yet the debt service requirement supports the conclusion that the present and future conditions will provide for sharply different means and sources of growth than in the past.

The economic sectors of Indonesia have become much more closely linked in recent years. Together with macro-economic policies (monetary and fiscal) these linkages require that policy directions for any sector be sought more broadly. Deregulation in the financial sector and the shift in some areas from quotas and import licencing toward tariffs and a freer trading regime are an important indication of the recognized need for response to the different domestic and international conditions. The deregulation is part of a broad economy-wide strategy of moving toward a more market driven allocation of resources with less public sector involvement in directing investment, production and consumption. While little if any of the deregulation has begun to directly affect the agricultural sector as yet, the agricultural sector needs to be positioned during the next Repelita to accommodate the shift to market oriented decision making in the years ahead.

From the perspective of the agricultural sector, very substantial change has also occurred recently. The sharply reduced of rice imports in the early 1980s began to free up foreign exchange for other critical imports. It also allowed the attention of policy makers to turn toward agricultural diversification and the non-rice food crops. In trade, the decline of oil exports (by value) added greater pressure to expand exports from fisheries and estate crops. It has also led to fostering import substitution in the food crop and livestock sectors, although the initial attempts have led sectoral policy away from the market orientation sought more generally in the economy. But the sources of growth provided by the 'green revolution' in rice from a technological viewpoint have largely been implemented. While output growth can and must continue in rice, the process will be more one of reducing the gap between the potential and the

farm level yields than in greatly increasing the potential yield (Nestel 1987 and Guhardja et al., 1987).

The present policy in agriculture was designed early in the New Order Government under widely different conditions than now prevail both in the agriculture sector and more generally. It then becomes fundamentally important to the search for alternative more viable and dynamic policy directions. While "fine tuning" in policy may have represented an acceptable approach to policy in the recent past, considerable re-thinking of policy will be needed over the longer term to respond to these underlying, basic changes in the economy. Necessarily these changes will be evolutionary and careful since the flexibility in budgetary experimentation in policy is now more limited. Also policies for the future must increasingly be based on achieving objectives with very much smaller budgetary commitment than in the past. This will require a thorough understanding of the changing role of government in the future and resources concentrated on those areas that cannot be serviced directly by the private sector. In particular, the research for the crops, fisheries and livestock sectors will require greater spending and the subsidy components of spending will need to diminish. While the fertilizer subsidy may need to be phased out very gradually, the subsidies on pesticides, mechanization and credit could be reduced or eliminated much more quickly (Guhardja et al., 1987 and Tabor et al., 1987).

The growth in agricultural production has been led by the application of widely available technology in rice, some of the estate crops and to a lesser extent, corn. This technology, by and large, has been developed elsewhere and adapted very successfully to Indonesian conditions. For the future, a growing amount of indigenous research will be needed to stimulate technological change in the agricultural sector and sustained growth. Simply, the importable technology that can be adapted easily has already been largely exhausted. And yet, growth in productivity and efficiency, founded on new and improved technology and policy reform in the sector is generally seen as the principal objective for the short, medium and longer term for Indonesia. Without these changes, policy in the sector may well be caught up in promoting more heavily controlled and public

sector driven measures inconsistent with the more market oriented guidelines now being established generally for the economy. Equally, the domestic resource costs of pursuing a protected food sector by concentrating on elimination of imports on a crop by crop basis can be expected to slowly choke long term growth for this component of the agricultural sector.

The overall task then is to find alternatives in policy that allow for the comparative advantage by crop and region in Indonesia to be expressed. This argues for productivity and efficiency as the areas of emphasis in setting policy for the sector as a whole.

III. LONG TERM NATIONAL AGRICULTURAL PERFORMANCE

In attempts to examine the agricultural growth prospects for the Indonesian economy, discussions evolve to three major topics: income growth and poverty alleviation, employment growth and regional development. While these criteria are of dominating importance, it is difficult to use them as the focus for specific policy actions and recommendations. Rather, it is more productive to find policy options and strategies to address the underlying causes that drive each of these long term performance criteria. Hence, while each of these criteria is reviewed below, the examination is with a view of identifying general problem approaches, rather than specific targets and policy measures.

Agricultural is arguably the most important sector in the Indonesian economy. In 1986 agriculture accounted for a quarter of the GDP for Indonesia. Over 50 percent of the Indonesian population have agriculture as a primary income source. Total exports from Indonesia were $18 to $20 billion in 1986, about 10 to 12 percent of which were from agriculture. Clearly, the macroeconomic or national objectives for Repelita V must be articulated in the agricultural sector plan. Per capita income must grow at a rate consistent with the recent past, approximately three percent or more per year. Employment must grow to accommodate the new entrants to the labor force. And, since most of the Indonesian population is rural and evolving from a subsistence agriculture, enhancing the quality of life economically and more generally is a key policy concern.

Income and employment in the longer term are economy-wide performance criteria that are in turn determined by policies toward agriculture and other sectors, macroeconomic and monetary policy, trends in population, and economic factors external to the domestic economy. Regional development is more specialized but will depend heavily on the economic conditions in the sector and the economy. The agricultural plan for Repelita V therefore must be integrated with policies of other economic sectors, macroeconomic and financial plans and a consensus set of projections on likely outcomes for economic factors external to the Indonesian economy. The questions for the agricultural sector in the longer term are then: what are the policies and programs to be undertaken and how are these measures to act in concert with other domestic policy and external conditions to assure the desired or targeted levels of the three long term performance criteria, employment, income and regional development?

The long term planning for the agricultural sector will be made within a number of constraints. First, the budget situation for the national government is limited currently and will be during the five years of .Repelita V and well beyond by lower oil prices, debt servicing and the ongoing revaluation of currencies. Second, and of emphasis for the discussion in this paper, the measures taken in the plan must be consistent with longer run growth in per capita income and full employment of human and natural resources and a higher quality of rural life for the Indonesian people. That is, the plan should not be short sighted, realizing targeted outcomes at the expense of major goals for the economy in the longer term. This requires careful consideration of the income, employment and regional development performance criteria, particularly as the major policy measures to be used in achieving the goals for Repelita V are likely to involve reforms in the economic structure of the agricultural sector to increase productivity and economic efficiency.

INCOME AND POVERTY ALLEVIATION

An ongoing concern with income in Indonesia and in other countries is the balance between rapid growth and income

distribution. Indonesia continues to experience problems with the areas of poverty. A number of the households in Indonesia have incomes that are inadequate to insure diets that are nutritionally sound. Clearly, something must be done to improve the economic status of those at the lower end of the income distribution. But, is this to be done at a sacrifice to increasing per capita income over the long term? It could be, for example, that by holding labor in production agriculture, the income in the lower strata of the distribution could be increased, but at the expense of economic efficiency and the longer term rate of economic growth. A similar argument can be made for the myopic exploitation of the natural resources base. Thus, for agriculture and other sectors, policies for Repelita V must be undertaken with a longer term view than just the next five years.

For future income growth, investments must be made in research and technology and policies for agriculture must be to orient the sector to a future of growth and competitiveness on an interregional and international basis. These guidelines if followed hold sweeping implications not only for Repelita V but also in the five year plans to follow. First, agriculture must be lead by policy to create a structure that will make it more efficient and productive. This means that strong measures to deregulate agriculture should be undertaken. The deregulation will likely find expression in pricing to encourage regional or provincial production patterns that reflect comparative advantage. Introduction of economic structures to insure that advantage can be taken in size economics will be necessary. For example, building production and processing plants that are inefficient may seriously limit longer run competitiveness and growth. The result would be to achieve future targets at the expense of the future of Indonesian agriculture. Other policy choices should be governed by the same longer term concerns of consistency with longer term performance of the economy and the society.

A major part of the agriculture sector budget is currently being allocated to subsidies. Relative to the longer term, these subsidies may be quite limiting. It is not likely that the agricultural budget will be increased significantly in Repelita V. Thus, funds used for subsidies are funds that will not be available in research and

other initiatives. In short, continuation of the subsidies has a high opportunity cost for agriculture. The alternative is to significantly change the structure of agriculture, introducing market reforms and reducing subsidies. In an international situation with low and decreasing real agricultural commodity prices, this experiment is considerably less risky than it might be under high and rising agricultural prices.

But what of the low income population and those in the growing rural labor force that may move from agriculture in the longer run under the reforms advocated? Policies must be designed to improve incomes of these households and aid their transition to areas or activities in which their labor can be more productively utilized. The recommendation is to actively develop programs to support these households in transition. It is natural for this responsibility to be assumed by agriculture. The labor will be from households that have agriculture as a primary occupation. The adjustments releasing or limiting labor force absorption will make agriculture more efficient. And, much of the new employment opportunity for this labor will likely be in agricultural processing and distribution. In short, the recommendation is to keep the productive engine in agriculture efficient and lean and to simultaneously adopt active policies that assist the rural labor released from agriculture, employing it in processing and related economic activities.

EMPLOYMENT

Approaches to employment must of course be consistent with those for achieving the income goal. Agriculture will be under pressure to assume partial responsibility for the employment increase necessary to accommodate the larger size of the labor force. But, this may run directly counter to the increase in aggregate income. As agriculture develops and becomes more productive, the factor share for labor (the payment to labor per unit of product) is likely to decline. Certainly by comparison to other economies with highly productive and well developed agriculture, this is the case. Reforms will make Indonesian agriculture more efficient and productive and may increase total production enough to increase total labor utilization for a period of time. However, an absolute reduction in total labor

use in the sector will eventually occur as part of the long term developmental process. Holding labor in agriculture through targeting employment levels will work against efficiency and productivity, and will seriously weaken the long term capacity in the sector for growth. Equally, it will work against the growth in incomes in the sector.

There are two major routes to approaching the employment issue in agriculture. These are based on the recognition that as the development process of the agricultural sector evolves in the long term, the labor force in agricultural production will eventually decrease. Concomitantly, the labor utilization in the processing and service sectors will grow rapidly in favorable economic structure and business climate. However, the processing and services sector for sectoral products is unlikely to absorb all of the labor leaving agricultural production.

A considerable part of the labor leaving agricultural production will need to find employment in other parts of the economy. The first route then is to press for the development of processing and services based on agricultural production as well as to encourage rural based employment more generally. This avenue argues for programs in the long run to assist, possibly through refocussed extension agents, with the transition of people out of agricultural production. Such programs could target those with few or no resources in agricultural production.

A second route builds on the first. Because of the need for a great deal of coordination between the agricultural production sector and the processing and services sector based on sectoral product, the concept of the "agricultural sector" needs to broaden to encompass all aspects of production, processing and services. Instead of agreeing to attempt to increase the share of labor per unit of output or relative to land, the emphasis should be on total employment in the sector, with agriculture broadly defined to include the secondary and tertiary processing and services. This is the way agriculture can best meet the income growth and regional development objectives and help with the employment of the larger labor force without sacrificing the competitiveness of Indonesian agricultural production in the longer run.

Tree crops, fisheries and livestock sub-sector should be carefully considered relative to employment goals. Indonesia appears to have a comparative advantage relative to international markets in many estate crops and in some fisheries products, when the domestic sub-sectors are efficiently organized. Rice and secondary food crops may have to release subsidies to encourage development of these sub-sectors. These are also sectors that may provide future opportunities for processing and post-harvest value added. Associated economic activities are normally highly labor intensive. Thus, by reforming agriculture, encouraging regional specialization and reducing subsidies, employment can be increased in areas where Indonesia has a comparative advantage relative to international markets.

This employment strategy is also consistent with likely developments in the domestic market for food. If the objective of increased per capita income is realized, the demand for food will change in ways indicated by elasticities from the most recent analyses. These results show low income and price elasticities for rice, higher income and price elasticities for meat and dairy products and cross price effects with rice and secondary food crops indicating substitution possibilities in demand and diets (Johnson et al., 1985 and Johnson et al., 1986). Thus, by moving labor to livestock and fisheries as well as to internationally competitive sectors, a rapidly changing domestic demand will also be served. That is, a food and agricultural industry will be developed that can better serve the longer term higher income Indonesian population.

REGIONAL DEVELOPMENT

The strong commitment to regional development has been translated in the agricultural sector to assuring a regional or provincial capacity to provide sufficient food in the region from local production. This direction in policy has been the basis for pan-territorial pricing and production strategies in agriculture. Certainly as well, concerns with local security, the high cost of transport and the desire for regional self-reliance have supported this approach to policy. Nonetheless, the resource endowments differ very sharply by region across Indonesia,

suggesting that the comparative advantage of regions differs equally sharply. Directly targeting production in each region for all food crops can then impose substantial costs on the economy.

High transport costs between regions can also limit the expression of comparative advantage by region and crop opportunity. Thus, for comparative advantage among regions to be fully realized, the transportation sector of the economy must be correspondingly altered. Margins between retail and farm prices must reflect costs of transports and processing. Policies and regulations must be changed to permit private sector participation and free trade among the provinces or regions.

Much of existing policy in the sector has been dominated by concern with equity among regions. While agriculture remained largely independent from other parts of the economy domestically and international, the regional self-sufficiency approach may have had a substantial payoff. However, with greater integration among sectors of the economy, the costs of achieving equity in society among regions in this manner rises rapidly. The recommendation is for policies to encourage regional specialization with freer trade and resource mobility providing the mechanisms for achieving a more equitable income distribution.

IV. OPPORTUNITIES FOR POLICY CHANGE

From the three performance criteria in the long term, income growth and poverty alieviation, employment growth and regional development, five primary components of longer term policy can be identified: natural resources development, human resources development, environment, technological change and the economic structure of the production sector as well as the secondary and tertiary sectors supported by agricultural, livestock and fisheries production.

NATURAL RESOURCES DEVELOPMENT

The present concentration of food production on Java is largely a reflection of the abundance of soils of volcanic origin together

with the relatively fertile alluvial lowlands and irrigation development. These soils have permitted a steady increase in cropping and hence human population on Java from an estimated 7 million in the early 19th century to about 105 million now. The increase in population has been accompanied by a progressive intensification of land use in both low lands and uplands to the point where Java may be considered as "fully exploited for cropping". Indeed, the area under cultivation in Java substantially exceeds the area conventionally classified as suitable for cropping. While this largely reflects the massive human effort that has gone into the modification of land geometry by land terracing, making conventionally "unsuitable" land "suitable", there are areas in the Javanese montane region which should be retired from annual cultivation and placed under permanent tree cover for the protection of catchments draining into the more settled lowland regions.

A great deal of investment has been devoted to rehabilitation, upgrading and expansion of irrigation systems in Java. These investments can improve water control and increase cropping intensity and yield. By and large, this type of strategy will generate relatively rapid income and employment increases.

Within Indonesia, there is tremendous variability in the potential of land to produce tree and food crops. This is an important factor in the geography of food supplies and influences hunger patterns more than it would if regional comparative advantage were allowed.

Mapping and documentation of the land resources of Indonesia for the purpose of agricultural development is still lacking. This means the existing assessment of soil, topography, climate and the like can be extended, integrated and refined. The manpower training requirements for such effort would be substantial, but should be planned at an early opportunity. To a great extent the data already exist for much of this effort, although the sources and quality of these data are variable.

While Java can still contribute substantially to agricultural production, the largest long term potential for increased production will come from the outer islands. Potentially usable

land within slope classes 0-3 percent and 0-8 percent, considered suitable for permanent annual cropping, is 22.7 million hectares out of a total land area of 162.4 million hectares. Of this area, 41 percent is in Sumatra, 34 percent in Kalimantan, only 3 percent in Sulawesi, and 22 percent in Irian Jaya. Also, the margin between forest and tree crop agricultural uses of land needs very careful consideration to assure that environmental and regional development concerns are in harmony.

Development spending on irrigation is estimated to have fallen by one third in 1986/87. As a result, physical additions to irrigated area have declined to about 100,000 hectares per annum. The structure of the program has also changed, with more emphasis on irrigation development on the outer islands. In addition, the Government has tried to protect the allocations for operations and maintenance, which have increased as a share of development spending from 6 percent in 1983/84 to about 10 percent in 1986/87. However, allocations for operations and maintenance have fallen in real terms and are now grossly inadequate. Even in 1985/86, before the latest budget cuts, total operating and maintenance spending by both the central and local governments was only Rp.11,300 per hectare, less than half the required level on average. This shortfall results in a loss of productivity and deterioration of the country's capital stock.

Indonesia has some 40 million hectares of coastal lowland or tidal swamps of which some 3.3 million hectares are already occupied. It is estimated that a further 5.6 million hectares are suitable for agricultural development. This area has a greater agricultural potential per hectare than most of the remaining upland rainfed areas. If managed properly, lowland swamps can support a wide variety of food and non-food crops and yield a higher income per hectare than can normally be expected under upland food crop conditions.

Because the Government is facing a much tighter budget constraint, the priorities for future irrigation will be to:

- improve the operations and maintenance of the irrigation system, funding by donor agencies and water charges,

- pay more attention to water management, the role of water users associations and diversification of crops,
- promote private sector involvement in irrigation on small scale irrigation systems,
- invest in making tidal swamps more productive,
- invest in smaller scale projects and provide incentives for private sector involvement.

Government capacity to fund major investment programs is severely constrained. The development of irrigation, the inputs subsidy, the use of mechanization and others will be affected. To some extent, this tighter budget constraint is considered as a blessing in disguise for Indonesia. Indonesia is moving toward self-reliance which means it will depend more on domestic capability in capital markets. Domestic savings mobilization is the key factor for domestic investment. Because domestic funds are not expected to be available in large quantities at least initially, decisions on the choice of investment will be very important. Irrigation development would be likely small scale because of the low investment and faster yield.

Faster return on irrigation investment will yield employment benefits. Also, with the budget constraint, the use of mechanization provided by the public sector would likely be curtailed. The reduction of input subsidies are not expected to be a threat to employment, since the share of modern inputs in the cost of production is small compared to labor cost.

Fisheries is an important sector of the Indonesian economy because it utilizes a major part of the nation's available natural resources and provides employment for an important portion of the country's rural poor. Although subject to substantial annual variations, a strong upward trend has been apparent in the volume and value of fresh fish exports. Total fish production has been increasing about 5 percent annually. However, this increase is confined to the marine sector. The production from inland waters is increasing much more slowly over all, declining in some areas and products due to urbanization, siltation, eutrophication in many lakes and swamps and reduction of rice

paddy-fish culture resulting from the increased application of pesticides in agriculture.

Waters in Malacca Straits have been over-exploited and the Java Sea is nearing over-exploitation of the resource. East and South Kalimantan waters as well as those of the eastern part of Indonesia continue to be under-exploited. The Exclusive Economic Zone concept has brought about a significant change in jurisdiction of the coastal waters up to 200 miles offshore. With the 200 mile limit, the production potential as well as the control over the resource have greatly increased although little has been realized from this so far. To promote this potential, technical skills, modern equipment and new fishing techniques and methods need to be developed.

HUMAN RESOURCES DEVELOPMENT

An integral part of the development strategy for Indonesia has been human resources development. Basic education has been extended significantly. A greatly increased percentage of the eligible age population is enrolled in primary school. In higher education, a number of advanced degree programs is in place at national and provincial universities. Health care, important in maintaining productivity and extending longevity, have improved. These basic human resource development programs must be continued and accelerated, even in the difficult budgetary situation, if economic development is to be fostered and the quality of life in Indonesia is to increase.

In addition to the general human resource development program, there are more specialized activities that contribute in a direct way to the productivity of human capital. In agriculture, except for extension, these programs have been perhaps more limited than in the rapidly growing industrial sector. On the positive side, the intensification program for rice and other food crops have shown the advantage of improving the value of the human resource through programs directed at a specific productive activity. The same is true but on a lesser scope for new and innovative programs in tree crops, livestock, and fisheries. In short, it has been clearly demonstrated that technology packages and education, permitting producers to use the production

methods effectively can result in improved productivity of human, land and capital resources.

In the transition to a less regulated agricultural sector, these human resource development programs will have to be extended and altered in approach. For the later, the emphasis on efficiency and productivity will place a greater management burden on the producers. The pay-off to society will be more output with fewer purchased inputs. For the producers, the benefit will be the return to management and successful risk taking, raising household income. Extension of these specialized production oriented approaches to other crops or outputs, and in particular to land and production methods that place a higher management burden on producers, will be a major requirement if agricultural production potential more consistent with the extensive natural resource base on Indonesia is to be attained.

A related area in which the human resource in agriculture will require development is the processing and distribution sub-sectors. For processed goods in the export market, quality and predictability of quality are important. This is particularly true of processed foods and other agricultural commodities that include a substantial possessing component in their value. Since much of this component is labor, the development of programs to extend and improve the processing and distribution of agricultural products can aid in the increase of employment in agriculture, broadly defined.

One of the demands on the human resources in agricultural production and in processing and distribution of agricultural commodities is the capacity to effectively process and utilize information. Thus the development of human resources and the use of the resource effectively has institutional implications. Information to be used by the farmers and in processing and distribution sub-sectors must be generated. For a market economy, this will require changes in institutions to permit participation of the private sector and insure that the information is at hand to be used in production and distribution by the more knowledgeable human resource. Contingency markets, marketing information systems, scouting systems for pests, weather forecasting and trade related data are examples. Where

the information cannot be packaged to insure a yield on private investment consistent with opportunity costs of capital, the public sector will have to intervene through direct supply and servicing or through a change in the legal or organizational structure for the economy designed to insure a private return.

Last, as an organizing concept for human capital development and the increased productivity of agricultural and related sectors of the economy, "packaging" of technology that has proven so successful in rice and other production activities should not be neglected. Packaging can be extended to processing and distribution industries, other agricultural production activities and to distribution. As well, packaging can be used as a concept in organizing resources for research and technology development. For example, well trained researchers without adequate facilities and operational support will not be able to use their human capital to insure a high rate of return on what has in many cases been a substantial public investment. Packaging in the sense of coordinating production, processing, distribution and marketing in processing and trading sectors should also be emphasized. Much is to be learned from the experience with intensification about development and organization of human resources on a larger scale.

Recommendations implied by these observation which are closely related to the approaches suggested in the research and extension papers follow.

- Expand the education systems, recognizing the importance of basic skills in a more complex and integrated economy which through reform places increase burden on management, communication and the ability of the human inputs to production and distribution.
- Integrate human resource development with technology development and adoption programs. University education, research and extension will be touched by these organizational changes and approaches to human resource development.
- Maintain the human resources developed through health and educational programs aimed at prolonging the productive live of the resource and continuing development and adaptation.

- Extend packaging approaches that have proven so successful to other crops and to ventures in processing and distribution. These packaging approaches will have to be altered with the economic reforms that place more responsibility for decisions on farmers, laborers and managers.
- Recognize the important role of information services in a highly complex reformed economic sector. Make the institutional and other changes necessary to insure the supply of this information by the private and public sectors.

ENVIRONMENT

The implementation of the new environmental law in Indonesia in June 1987 and the focus of the IGGI meeting in 1988 on issues of the environment represent major opportunities to raise the consciousness of producers and policy makers to growing environmental degradation. The continuing concerns for sustainable and intensive rice cultivation, use of pesticides and chemicals, loss of upland soils, the interface between crop, forestry and fisheries uses of land, limiting or preventing soil erosion and loss, the safety of fisheries uses of the runoff water from agricultural lands, the use of forested areas as reservoirs of year-round water supplies for irrigation, the fragile and easily destroyed soils occurring through much of Indonesia, the conservation of genetic diversity: all are of increasing importance to sustainability. There is an interaction between economic policy and environmental issues. For example, subsidies on fertilizer and pesticides in many cases are promoting over use of these inputs with resulting environmental degradation and human health risk. The argument is that the interest of the agricultural sector in the long and short run is best served by assuring that these environmental concerns are adequately addressed; that is, the agricultural sector cannot in future afford the impact of the environmental degradation now underway.

Environmental concerns are especially important given the nature of economic reforms being recommended. And, effective policy to address these concerns implies a new type of regulatory role for government. Past government policies, placing a high priority on increased food production can be argued to have

been overly myopic relative to environmental degradation, in retrospect. The thrust of these comments is, however, not to criticize these policies developed under an administered approach to organizing agriculture and food production. Instead, the emphasis is on the types of measures that will be required by government to safeguard the environment as agriculture is reformed, introducing privatization, market incentives and competitively driven resource allocation.

Viable policy instruments available to government which can induce a market oriented agriculture to perform in the interest of society and longer term goals are difficult and involve property rights. If those operating lands for crop production have the right to erode it consistent with private incentives, then government programs that in effect "purchase" this right for society are appropriate. Alternatively, if the public is assumed to own the right, then taxation, the imposition of restrictions, say, on amounts of pesticides and application rate are appropriate. In reality, policies to insure that the environment is preserved consistent with longer term societal objectives will involve a combination of measures, striking a balance between the right of individual producers or agents in the agricultural sector and national interests.

Against these broad long term considerations, what can be said about appropriate directions for environmental policy? A few general principles are given below that provide a general framework for guiding shorter or intermediate term policy.

- At the heart of most of the environmental policy controversy is the question of property rights. A clear understanding and agreement on the primary rights issue is a key to consistent environmental policy.
- Indonesia is a land of many ecological zones. Policy must be specific to the biogeophysical differences. This argues for specialized policy measures developed regionally but coordinated to meet national objectives.
- Environmental policies must incorporate systems concepts. Many of the most efficient environmental policy measures will be indirect. Environmental impact assessments of regulations aimed broadly at agriculture are a mechanism for forcing the

articulation of these effects and raising the level of public and private awareness.

- Many environmental problems are of immediate concern. Retro-correction in ecological systems tends to be highly costly. Research and analyses to better monitor environmental degradation and more accurately identify causes should be initiated with high priority.
- Coordination of environmental policy across sectors in the economy is likely to be necessary. In other countries, this concern has lead to establishing a cross-cutting governmental agency charged with environmental monitoring and regulation. The Environmental Protection Agency in the U.S.A. is an example.
- Research in agriculture, developing more productive technologies should have a longer term orientation. Outcomes of production technologies, most of which by nature stress an aspect of the natural environment, should be investigated with care as great as we now devote to other performance characteristics, e.g., yield, cost of production, yield variability and the like.
- With the reform of Indonesian agriculture, market incentives will be more dominant. For both renewable and non-renewable resources, market incentives can not be counted upon to assure use consistent with societal interests.

Finally, regional development is not a policy objective independent of environment. The populations in the regions are active participants in the ecosystems as well. Broadening the concept of environment to include features that lead to a higher quality of life for these populations will be helpful in preserving or even leading to a more even population density in Indonesia, limiting indirectly a major source of biogeophysical environmental stress.

TECHNOLOGICAL CHANGE

As a starting point for the discussion on policies to guide long term technical change, it is appropriate to recall the earlier observations on the innovations that have fueled the rapid increases in agricultural output for Indonesia over the past ten years. Much of this green revolution technology was imported,

developed at international centers and more generally, out of the country. Indonesia made admirable strides in organizing systems to adapt and implement this technology for rice and to a lesser extent, secondary food crops. But, for the food, feed and industrial crops this well is nearly dry. More than in the immediate past, technology for food and related crops will have to come from domestic research and development. As well extension systems, which have been responsible for the success with the imported green revolution technology have evolved with a specialized structure. Redirecting the research and extension programs to a more domestically produced technology for agriculture implies fundamental changes in organization and philosophy.

A related major concern for technology development and adoption involves the impact of the reforms underway in the economy. This implies that some of the technology development and the services to initiate adoption will be supplied by the private sector. There are, however, some perhaps obvious principles that should guide the organization and regulation of technology development and adoption services by government. First, whether the technology services are provided by private industry or the public sector, the consumers of Indonesia will ultimately pay. Private firms must ultimately recover their investments. Public investments are supported by tax revenues. Of course, these observations abstract from questions of leakage through trade and international sharing. The point is, however, that private sector development of technological services is not a panacea.

Given that consumers ultimately pay for the technology services, whether provided publicly or privately, there are two questions. What types of technology should be developed by the private and public sectors, respectively? And, what are the policy measures what will lead the private sector to take initiatives in the socially optimal types of technology development. Of course, in both cases the investment for society should yield a return higher than the cost, vis-a-vis associated improvements in efficiency and productivity. To encourage private sector investment in technology development, regulations and policies must be put into place to enable the associated firms to capture benefits of the technology consistent with rates of return in

such uncertain enterprises, but not to let them over exploit the knowledge base developed.

Much of the private investment would wide in the technology area is in pharmaceuticals, medicine and agricultural chemicals. The reason is that private firms involved in research must generate products that will provide an adequate return on the research and development investment. Of necessity then, these firms must have the protection of licensing and patent laws. Licensing, patents and high developmental costs are barriers to entry by competitors and ensure a profit on the methods and products developed. But balancing these rights to monopoly rent to encourage investment in technology but not to permit unreasonable rates of return is a complex undertaking. These observations imply that much of the policy stimulating and controlling of private sector involvement for technology services to meet long run objectives and to coordinate with public investments by agriculture is broad in scope. At the same time, agriculture should not be passive in its approach to these key but complex policy decisions. In Indonesia where research funds are highly limited this is a luxury that cannot be enjoyed.

For the long term, a number of general recommendations emerge.

- The cost of technology development is a societal one, justifying careful government policy to guide public and private investments both in amount and by area.
- Adoption or agricultural extension should be viewed as an integrated part of the investment in agricultural technology. Public and private programs for technology services may address the adoption service quite differently.
- Indonesia cannot assume that all or even nearly all technology can be imported for agriculture as was the case with the green revolution. New systems of providing technology services are suggested, carefully orchestrating private sector involvement and adjusting the public sector supply system to one not dependent on imports of the basic research results.
- Patent laws, licensing and other mechanisms are required to induce private investment in technology services. There are such laws in Indonesia and internationally. The implications of these institutional arrangements for private investment

should be studied and perhaps changed. At a minimum, studies would show where the private sector will invest if agriculture takes a passive posture, contrary to the recommendations here.

- For regional development and employment, particularly, forms of technology investment are important. Labor saving or region specific technologies are possible, as are others. The investment mix in technology services should be guided by the three national goals and an outward looking policy for an agriculture in Indonesia that is world class.

The recommendation is for an active technology policy by agriculture, recognizing the participation of the private sector and what guides it. With this approach, the system providing technology services can be better organized to serve the interests of Indonesian agriculture.

ECONOMIC STRUCTURE

There are several aspects of the structure of the Indonesian economy that need attention in the longer term. One involves the targeting of production of the sector, another deals with the nature of employment in the agricultural and food sector as development occurs, a third has to do with the regulation and licensing in the secondary and tertiary sectors after the farm gate and the last is the institutional needs within and among Ministries required for sustained growth.

The use of targets for agricultural production has long existed for the estate crops, rice and sugar and more recently, extended broadly to many of the food crops. One implication is that as growing area food crop requirements are placed on land and resource base, lands utilized for production of annual food crops have been increasingly extended to the more fragile upland soils. This has lead in turn to growing environmental concerns with agricultural use of these lands for annual crops. Another implication is that it becomes increasingly difficult to assure that the area and production targets are integrated with the economic incentives and factor endowments available. Consequently, the domestic resource costs of production can be expected to rise over time within this target driven structure.

Allowing comparative advantage to be expressed by setting productivity and efficiency objectives for the sector is more likely to lead to sustainable economic growth.

The mandate of the Ministry of Agriculture has in the past been restricted to production. In addressing employment performance, the Ministry may target employment levels in production that are inconsistent with the efficiency and productivity objectives. This suggests that either the mandate of the Ministry needs review or that the burden of employment augmenting policy be placed elsewhere in other Ministries. One important area already noted is the processing and food services sector, where the employment multipliers are the highest. Integrated policies for employment need to cut across the production and industrial value added components of the agricultural, livestock, tree crops and fisheries sub-sectors.

While a great deal of deregulation has already occurred in the Indonesian economy, little has been introduced in the secondary crops, the processing and tertiary sectors of agriculture, tree crops, fisheries and livestock. Clearly, very important and politically sensitive issues are involved. Equally clearly, an ability is required to reflect dynamic demand for sectoral products and transmit market prices to farmers from competitive markets. Long term policies directed to efficiency and productivity require these linkages. This institutional change through deregulation is a sine qua non for moving toward a more market driven sector.

The linkages between the sector and other parts of the Indonesian economy have grown very rapidly in the past few years. Policies for production can no longer be established independently of activities in other parts of government. Rice production objectives in the past have provided for drawing the efforts of Ministries together, but the achievement of self-sufficiency in rice has weakened these ties. Also, the linkage between other parts of the sector, tree crops, fisheries and livestock, and the industrial production have not been fully established. Some integrating mechanisms will be required among various sectors and sub-sectors of government to fully exploit the productivity and efficiency potentials of the reforms.

In summary, the directions that could be pursued to support the market orientation of the sector follow.

- The Ministry of Agriculture needs to strengthen the capacity to examine all aspects of policy and planning across the sub-sectors. A strong analytical role to support the complex interactions among components of the production sector and also to the processing and industrial activities beyond the farm gate is required to provide the evidence and detailed recommendations on the transformation in the sector suggested in this paper.
- Study carefully the deregulation of the processing and service sectors beyond the farm gate. Little evidence has yet to be generated on the precise costs of the regulation and licensing; clearly this issue needs to be addressed.
- The institutional approach to employment within the government needs to assure that the agricultural sector is not burdened with absorbing the residual labor in the economy.
- The present role of government in planning and prescribing the pattern for growth in agriculture is likely to run out of steam. Consequently, the government should consider positioning the sector during the next Repelita to move toward a more market oriented approach to production in the longer term.

V. CONCLUSIONS

All of these comments on national priorities and the broad policy recommendations suggest a significant change in the conceptual approaches to sectoral development. The responsibility of agriculture and of the Ministry of Agriculture is to provide Indonesia with a "world class" agricultural sector through efficiency and productivity. Agriculture may not in the longer term provide all the food needs of Indonesia, although on a net trade balance it certainly could. One would not put this burden on the tourism sector, for example. That is, tourism would not be called upon to generate enough income or value of output to purchase a good diet for all households in Indonesia. The example is stretching the analogy clearly. But it illustrates the

burden that will be placed on agriculture and the limitation of agriculture relative to long term goals of employment, income and regional development nationally, of tying agriculture too closely to Indonesian food requirements. Consumers domestically must be seen more like international customers of Indonesian agriculture if the sector is to continue to evolve from a subsistence mode.

The longer term issues facing the agricultural sector mirror many of the concerns felt more broadly by government and society. The income growth, employment growth and regional development performance criteria used in guiding the developmental process for the economy as a whole are reflected directly in the food crops, livestock, estate crops and fisheries sub-sectors. And, agriculture must take action to initiate reforms consistent with those in the other sectors of the domestic economy and the international market conditions if it is to keep pace as a vibrant force in the economy and meet its implied obligation to make the rich natural resource base serve Indonesian growth and development.

References

Boediono, 1987. "Indonesia: Past and Future Sources of Growth and the Role of Agriculture". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia.

Edi Guhardja, Faisal Kasryno, Barry Nestel and John Russell, 1987. "Incentives, Research and Extension for the Agricultural Sector in Repelita . V". Paper prepared during the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia.

D.D. Hedley, 1987a. "Diversification: Concepts and Directions in Indonesian Agricultural Policy". In: Dauphin, F. and Bottema, J.W.T. (Editors), Soybean Research and Development in Indonesia: Proceedings of a Workshop. The CGPRT Centre, Bogor, Indonesia.

----------, 1987b. "Aspects of Diversification in Indonesian Agriculture: Research and Policy Implications". Bogor, Indonesia.

Notes for a presentation to the CGPRT-CIMMYT-EEC Workshop on Research on Domestic Resource Allocation and Comparative Advantage. (29 October 1987).

S.R. Johnson, W.H. Meyers, L.B. Fletcher, A.W. Womack, T. Teklu, and M. Wardhani, 1985. "Policy Issues, Project Design and Implementation Plan: Final Research Strategies Based on Host Country Review". FAPRI: University of Missouri and Iowa State University, Columbia, Missouri and Ames, Iowa. Report No. 1: CEAP Project in Indonesia/USAID. (July 1985).

S.R. Johnson, W.H. Meyers, K.H. Jensen, T. Teklu, and M. Wardhani, 1986. "Evaluating Food Policy in Indonesia Using Full Demand Systems". CARD: Iowa State University, Ames, Iowa. Report for the CEAP Project in Indonesia/USAID. (January, 1986).

Barry Nestel, 1987. "Agricultural Research in Indonesia: Its Potential Role in the Development Process with Particular Reference to the Advancement of Biological Technology". Paper prepared for the Round Table on Indonesian Agricultural Development, Ministry of Agriculture, Jakarta, Indonesia.

Steven R. Tabor, 1987. "Marketing in Indonesian Agriculture: International, National and Regional Development". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia.

Steven R. Tabor, Lutfi I. Nasoetion, Achmad Suryana and Donald O. Mitchell, 1987. "Economic Issues for Agriculture in Repelita V". Paper prepared during the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia.

ECONOMIC ISSUES FOR AGRICULTURE IN REPELITA V

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I. INTRODUCTION

The agricultural sector is the largest sector in the Indonesian economy, accounting for nearly one-fourth of gross domestic product and more than one-half of total employment. Past performance in the agriculture sector has been very good, especially in the last several years. During 1978-1985, the agricultural sector grew at 4.3 percent per year, while the entire economy grew at 4.6 percent per year. The most rapid growth in the agricultural sector was from food crops which grew at 5.4 percent per year during 1978-1985. Rice is the dominant food crop and accounted for most of the growth.

In the future, rice will provide less of the growth in the agricultural sector. This is due to technical limits to land and yield increases and also to the changing nature of demand which will require less growth than in past years. Future growth in rice production is expected to reach only 2.5 percent to 3.5 percent per year, half the rate of the past. If the agriculture sector is to continue rapid growth, then new sources of growth must be found to replace rice. This is a difficult task, and it is made more difficult by the prospects of smaller budgets for investment in agriculture. This means that future growth will need to be based on improvements in the existing agricultural base, not from the large development programs which characterized past rice productivity gains (Tabor 1987). The growth will not likely come from a single commodity as was the case with rice. Instead, it will come from production improvements in many crops.

The best prospect for continued rapid growth in agriculture is through greater economic efficiency. This means that agricultural production, marketing, transportation, processing and distribution must produce greater output per unit of input.

These changes are not unlike the changes which occurred in rice production over the last two decades. In that case, less productive traditional varieties of rice were replaced by new higher-yielding varieties. The same type of shift in production must also occur for other commodities if Indonesia is to continue the rapid growth of the past. Less efficient production must be reduced in favor of the more productive activities. Greater economic efficiency will not occur without active policies to encourage it. Three things are needed to achieve rapid growth in agriculture:

(a) incentives to produce,
(b) the proper technical packages, and
(c) the removal of barriers to growth.

Farmers the world over respond to economic incentives. This requires adequate prices, access to markets and the infrastructure to transport, process and distribute the agricultural products. A second requirement for rapid growth is a proper technical package. Without this, price incentives will not significantly increase production because of the technical constraints. A third way to achieve growth in agriculture is by removing restrictions which cause inefficiencies. Often these restrictions are due to government regulations which have an objective such as creating employment or providing income to a certain group. The regulations sometimes make it impossible to achieve the economies of scale possible from larger operations. The result is that production costs remain high and consumers are required to pay higher prices for products than they would without the regulations. The lower prices possible from deregulation will also lead to greater demand and eventually to larger production and increased employment.

II. DOMESTIC DEMAND PROSPECTS

Income growth, population growth and demographic change will be the main factors driving future demand for agricultural commodities. The macro-economic forecasts suggest that a rate of GDP growth of 5.0 percent is possible. Population growth is estimated to average 2.1 percent per annum over the next five year planning period. Demographic shifts will also produce an older more middle-aged population, with increased average dietary requirement. This change in demographics will add approximately 0.4 percent per annum to aggregate demand. Hence, the total effect of population growth of 2.1 percent will be to increase food demand 2.5 percent per annum.

Assuming that real prices remain constant, growth in incomes of 5.0 percent per annum and growth from population of 2.5 percent per annum imply that demand will increase at the following rates during Repelita V:[2]

	Growth Rate (percent)
Rice	3.2
Corn	3.4
Cassava	3.1
Soybeans	3.7
Sugar	3.7
Fruits and vegetable	4.5
Poultry Products	5.0
Other Meats and Dairy Products	5.7

Research has shown the demand for fruits, vegetables, livestock products, fishery products and edible oils to be quite responsive to price movements (Altemeier et al., 1987, Tabor et al., 1987a).

[2] Note that the rate of increase in demand is higher than the rate of supply growth required to meet the demand increase. The rate of growth of demand for human consumption is calculated on that portion of total supply that is consumed domestically.

Increasing the efficiency of production and distribution of these commodities would allow lower prices and lead to even faster demand growth. For example, a 10 percent decline in market price would increase the rate of growth in demand for rice from 3.2 percent to 3.5 percent, for corn from 3.4 percent to 3.8 percent, for soybeans, from 3.7 percent to 4.8 percent, for poultry products from 5.0 percent to 7.4 percent, for fruits and vegetables from 4.5 percent to 6.0 percent, and for dairy products from 5.7 percent to 7.1 percent.

The demand for processing services in the food sector is also likely to be highly price elastic. Hence, lowering the costs of processing agricultural commodities, through improvements in technical and allocative efficiency, would cause a significant expansion in the demand for processing services. This is important because of the direct employment benefits created by an expanded processing sector. Clearly domestic demand for agricultural products cannot be taken as given, particularly when price elasticities are high. In fact, consumer demand growth can be an engine to drive supply expansion if production and distribution costs are reduced.

III. INTERNATIONAL PRICES AND THE TRADING ENVIRONMENT

International markets for most agricultural commodities are very large and Indonesia's action will not significantly influence the level of world prices. However, Indonesia does produce a number of commodities whose world prices will be influenced by Indonesia's actions. These include rice, palm oil, rubber, coffee and several of the spices. For these commodities, Indonesia must consider the impact on the world market of its policy decisions (Mitchell 1987).

The world prices of most agricultural commodities move in parallel because of the ease of substituting between them in both production and consumption. Similar weather patterns also influence large geographic regions and cause yields for many crops to be correlated. A consequence of these factors is that prices tend to be low when Indonesia has a good harvest and would like to export and high when Indonesia has a poor harvest and needs to import.

The prices for agricultural commodities have declined sharply since 1981 and only recently begun to rise. It is not possible to predict accurately where prices will go in the future, however, they appear likely to rise over the next several years. This rise will not cause prices to approach the level of the early 1980s, but prices will rise an average of 10-20 percent by 1990 after inflation. In the long term beyond 1990, agricultural prices are expected to decline in real terms because of improved crop varieties which lead to higher yields. This has been the pattern of agricultural prices for many decades. This pattern has been interrupted occasionally due to unusual events such as occurred during the 1970s. In that period a number of factors including policy changes in the major exporting continues, flexible exchange rate policies and the rise in energy costs contributed to the higher prices. The emergence of a strong OPEC was especially important because it led to sharply higher petroleum prices which stimulated income growth in many developing countries and led to rapid increases in import demand. At the same time, higher energy costs led to higher fertilizer prices which lowered yields. Together higher import demand and lower yields caused real prices to rise sharply. A repeat of these events is unlikely.

Indonesia cannot reasonable expect sharply higher world prices for agricultural commodities. Perhaps some increases will occur in the near term, but major increases are not expected (Mitchell 1987). Indonesia must, therefore, concentrate on improved quality and lower costs to compete in international and domestic markets which will likely become more competitive in the future.

IV. MAINTAINING RICE GROWTH

The rapid growth of rice production has provided a major source of income and employment to the Indonesian economy for nearly 20 years. Traditional sources of this growth have been irrigation expansion, adoption of modern high-yielding varieties and the heavy use of fertilizers and pesticides. These factors are expected to contribute less to rice productivity gains in the future. Irrigation expansion has slowed in recent years and new investments have been small. Fertilizer and pesticide application rates are near the maximum possible and

further increases may not increase yields yet balancing nutrient use still holds prospects for gains (Guhardja et al., 1987).
The transfer of new varieties from IRRI is also expected to slow based on the nature of their current rice breeding work. The emphasis of IRRI's breeding program has now shifted to improving varieties for dryland areas, improving disease resistance and improving quality characteristics. The researchers are not concentrating as heavily on ways to improve yields of wetland rice, which is the most important to Indonesian production.

It seems likely that future growth in rice productivity in Indonesia will need to come from better use of existing land, labor and capital resources. The Super Intensification Program (Supra-Insus) strives to improve management capabilities and make better use of existing technology. However, maintaining past rates of growth in rice productivity will be a difficult challenge. Over the longer-term, better varieties, pest management and improved fertilizer use will be needed to complement the efforts of the Supra-Insus program (Guhardja et al., 1987 and Nestel 1987).

V. OPPORTUNITIES FOR GROWTH AND DEVELOPMENT

A BROADENED INTERPRETATION OF SELF-SUFFICIENCY

The goal of self-sufficiency in strategic commodities has shaped food and agricultural policy in Indonesia for many years. Self-sufficiency was originally interpreted as self-sufficiency in rice. In more recent years, self-sufficiency has included all strategic goods and now self-sufficiency in strategic goods is planned for each region of the country.

Achieving and maintaining self-sufficiency nationally, and especially regionally, can be very expensive The benefits of self-sufficiency must be weighted against higher costs, less efficient resource allocation, slower growth, greater domestic market price instability and lower employment in less protected sectors. The major source of growth in the agricultural sector in the future will most likely be from economic efficiency gains. The goal of economic efficiency conflicts with the goal

of self-sufficiency, both nationally and regionally, in the production of strategic commodities.

A policy of regional self-sufficiency in the production of strategic commodities also encourages less efficient resource allocation. Under this policy, the different regional factor endowments are not allocated in the most profitable fashion but are instead allocated in such a way that regional self-sufficiency is met. This results in resources not being used in the most productive activities. An example is when lands which are best suited to produce tree crop commodities in Sumatra and Kalimantan are placed under food crop cultivation.

The development of self-sufficient regions narrows markets and makes market demand more inelastic. Production disturbances then produce larger swings in prices and consumption levels in a particular regions because other regions are not allowed to compensate for the production shortfalls. Hence, a regional self-sufficiency policy both misuses scarce resources and increases the degree of risk and insecurity associated with production, pricing and consumption.

Economic efficiency can best foster agricultural growth and development if there is a broadened interpretation of self-sufficiency. The self-sufficiency goal could better be defined as a goal of producing a surplus of agricultural exports over imports on a national scale. A development objective of increasing the net trade balance of the agricultural sector would be a more efficient means of linking commodity policy objectives to the government's broader objective of generating foreign exchange from the agriculture sector.

Increasing the agricultural trade balance implies that the nation is a trader in world markets and that it is consciously searching for opportunities to increase the value of its exports over its imports. Self-sufficiency is an inward oriented development strategy, while increasing the agricultural trade balance is an outward oriented, more economically efficient development strategy.

It will be very difficult for government to move away from a goal of self-sufficiency in rice production, although, within limits this would be wise. For example, forward contracting for rice on the world market would be an alternative means of guaranteeing food security compared to a domestic stockpile program. Another alternative to maintain rice self-sufficiency would be to reduce sugar production and divert the one-third of a million hectares of irrigated lands into rice production.

If world market forces were allowed to directly influence domestic market resource allocation, then Indonesia would produce much less sugar and soybeans, and more of other crops such as rice, fruits, vegetables, fish, eggs, poultry products, tea, and coffee, given existing technology. This would result in faster growth in the agriculture sector, higher farm incomes, greater opportunities for off-farm processing and marketing and a higher rate of growth nationwide. The effects of the recent trade reform in manufactured goods has demonstrated that large gains are possible and suggest that additional gains can be made by moving to a more efficient agricultural economy. Although removing trade restriction would cause imports of soybeans and sugar to rise, resources released from the production of these commodities would flow into the production of other crops such as rice, horticultural commodities, peanuts, mungbeans and corn. A gradual phasing-in of liberalized pricing would be required, particularly in those sectors where a great deal of dislocation would be involved. The essential aim, however, would be for domestic prices to track long-term trends in world market prices.

MARKET GUIDED DECISION MAKING

The way consumers react to price changes has changed dramatically over the past fifteen years because real incomes have doubled. For example, for rice the price elasticity of demand is now about -0.17 (Altemeier et al., 1987). In 1971, the price elasticity was estimated to be -1.2 (Timmer 1972). This dramatic change leads to questions about the need for different price policies for rice. In the past stabilizing rice prices was an effective means of protecting consumption levels of the population. However, at current lower price elasticities,

stabilizing rice prices is less important. In other words, economic growth has provided the majority of the population with the ability to protect rice consumption levels from price fluctuation. In fact, recent market surveys on Java suggest that changing rice prices primarily induces a change in the qualities of rice that consumers purchase, not an appreciable change in the amount of rice consumed.

The implication of this response to price is that the public rice storage program used to stabilize rice prices is no longer economically necessary to protect most consumers and, it is a very expensive way of protecting the poor. Helping both the urban and rural poor remains a notable objective. However, at this stage of Indonesia's economic development, a more efficient means of improving the rice consumption status of the poor would be through targeted food or income transfers rather than price intervention (Tabor 1987).

Increasing the levels of economic efficiency in agriculture will require greater reliance on the market to guide decisions instead of on government controls and guidance. Past agricultural progress has prepared the farm community for a greater degree of reliance on the market. Government investments in infrastructure and modern rice varieties have served to integrate the farm community into the market place. Research on agricultural supply behavior suggests that the cross-commodity and cross-factor pricing relationships can have a powerful effect on allocating resources across crops and land types (Tabor et al., 1987b). More than ever before, the farm community has demonstrated its ability to respond positively to market signals. At the same time, reduced budgets make it increasingly unlikely that the government can enforce a system of controls and restrictions to replace the market as an allocative device.

A deliberate movement away from the use of area targets in national production program is an essential first step in encouraging efficient resource allocation at the farm level. The use of macro-level area allocation targets tends to bias the allocation of land resources, at the margin, and raises the cost of producing agricultural commodities. More efficient land allocation decisions can be made if the government provides the

farm and trade community with information on economic opportunities in agriculture and encourages land allocation that will maximize returns to farm investment.

Efficiency in the farm sector must be complemented by increasing efficiency in the trade and processing sector. The high cost and limited access to capital raises the entry and operation costs of agricultural trade and processing. Financial deepening in the countryside is required in order to stimulate greater investment in trade and processing services. The use of subsidized credit, through State Banks, has not had the desired effect in the rural areas. Encouraging a greater degree of private bank lending in the rural areas; providing public credits at market rates and making better use of informal credit distribution services are ways to encourage more efficient capital allocation in the countryside.

Great scope for increased employment exists in the processing and distribution of foodstuffs. Better utilization of rural capital resources is necessary in order to stimulate rural employment opportunities. Without the necessary capital investment, the small-scale processing and trade sector will not be able to absorb the 1.5 to 1.7 million additional entrants to the labor force originating in rural areas each year. Primary commodity production in agriculture, if operated efficiently, will still provide additional employment opportunities, although this will likely absorb less than a quarter of the new rural labor market entrants. Increasing the growth of the agricultural trade and processing sector, through a market-driven allocation of capital resources is necessary to generate the far greater reservoir of productive employment opportunities in the countryside.

The government must support private sector investment by minimizing the degree to which public investments crowd-out private sector investments. In the tree crops sub-sector, major donor agencies have noted that the rate of efficiency in public sector tree crop production and processing is well below reasonable expectations. In order for Indonesia to exploit its natural comparative advantage in tree crop production, rates of efficiency and profitability must be increased in the sector as a whole. A combination of capital restructuring, privatization and

a reorientation of public investment from estate management to better smallholder extension services would lead to a more efficient allocation of resources.

The use of quotas and other forms of non-tariff trade barriers are a costly means of insulating the domestic economy from the world market. In the agricultural sector, international trade restrictions exist in practically every market. Most of these take the form of non-tariff trade barriers which create investment uncertainly due to the risk of inconsistent public sector behavior.

The Indonesian economy could achieve a manageable degree of insulation from short-term world market forces through the use of tariffs, instead of relying on trading monopolies and licensing restrictions. The shift to a tariff managed trade regime for rice, sugar, soybean, soybean meal, corn and wheat would be a practical and efficient form of international trading reform. The savings to the public sector form such a shift in trading regime would be great.

PUBLIC EXPENDITURES IN AGRICULTURE

Public expenditures (both explicit and implicit) on agriculture in 1986/1987 were an estimated Rp.1.2 trillion. This level of expenditure is not sustainable given current budgetary conditions. Both a reduction in the level and a reconsideration of how the public expenditures are allocated are essential.

The largest input subsidies are for fertilizer, pesticides and irrigation, benefiting primarily rice producers. Now that rice self sufficiency is close at hand it is time to reduce the subsidies for the rice sector and consider alternative investments which have greater economic return. This is an opportunity to shift government expenditures away from costly input subsidies and toward investment which will sustain rice and other agricultural production growth into the next decade. Greater investment should be made in research and extension which are expected to provide a rate of return on expenditures many times greater than current input subsidies. By investing now in improved extension for farmers, the current technology can be fully

exploited and thus ensure an adequate agricultural output for the next several years. Beyond that, returns would begin to emerge from investments in research which could then be passed to the farmer through the extension service. This two pronged approach can effectively reduce the need for the current system of costly input subsidies.

Investment in research in non-rice crops will improve the technical package for these crops and permit the diversification of agriculture. The need to pursue this strategy is especially apparent in soybean production. In spite of strong price incentives which have expanded the area planted to soybeans, yields have not grown significantly. Currently they are approximately one-half the level in Thailand. This reflects the lack of attention to research in this important crop, except in the recent past.

An additional area which receives substantial public expenditures is credit (11 percent of total public expenditures on agriculture in 1986/1987). The bulk of this outlay goes to Bulog and the sugar sub-sector while a severe credit shortage exists in other agricultural sub-sectors. Credit should be redirected to producers of rice, palawija and export crops to ease the credit shortage which has begun to limit the expansion of production and trade. Increasing the supply of public credit at commercial rates would still provide farmers with lower cost loans than under current conditions.

A gradual reduction in the fertilizer and pesticide subsidies along with improved cost recovery in irrigation and reduced credit subsidies to Bulog and the sugar sub-sector would allow the research, extension and small farmer credit programs to be funded while still reducing public expenditures in agriculture.

DEREGULATION

The government uses a wide range of directives, decrees and regulations to achieve the desired levels of production for many commodities. The desire for close control of the production system is understandable on the part of the government, especially for the staple food crops. However a more flexible

and efficient system would be to allow individual farmer control over production decisions. Only the farmer knows the optimal combination of crops given his specific land, labor and capital. Centralized decision makers cannot know the comparative advantage of each farmer. A more market oriented approach which allows every farmer to produce the crops which best utilize his resources should be pursued. Sugar production is an example of the consequences of government rather than farmer decision making. Even though Indonesia is not competitive in sugar, farmers are required to plant land to sugar to satisfy self-sufficiency. Farmers are required to divert land to sugar instead of more profitable crops better suited to the land. Consumers must pay several times as much for sugar as they would if it was imported. The growth of the entire economy is slowed because the value of agricultural output is less than it would be if the resources were used to produce the most profitable crop. Consequently income and employment are reduced.

Along with greater market orientation in production decisions, it is also important to increase competitiveness in the marketing of commodities. The lack of competition in the marketing system, which is caused by the market power of licensed exporters and approved traders, inhibits the transmission of market signals to the farmers.

A more market oriented approach is desirable for irrigation (Faisal 1987). Currently the provincial governor decides which land will get water, and farmers must obtain water utilization licenses. A more desirable system would be to make water available to all farmers, but charge fees which are consistent with the value of the water. This would encourage efficient water use and provide for operation and maintenance of the irrigation system.

The major gain from less regulation is that resources will shift to the most productive use. Land, labor and capital will be allocated by each farmer to obtain the maximum income. This reallocation of resources should result in significant increases in production. In markets such as coffee, cocoa, red onions and garlic, which are not regulated, farmers have increased production dramatically. It is essential, however, that the

incentives reach the farmer and not just be absorbed by intermediaries in the marketing system. This means that greater competition and fewer regulations in the marketing system must be implemented at the same time as farmers become more independent and market oriented.

Foreign investments in agriculture have traditionally been small, but represent an opportunity to introduce both capital and new technology into Indonesian agricultural production and processing. Attracting foreign investors requires the opportunity for profit and the assurance of economic and political stability. Currently other countries, such as Thailand, have been able to attract larger amounts of foreign investments in agricultural production and processing than Indonesia. If Indonesia is to compete for its share of foreign investment capital, it must reduce restrictions on such investment and adopt a policy of actively encouraging such investments. An initial step is to improve Indonesia's land title procedures and minimum investment requirements.

REGIONAL SPECIALIZATION

Indonesia's diversity in resources, climates, cultures and levels of development provide opportunities for specialization through regional comparative advantage. Market forces coupled with the implementation of government policy which recognizes regional differences will allow high rates of growth through specialization. This will foster a more stable and efficient national production system.

One of the steps that encourages development of regional comparative advantage is the promoting of appropriate cropping/farming systems in the different agro-ecological regions. This will require a better knowledge of soil types, climatic patterns and economic opportunities at a regional level. To use this information, decisions on cropping patterns and technology packages must be specific to each agro-ecological region. Institutional upgrading at the local level, in the form of better capabilities in planning, management, budgeting, monitoring and evaluation will be necessary to support this change (Russell 1987).

Planning at the national level should shift from nation-wide programs to a more regional focus. The Ministry of Agriculture should participate with the other ministries concerned with developing regional plans for transportation, marketing and communication systems.

Investment policies in agro-industries should also promote regional specialization. At present many of the agro-industries are located in Java although the potential growth areas for raw material supplies are outside of Java. This implies that high costs must be incurred to transport raw materials from a distant market to a Javanese processing center. Opportunities for greater efficiencies in processing exist if the processing facility is located near the production site. Agribusiness investment promotion policy should actively encourage investors to establish processing sites near production areas. The secondary benefits, in terms of complementary investments in infrastructure and upstream employment, will encourage higher rates of growth in the more under-populated regions.

Government policies should be sensitive to the problem of environmental deterioration which can distort the comparative advantage of agro-ecological zones (Hedley 1987). For example, approximately 30 percent of Indonesia's soils, outside of Java, are red, yellow podzolics which are on undulating to hilly regions under hot and humid conditions. These soils are acid and have a low availability of phosphorus, low cation exchange capacity, low organic matter content, low base saturation and high aluminum saturation. They are poor, highly erodible soils. These soils are found throughout Sumatra, Kalimantan, Irian Jaya, Halmahera, Sulawesi and West Java. The development of these soils will require careful long-term planning and intensive soil conservation measures. The best option appears to be the development of perennial crops on these poor soils because of their high erosion risk.

However, pressures to increase the national food supply have required that special programs, such as liming, be used to enable the production of annual food crops on these soils. Research suggests that these soils can support annual crops, such as

soybeans, for a few years but risks of long-term damage to the soil resources are great. The short-term success in using these resources for national food crop production has to be traded off against the high risk of permanent loss of these productive resources. The government should encourage long-term resource usage and planning to complement regionalization. The opposite will lead to serious losses in long-run productive efficiency.

VI. GROWTH AND EQUITY

Equity issues must be addressed when advocating an agricultural development strategy based on improved efficiency. The benefits from a high-growth efficiency based strategy will be shared by the poor through growth in employment opportunities. However, a segment of the population may not adequately share in the benefits from high-efficiency growth. It is this group, the impoverished, which will require redistributive assistance to participate in the agricultural growth process.

Some have argued that growth and equity cannot be achieved simultaneously without special programs and policies. The Indonesian experience in rice does not support such a pessimistic view of growth. In Indonesia the new rice technologies had a rather neutral effect on income distribution. But studies of Java indicate that while the green revolution increased labor use per hectare of land, other factors have contributed to a worsening in the distribution of land resources. Thus, the factors affecting the agricultural sector have been both positive and negative. Poverty and undernutrition are still very serious problems in Indonesia, although average welfare levels have been rising steadily. Based on the 1984 Susenas, average consumption was 1905 calories and 46.1 grams of protein. This exceeded internationally set standards for average consumption requirements. In 1964, by comparison, average consumption levels were much lower at 1671 calories and 37 grams of protein.

Although the average nutritional status of the population appears to be more than adequate, pockets of absolute poverty are present among the lower income segments of the population. Disaggregated data on nutritional status reveal that approximately 25 percent of the population were categorized as deficient in

calories, or protein, or both. The incidence of severe under-nutrition is highest in the eastern islands of Indonesia and the most vulnerable groups are infants and pregnant and lactating mothers. The fact that access to resources in the countryside is not equally distributed and that a great deal of poverty still exists in particular parts of the country leads to the conclusion that not all segments of the population have shared equally in the benefits of a high agricultural growth strategy. These problems cannot be adequately addressed by forcing scale limits or smallholder partnership requirements on the private sector. This approach risks causing lower profitability, reducing efficiency and choking growth.

Targeted transfer programs are one means of alleviating the worst malnutrition and poverty. Already the government operates transfer programs in the form of free elementary education and immunization programs. In the eastern islands of Indonesia, where the incidence of undernutrition is reported to be the highest, instituting a school lunch program and distributing rice to mothers at the village health care centers would be one means of attacking poverty.

In the long run, addressing poverty by providing the poor with productive resources--skills, capital, and technology-- will enable them to realize the benefits from economic growth. This includes the development of technologies appropriate for rural households with few skills and low land holdings, in areas such as livestock, fisheries and horticulture.

VII. SUMMARY

In the medium-term the objective of the agriculture sector should be growth through efficiency. This will produce an agriculture sector which is rapidly growing. Rapid growth in agriculture will provide for domestic consumption and will provide employment for the growing rural population.

Domestic market expansion will continue to be a source of growth in agriculture although the growth will come more from higher value commodities, such as meats, fish and horticulture products and less from rice. At constant prices, demand for

rice is forecast to grow by 3.2 percent per annum, corn by 3.4 percent, cassava by 3.1 percent, soybeans by 3.7 percent, sugar by 3.7 percent fruits and vegetables by 4.5 percent and other meats and dairy products by 5.7 percent. Most of this demand increase is driven by population growth and demographic shifts. Increasing efficiency will lower commodity prices and lead to even faster demand growth, particularly for the higher value commodities.

Primary commodity prices on the world market are likely to rise slightly for the next several years. However, marginally higher world market prices will not significantly stimulate domestic agricultural growth. Indonesia must therefore concentrate on improving product quality and reducing costs to compete in both domestic and international markets.

Traditional sources of rice production growth are expected to contribute less in the future. Better use of existing land, labor and capital resources will be needed to maintain the growth momentum. Still, this will be a difficult challenge.

The goal of self-sufficiency has guided Indonesian food policy for many years. Inflexible self-sufficiency goals can conflict with economic efficiency. A broadened interpretation of self-sufficiency, defined as a positive agricultural trade balance, would preserve the nation's strategic gains while encouraging greater economic efficiency.

Income growth has provided most Indonesians with the ability to maintain rice consumption even when prices rise. This reduces the need for the public sector to stabilize urban rice prices. Targeted food transfers, rather than price intervention, should be used to assist the poorest consumers.

Improved efficiency in agriculture will require a greater degree of dependence on markets and less on government guidance. A deliberate movement away from the use of area targets in production programs is an important step in encouraging efficient resource allocation at the farm level. Investment that takes into account comparative advantage considerations, more regional specialization and better integration of market forces in rural

capital markets will also encourage greater farm level efficiency. Greater competition in the marketing system will also contribute to efficiency gains in the farm sector.

Current expenditures in agriculture are heavily weighted towards input subsidies. Use of these subsidies was justified during the early adoption period for the modern rice varieties. The use of modern varieties is now widespread and such subsidies are now a very expensive method of increasing yields. A greater return to public investment can be expected from investments in agricultural research and extension. Additional investments are also needed in non-rice commodities to support diversified agricultural growth.

Regulatory reform can promote a more market oriented agriculture. This holds true, particularly in the areas of food crop trade, irrigation, marketing, land allocation, and foreign investment. The major gains which comes from less regulation is that resources will shift to their most productive use.

Indonesia's diverse resource endowment provides opportunities for specialization in agriculture. Greater decentralization in planning and resource management, encouraging agro-industrial development in regional markets. Pursuing policies which protect fragile soil resources encourages environmental sustainability while stimulating regional specialization.

Growth with equity can be achieved if special programs are introduced to help the most disadvantaged. Targeted food assistance should be directed to the lowest income segment of the population rather than through programs that lead to distorted prices in an attempt to transfer income. Providing small-scale development programs and training could also be used to alleviate poverty.

References

K. Altemeier, S.R. Tabor, B. Adinugroho, N. Daris, 1987. "Policy Parameters for the Economic Analysis of Supply in the Indonesian Foodcrops Sector". Directorate of Food Crops, Ministry of

Agriculture, Jakarta, Indonesia. Working Paper 3, Sub-Study I, Supply/Demand Study.

E. Gulardja, F. Kasryno, B. Nestel and J.F.A. Russell, 1987. "Incentives, Research and Extension for the Agricultural Sector in Repelita V". Paper prepared during the Round Table on Indonesian Agricultural Development, Ministry of Agriculture, Jakarta, Indonesia, 11-20 November 1987.

D.D. Hedley, 1987. "Diversification: Concepts and Directions in Indonesian Agricultural Policy". In: Dauphin, F. and Bottema, J.W.T. (Editors), Soybean Research and Development in Indonesia: Proceedings of a Workshop. The CGPRT Centre, Bogor, Indonesia.

Donald O. Mitchell, 1987. "Prospects for Agricultural Prices and Trade". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (16 pp.)

Barry Nestel, 1987. "Agricultural Research in Indonesia: Its Potential Role in the Development Process with Particular Reference to the Advancement of Biological Technology". Paper prepared for the Round Table on Indonesian Agricultural Development, Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (58 pp.)

John F.A. Russell, 1987. "The Role of Agricultural Extension in Indonesia and Issues for the Next Decade". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (8 pp.)

Steven R. Tabor, 1987. "Marketing in Indonesian Agriculture: International, National and Regional Development". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (36 pp.)

S.R. Tabor, K. Altemeier, B. Adinugroho and N. Daris, 1987a. "Demand Parameters for Food Policy Analysis in Indonesia". Ministry of Agriculture, Jakarta, Indonesia. Supply Demand Study: Secondary Food Crops Project/USAID. (January 1987).

S.R. Tabor, Soepani, K. Altemeier, Nuryanto, Wardoyo, B. Adinugroho and S. Purnomo, 1987b. "Trends in Agricultural Supply and Demand to the Year 2000". Directorate of Food Crops, Ministry of Agriculture, Jakarta, Indonesia. Draft Report for the Supply and Demand Study.

C.P. Timmer, 1972. "Employment Aspects of Investment in Rice Marketing in Indonesia". Food Research Institute Studies. 11.

INCENTIVES, RESEARCH AND EXTENSION FOR AGRICULTURE IN REPELITA V

Edi Guhardja, Faisal Kasryno, Barry Nestel and John F.A. Russell

I. INTRODUCTION

Over the past decade, agricultural GDP has grown at the remarkable rate of 4.6 percent per year. A large part of this growth was derived from the rapid expansion of rice production which accounts for around 30 percent of the agricultural GDP and over 40 percent of agricultural land use and employment. Indonesia attained the important national objective of self-sufficiency in rice in 1984.

The spectacular growth in rice production is a result of improvements in expanding irrigation systems which created a physical environment conducive to high productivity. Modern rice varieties enabled that potential to be exploited. A national seed production program rapidly multiplied these varieties to make them available to the farmers and, through the Bimas program, improved varieties, subsidized fertilizer, pesticides and production credit were made widely available. All of these developments stemmed from public investment in irrigation, research, seed production, plant protection, extension and incentive policies.

Since self-sufficiency was attained in 1984 the growth rate in rice production has been very low. For Repelita V the need is not to restore the growth rate to its 7 percent per annum of the early 1980s but to maintain it at 2.6 percent per year to meet the expected increase in demand, and to accelerate the growth of other agricultural commodities in order to raise the growth of the agricultural sector as a whole to about 3 percent per annum.

This paper examines the role of input price policies, research and extension and discusses possible policy changes that could contribute towards bringing about the necessary changes in production. It does this against the background of the financial constraints now facing the government and the role that the agricultural sector will need to play to help the Government of Indonesia achieve its objectives in the fields of income, poverty alleviation, employment and foreign exchange earnings.

The policies that are proposed with respect to inputs, research and extension are closely linked to the viewpoints put forward in the two other papers at this Round Table about self-sufficiency, resource utilization, production efficiency, comparative advantage, technology packages, diversification, regional development, deregulation, agro-industrial development and wider involvement of the private sector (Hedley et al., 1987 and Tabor et al., 1987).

II. FARM INPUT PRICES

Farm input pricing has served as a major tool in Indonesian agricultural policy. The wealth generated by the oil industry has made it possible to provide generous input subsidies and these have played a significant role in the rapid growth in rice production. The recent decline in oil prices has made it difficult to maintain these subsidies and the attainment of self-sufficiency in rice has lessened the need for them. Thus a major issue now confronting the government relates to the future policies to be adopted toward farm input prices.

The principal incentive instruments used by the government in the past to stimulate agricultural output growth have been fertilizer price policy and the regulation of trade in rice. The stabilization policy with respect to rice price and fertilizer price subsidies led to the paddy/urea price ratio increasing from about 1.0 in the 1970s to nearly 2.0 in the 1980s. This highly favorable price ratio, together with the spread of modern varieties and large investments in irrigation, stimulated extremely high rates of growth in fertilizer use. This led to the fertilizer subsidy increasing from 25 percent of the total government budget for agriculture and irrigation in 1979/1980 to about 40

percent in 1986/1987 even though the total budget of the sector was also expanding very rapidly as well.

At current levels of technology and fertilizer application for rice, the economic efficiency of additional fertilizer use is very low (Kasryno 1987). Several studies have indicated that the supply elasticity of rice with respect to fertilizer price is both negative and low (Kasryno 1987 and Altemeier et al., 1987), where fertilizers represent under 10 percent of the total cash costs of rice production. Fertilizer subsidies, therefore, no longer appear to be a necessary means of increasing rice production. All fertilizer plants are government owned or controlled and imports as well as exports of fertilizers are controlled by the government. Domestic distribution is subjected to a relatively inefficient distribution system burdened by a number of costly regulations and cumbersome distribution channels. This obviously poses the question whether the fertilizer subsidy could be eliminated, given that it is unlikely to serve as a major source of future growth in agriculture. However, a sudden and complete phase-out of the subsidy would be likely to lead to a fall in both rice production and farm incomes and to a rise in rice imports. A complete phase out of the subsidy would only be justified were significant progress to be made in other areas such as:

- greater efficiency in fertilizer production, distribution and use;

- appropriate new technological developments for food crops other than rice, and their widespread dissemination; and

- expansion of institutional loans at market rates.

The removal of the fertilizer subsidy could take place without an adverse effect on production providing there is significant success in the above activities. However, since such changes will take time to come about, a partial removal of the subsidy, associated with adjustments in output pricing, represents a valid alternative for consideration. Some of the savings achieved could then be devoted to strengthening research and extension. This contrasts with current practice in that during the past two years, although direct budgetary subsidies have been reduced

by 10 percent, operating funds for research and extension rather than being increased have been reduced by 75 percent (Nestel 1987).

The price elasticity of supply for rice ranges from 0.36 to 0.51, implying that government rice price policy can have a positive effect on rice supply, independent of fertilizer pricing policy. The rice supply elasticity indicates that the decline in fertilizer use associated with increasing fertilizer prices by around 20 percent could be offset by only a small increase in the rice price.

Thus a rational national fertilizer policy for the future would be to have a gradual phase out of the subsidy, geared to the rate of progress in implementation of the technological changes suggested above, and coupled with a small upward shift in the price of rice. Changes in both rice and fertilizer prices would need to be carefully monitored in terms of both consumer and producer welfare, with periodic adjustments based on these assessments.

A second subsidy that requires re-examination is that for pesticides, where farmers pay only 5? percent of the economic price. Pesticides represent under 3 percent of the total cash cost of rice production and the supply elasticity of rice with respect to pesticides is negligible. In recent years evidence has accrued that pesticides are being overused. As a consequence of this, insect resistance has developed, particularly in rice, and environmental damage has taken place.

To counteract this situation the government has banned many pesticides for rice and has begun to emphasize campaigns to promote integrated pest management. These campaigns need to be encouraged and enhanced and alongside them it is now appropriate to consider complete elimination of pesticide subsidies. This measure must, however, consider the pesticide requirements of these other crops which need to be encouraged under the diversification program. Elimination of the pesticide subsidy will have a negligible effect on farm income, whilst at the same time encouraging the use of integrated pest management.

Subsidized credit has been another tool used by the government to encourage food production. But a number of studies have shown that it has contributed to a widening gap in income distribution in the rural areas. Low income small farmers usually only have access to non-institutional, high interest credit, while the main users of subsidized institutional loans are medium and large farmers.

In recent years, there has been a move away from providing subsidized credit for specific crops, and towards the provision of more general credit at market rates of interest (Kupedes). However, the coverage of the Kupedes program is still rather limited. For real improvements in the rural financial market it will be necessary to embark on a policy of establishing a viable rural banking system that can work efficiently, meaning that it offers simple procedures for both credit application and saving, so that the capital resources within the rural area can be mobilized more readily.

The idea of establishing a comprehensive rural banking system is consistent with the proposals outlined elsewhere in this paper of adopting an 'agro-complex' approach to rural development, implying the development of appropriate farming systems supported by agro-processing and agribusiness activities. In many rural areas the financial climate would appear ripe for the introduction of such a banking system. This could usefully be combined with wider use of the revolving 'hamlet' funds that are having a major impact on the poorest groups in some of the rural areas of Java.

A further area of input subsidy has been the provision of improved seeds. This has worked well for rice but for palawija crops the lack of availability of improved seed has been a major problem. The dispersed nature of palawija crop production has not made private sector involvement in seed supply a profitable enterprise. Given the importance of a rapid increase in palawija crop production in Repelita V, steps will need to be taken to increase the viability of improved seed production both on and off-Java. This will require improvements in farming systems and regional specialization in production.

For the self-pollinating crops, varietal development and the distribution of improved seed by the private sector should be encouraged, by placing less emphasis on government seed farms and more on contract growers from the more advanced farmer groups. In the short run public breeding programs might be assisted by returning to them the levy raised at certification. Extension services could play a role by helping farmer groups to improve the quality of seed retained and fostering small farmer contract seed growers.

The medium term goals should be to phase out all seed subsidies and to use the fees realized by certification to support public sector breeding programs. This would ensure an adequate supply of breeder and foundation seed for those crops in which the private sector is not active.

The final area of comment on input subsidies relates to farm machinery. Here too, in the interest of efficiency, the subsidy should be phased out and machinery be purchased at market prices.

III. RESEARCH STRATEGY

A recent cross-country study by the CGIAR has shown that the rates of return to investment in research in agriculture as a whole in countries comparable to Indonesia have been more than 50 percent per year. In Indonesia this is borne out by the success of the rice breeding program which has been a contributory factor in leading the government to invest heavily in the creation and development of a national agricultural research service. A single multi-disciplinary multi-commodity Agency (AARD) has been established to conduct research on all aspects of crops, livestock and fisheries at both the production and the post-harvest level. The cumulative budget of this Agency from 1974 to 1986 totalled about U.S. $700 million and it plans to have a staff of 2500 scientists at the M.Sc. or Ph.D level by the end of Repelita V.

The physical resources of the Agency are largely in place and its manpower plans are not out of line with the needs of a country the size of Indonesia. However, the funds currently

being provided to support these resources are neither large enough nor sufficiently stable to effectively carry out the type of broadly based research program that AARD was set up to pursue.

Given the long time associated with success in agricultural research it is essential to have a strong priority setting mechanism that recognizes short, medium and long term national needs, comparative advantage and resource optimization. This is needed in order to identify which potential areas of research should be worked on and in what depth. To do this AARD urgently requires a small central planning and programming unit which is freed from other operational and administrative burdens. This unit should be attached to the office of the Director General and work closely with the Bureau of Planning, Bappenas and planners in other agencies in the agricultural sector.

A primary task for the AARD planners is to reconcile the size of the Agency with the budget likely to be made available to it, so that they can define a national research policy which realistically relates objectives to likely resources. At the present time there would appear to be at least four options that can be considered:

- full Ministry of Finance funding of the research budget to the level recommended below; failing this, either:

- reducing staffing in order to release adequate funds for effective operational activities; or

- maintaining existing (and proposed) staff, recognizing that they are unlikely to have sufficient funds to conduct a meaningful research program, and

- providing funds from outside of the Ministry of Finance through such measures as a commodity levy, private sector support or contract research.

Clearly getting the right mix between people, programs and funds is an interactive process. The World Bank has suggested that research should be funded at a level of 2.0 percent of the

agricultural GDP, which is about twenty times the level of funding now by the Government of Indonesia. However, if external support (which cannot be guaranteed on a long term basis) is taken into account, the discrepancy falls to something like 5 to 6 times. Given the new physical facilities just coming on stream and the number of staff now undergoing training there will be a need for a substantial increase in budget during Repelita V to maintain the current level of funding per scientist.

The Round Table working paper suggests that a more modest goal than the World Bank figure would be to aim at a research budget of 0.5 percent of the agricultural GDP or a total of perhaps 200 billion rupiahs annually (at current prices) by the end of Repelita V (Nestel 1987). This would triple the current Government of Indonesia budget per scientist, and put it at an appropriate level in international terms, but would avoid either having many scientists in new facilities with no funds for research or cutting back on personnel by perhaps a half.

If the Ministry of Finance and Bappenas are not prepared to recognize more explicitly the necessity of investing in agricultural research at the recommended level, and an effective research program is to be maintained, the fourth option, namely that of seeking alternative sources of funding, will need to be examined. In this context the experience of the parastatal PTPs who fund most estate crop research is relevant, as are experiences with commodity based funding for research from elsewhere in the world. These experiences suggest that research can be productively financed by imposing some form of levy on all agricultural commodities passing through collection points, be they ports, processing facilities, procurement agencies, abattoirs, etc. This would make it possible to provide adequate funds for agricultural research without calling for direct governmental support. Alternatively governmental support might be provided for a core or routine budget with the DIP being replaced by some form of commodity levy.

A commodity funding approach would also have the advantage of linking producers more closely to research and, in the long run, might lead to much greater producer inputs into research policy and strategy. It would also make it easier to provide incentives

for scientists in order to encourage them to work away from Bogor and to reward them on the basis of their performance. So long as research is purely a public good it will be difficult to offer scientists the sort of incentives needed to produce the quality of results that will encourage an appropriate flow of funds into research.

It is recognized that there is some contradiction between the proposal to fund research from a levy and the arguments put forward at this Round Table in favor of less regulation as a means of improving economic efficiency. The levy proposal is proposed as being preferable to the second and third of the options suggested above should direct Ministry of Finance support for research fail to provide the budget recommended above.

Some reduction in the load of the public sector agricultural research budget could also be made by having larger private sector involvement in this activity. Government should adopt measures to encourage this, recognizing that investments will not take place unless the private sector is able to obtain a rate of return from such investments that relates to the risks entailed in this type of venture. The current low level of involvement of the private sector in research may indicate the present investment climate for such activities.

The main research successes in Indonesia during the last decade have been in the area of breeding rice (and corn) varieties that were responsive to high levels of purchased inputs. But these inputs may be less readily available in the future if subsidy policies are changed. In such circumstances the maintenance of farm income will become more dependent on lower cost crop production strategies. These are likely to relate increasingly to such technology as improvements in integrated pest management. Should government policy move away from its past emphasis on yield targets and focus more heavily on efficiency, it will also be important for the research service to offer a rapid response in its varietal selection programs in order to ensure that a back up supply of suitable materials is available should input use decline.

The attainment of self-sufficiency in rice has also highlighted the need to diversify agricultural production. But whereas much of the rice is grown on irrigated land in Java and the number of recommendation domains is relatively limited, both food and non-food crops grow in a very wide range of agro-ecological environments and under many, and sometimes complex, farming systems, especially off-Java. However, given the limited (and declining) availability of land on Java and the vast land resources available in the outer islands, it is apparent that a major thrust in diversification will need to take place off-Java.

This presents another challenge to the research service, most of whose facilities and manpower are concentrated in the Bogor area, with lesser concentrations in Malang, Ujung Pandang and Medan. In order to serve the specific needs of farmers away from these locations AARD will need to develop a stronger network of sites for adaptive trials and will also need to carefully monitor a nation-wide system of local verification trials conducted by other Agencies. For many crops other than rice, yield levels have stagnated during the past decade and whilst, in the short term, this can be compensated with area expansion, higher yield levels brought about by technology transfer are essential if a sustained and satisfactory growth in production is to take place.

A major thrust in any agricultural research program is that of conducting maintenance research to ensure a continuous supply of new cultivars in order to stabilize production. This is particularly important as yield ceilings start to be reached and also where a traditional large mix of local varieties has been replaced by heavy dependence on a limited number of new high yielding ones. Both of these circumstances apply to rice. Thus a major strategic decision for Repelita V must be to maintain the impetus of rice research (while recognizing a strategy that places more emphasis on efficiency).

With better funding for research, new opportunities will arise for giving greater support to areas that are now relatively neglected, but which appear to offer opportunities for having a significant impact in the short or medium term.

Three areas of research that are currently not well developed but which offer the good prospects of success in biological terms, in the short run, and should be considered as high priorities are:

- aquaculture (including mariculture) for both the export and the domestic markets. The demand for fish is strong, especially on Java, and growth in aquaculture offers opportunities for improving human nutrition, creating employment and earning foreign exchange;

- horticulture (including floriculture) again both for export (which has largely been neglected) and domestic markets. Domestic demand is strong for these products, which are labor intensive and could offer innovative export opportunities; and

- agro-processing and industry, which are perhaps the areas with the greatest employment and export earnings potential. To support them will require major restructuring of the research approach and much closer private sector linkages, possibly with some form of governmental incentives or deregulation to promote this area of private enterprise.

Other areas of ongoing research that require expanded effort include:

- farming systems research which integrates technical and economic activities involving food crops, tree crops, livestock and (where relevant) fisheries. Particular emphasis needs to be given to upland areas and under-utilized swamps whose special problems have, to date, been given insufficient attention;

- soybean research on breeding, agronomy, seed production and integrated pest and disease control. Additional production could lead to major saving in foreign exchange;

- integrated biological and socio-economic research especially on crops such as coconuts where there is a need in the vast area under smallholdings to ease the financial problems associated with replanting and on-farm processing; and

- agricultural biotechnology, where a more clearly articulated and implemented national research policy is needed, as discussed in the next section of this paper.

Some areas of ongoing research would benefit from reorientation to bring their focus more into line with the changing nature of national needs. These include:

- research on the biology and technology of food/feed crop relationships, geared both to maximizing farm incomes and to developing the more efficient use of domestic products in the expanding animal feed industry;

- research on sugar, which reflects the proposed emphasis on rainfed cane production off-Java to release irrigated land for other crops; and

- research on coffee that relates more specifically to the agro-ecological zones and smallholder producers, who now dominate the production of this crop.

Of the areas of greater emphasis suggested above, one that offers particularly interesting opportunities and also confronts major non-technical constraints, is agro-industrial development. The constraints arise from the range of Ministries and agencies whose mandates touch this sector and the number of rules, regulations and restrictions surrounding small scale industry. The wide range of crops grown in Indonesia, the country's apparent comparative advantage in the production of many crops and the growing market in the developed world for new, processed tropical food products, all suggest that Indonesia should not let opportunities in the agro-industrial world pass it by. However, to capitalize on them will require carefully planned institutional and de-regulatory actions.

IV. BIOTECHNOLOGY

During the past ten years there have been extraordinary advances in the knowledge of fundamental biological processes, particularly at the cellular and molecular level. It is now possible to isolate individual genes and determine their structure, to modify this

structure in a directed way, and for some organisms, to achieve a particular change in the function of the organism. It is widely believed that these techniques can be applied to crop plants and to domestic animals to aid in the attainment of higher productivity. Biotechnological techniques are also expected to figure prominently in the future production of enzymes, food additives, animal feeds, improved new plant varieties, specificity of pesticides and herbicides, vaccines, plant growth hormones, and diagnostic reagents for plant and animal diseases.

From the agricultural standpoint there appear to be three major areas in which biotechnology can be expected to figure prominently in the medium term future.

- The introduction of new genes into plants. This is likely to lead to rapid improvements in characteristics controlled by single genes (including some disease, pest and herbicide resistance) but it may take many years before it influences complex characteristics such as yield improvement, the achievement of nitrogen fixation in non-leguminous crops, the enhancement of photosynthetic activity, the manipulation of growth regulators and improved stress toierances such as for salinity, low pH and drought. Furthermore, techniques for gene manipulation have, to date, only had very limited success with cereal crops.

- The growth of plants in tissue culture. This provides a convenient, efficient, and rapid method of crop propagation and for the establishment of experimental crossing lines and genetically superior selections for commercial production. It does not substitute for conventional plant breeding but offers a technique of accelerating genetic improvement and varietal selection and could be particularly important for tree crops.

- The production of chemicals and biological products by bioengineering. This has important implications in fields such as vaccine production and in the production of specialized flavors and essences where, for example, the recent production in the laboratory of pure vanilla essence could threaten the livelihood of producers of this crop.

A policy issue of immediate concern relating to biotechnology is that its development is taking place globally, primarily in the private sector where large multinational pharmaceutical and petrochemical companies are investing heavily. New products that are developed, including plant genetic materials, are patentable in a number of countries and this has led to understandable concerns. This highlights the need for Indonesia to have a clearly defined national strategy in the context of the rapid advances being made in biotechnology.

Such a strategy has already been formulated by LIPI, but it will not be easy to carry out in that it involves many different governmental and educational institutions. A Round Table background paper has outlined this strategy in an agricultural development context (Guhardja 1987). It has placed particular stress on the concept of comparative advantage and the need to monitor both the biological and the socio-economic implications of advances in biotechnology made both in Indonesia and abroad. This topic will need further review as part of an enhanced and better funded national program for biotechnology research. Such a program should clearly identify what is national policy and wherein lie Indonesia's comparative advantage and essential needs in an area where research (and its development) can be very costly. The agricultural component of the national biotechnology program should clearly specify institutional responsibilities.

V. EXTENSION

Over the past two decades, Indonesia has developed a network of 1,400 rural extension centers (RECs) staffed by some 32,000 extension workers (PPLs and their supervisors, PPUPs). An adapted training and visit extension methodology is used in most areas, based on fortnightly visits to some 350,000 farmer groups with regular training from the 1400 subject-matter specialists (PPS). New mechanisms to develop a more unified extension service are now being put in place, but they have been seriously imperiled in the past year by severe cuts in budgetary support. As virtually no adaptive trials are at present being carried out, the research-extension linkage has been further weakened, and in many areas there is a shortage of

new technology to pass on to farmers. This is indicative of the way that operational budgetary cuts are impairing the effectiveness of extension.

The challenges for the next five year plan are to revise, where necessary, and implement new extension policies:

- to maintain rice self-sufficiency,
- to support the Government of Indonesia's diversification program to improve both national and farmers' incomes,
- to further reduce rural poverty by ensuring that all types of farmers can participate in extension programs,
- to assist in creation of new employment opportunities, and
- to achieve all of the above in the context of severe financial constraints on the recurrent and developmental budgetary support.

An immediate priority is to address the severe shortage of recurrent funds. There is an irreducible minimum cost for operating RECs and for providing supervision and support to them. The Ministry of Finance should immediately restore the level of recurrent funding provided in 1985/1986 and consider the need for further measures. At the same time, farmers have to be made more self-reliant and, in the future, could even be asked to contribute to the running costs as well as participating in the design of extension programs at the RECs. A better balance also has to be reached in making conjunctive use of the media in reaching farmers. This approach could lead to some existing extension staff posts in densely settled irrigated areas being relocated which would reduce extension costs in those areas.

These comments imply a three pronged future strategy to address the present inadequacies in extension funding. This strategy would combine a higher level of funding, with careful evaluation of the most cost effective methods of extension delivery, and would also gradually place more responsibility on the farmer making him more self-reliant and giving him a larger voice in the nature of the extension support that he receives.

The maintenance of rice self-sufficiency will not require any major changes in extension policy, since the irrigated sawah areas are already well served with extension staff. Special attention will, however, have to be given to disseminating the newer technologies appropriate for upland rice growing in the dry land areas of the Java highlands and the outer islands, as well as for increasing rice production in the swamps of Sumatra, Kalimantan and Irian Jaya. In all areas, special attention will need to be given to the introduction of integrated pest management in order to reduce the problems caused by brown plant hopper and tungro, as well as by rodents. This will require involvement of plant protection staff in the main stream of extension programs, and developing better training programs in this sphere for both extension staff and farmers.

Since rice is no longer going to be the driving force of agricultural growth, strengthening Indonesia's diversification program will require specific changes in extension policy. Success in achieving rice self-sufficiency was assisted by the Bimas-targeted production programs, but upland areas have much more complex cropping and farming systems, where risks due to rainfall uncertainty and weaker technologies are also much greater and technological recommendations have to be more location specific. Rigid commodity production programs will not be readily accepted by farmers unless they are developed with more flexibility. Not all of the government's existing rice programs fully meet the needs of resource poor farmers. A case can be made for more flexible implementation, combining with extension programs with a much higher educational content and which contain advice on financial and socio-economic, as well as biological, topics.

In line with encouraging diversification under a freer, market oriented policy, it will be desirable to have more flexibility in production targets, if these are to be set in the future. During the transitional phase from a directed to a market oriented economy, it would be preferable to base broader production targets on regional considerations, considering agro-ecological conditions and comparative advantage, and thereby, placing more emphasis on potential efficiency.

This approach will require effective support from AARD research staff who will have to ensure that their stations have regional as well as national mandates. This will enable them to better assist in training PPSs in the conduct of verification trials and farming systems research so that they can develop location specific recommendations. In all provinces, but especially in those where no AARD stations exist, more support should be obtained for these two tasks from the agricultural faculties of universities. This will require the restoration of research funds to the universities, whose current pool of scientific skills is under-utilized in research. This also limits the practical training that they can offer to students, who will become the next generation of researchers and extension staff.

The proposed new extension approach will also need to be more sensitive to the needs of farmers with varying levels of resources by stratifying farmers within farmer groups and developing varying recommendations for each of them. Because of the risk factor, poorer farmers may have difficulty in following the lead given by their designated farmer leaders (Kontak Tani), whose resource endowments are often greater (Russell 1987). Farmer groups, therefore, need to select, from within their number, additional farmers who are representative of poorer householders and can demonstrate to others, specially prepared risk-averse programs more suited to their current stage of development.

In some areas farmer groups are already selecting members with varying levels of expertise to be their specialists on particular types of crop or livestock enterprise. Such an approach should be encouraged in all areas. It signifies a close partnership between the extension worker and the farmer, so that farmers gradually become more self-reliant. The formal mechanism for this is in place, but it is not universally followed and a more conscious effort has to be made by extension workers towards the manner in which they work with farmers and their representative leaders.

The need for an extension approach that is educational rather than directed and the emphasis being given to the vertical integration of crop diversification makes it apparent that new skills will have to be learned by extension staff. They will need

to be able to alert farmers to new agro-processing opportunities and to train them in the necessary skills to improve product quality and on-farm processing, as well as to improve grading and packing where necessary. This demand for more emphasis on skills in farm management and agro-processing will need to be reflected in manpower training programs.

To reduce the costs of extension and to respond to the increased educational standards reached by the new farming generation, more use will also need to be made of the newer media techniques and of distance learning in the training of both staff and client farmers. New training policies need to be developed from a review of manpower needs. This will be essential once the priorities for Repelita V have been agreed. Staff training will also need to be reviewed to accommodate the evolving approaches to extension and the new technologies in communication.

It will also be vital to further strengthen the revised extension organization by emphasizing the role of a single line of command in overseeing national programs agreed in the farmer committees A first step in this direction has been made by the Ministry of Agriculture by appointing the Head of Extension, Education and Training Bureau in the Office of the Kanwil to oversee implementation of all extension programs and agreements reached in FKPP I at the provincial level, with the Bimas Secretary doing the same at the district level. One early step that could be taken would be to have the PPS in the Agricultural Information Centers work more closely with the economics and marketing staff of the four agricultural services (Dinas) in developing the financial and market feasibility aspects of their technical recommendations. These services also need strengthening to meet the demand for financial as well as technical information to help farmers in choosing between enterprises. Regrettably, in the recent round of budgetary cuts, the economics and marketing divisions suffered more heavily than did other divisions of the provincial Dinas.

An effective extension program is likely to require an increased number and quality of PPSs. With increasing decentralization of development programs to the district level and below, more use

will also have to be made of Bappeda Tingkat II in the Kabupaten, the UDKP at the Kecamatan level, and the LKMD at the village level. Such measures would assist in making extension staff more aware of their role in the overall development program, and would help to train staff of the various agencies concerned in developing a more concerted and service-oriented approach. This will have cost implications which, in part, could be met by farmers, but in the main, will necessitate not only restoring the national budget for extension to its 1985/86 level but also considerably increasing it again by the end of Repelita V.

VI. MAIN POLICY ISSUES

(1) The first priority policy issue relating to research and extension in Repelita V is to define what size of national services the Government of Indonesia is willing to support, given its past investment in research and extension, and the vast gap between the funds currently allocated to these services and the sums that it is estimated that they will require to function in a way that will meet the goals of Repelita V. Ancillary to this topic are the questions of whether research could be funded by commodity levies, and extension be partially funded by farmers or whether the private sector or the universities (through LIPI or Ministry of Education funding) have a role to play in financing agricultural research. A related issue is whether savings produced by reducing the input subsidies could be channelled to support the research and extension that are needed to generate the growth sought in the non-rice sector.

(2) Closely allied to the question of funding are the questions of new policies for planning, programming and priority setting. In the research area a formal infrastructure appears to be necessary to develop a program structure that will relate more closely to resource endowments and be less opportunistically driven, assuming that research is better funded. For extension, greater cost-effectiveness could be attained by a closer coordination of the various agencies involved in this task. Such organizational changes for both research and extension will require specific policy measures to be taken.

(3) The Round Table papers have proposed that Repelita V should place less stress on yield or production targets and more on increased efficiency (Hedley et al., 1987, Prabowo 1987, Suryana 1987 and Tabor 1987). This has a number of important policy implications. One of these is the need to dismantle inefficient input subsidies for credit, pesticide and mechanization at an early date and fertilizer on a more gradual and carefully monitored basis, related to the pace of adoption of technological advances. Low cost technology such as integrated pest and disease management, as opposed to the use of agro-chemicals, will need more attention. Risk aversion will need more recognition by extension services, which will need to focus more on resource poor farmers rather than only on farm leaders.

(4) Allied to the question of efficiency is the topic of deregulation. Inefficient regulatory practices need to be cautiously dismantled, not only for inputs but also for production targets where comparative advantage criteria indicate the need for such a step, e.g., sugar. The agro-industrial sector in particular, offers opportunities for changes in institutional and regulatory practices in order to stimulate the development of agricultural product processing. On the extension side, deregulation is paralleled by the need to move from a top down targeted production approach to a much more educational approach that presents the farmer with a number of options from which to choose.

(5) Given the decreasing importance of rice in the agricultural GDP, an appropriate diversification strategy will need to be developed to ensure that the future goals of the sector are met. This raises major policy issues for the research and extension services who will have to determine how to readjust their programs, based on the productivity changes that are feasible, given the wide range of agro-ecological environments, the many types of farming systems, the diversity of cultures and the need for environmental sustainability. All of these present new challenges in many parts of Indonesia. A parallel challenge is faced by both research and extension in determining how to develop an effective interface in their activities so that appropriate technology relevant to his needs reaches the farmer more rapidly.

(6) In an Indonesian context, diversification will necessitate developing much more agriculture off-Java. To do this effectively the research service will need to develop a structure which will ensure that the results of its research are regional as well as commodity oriented so that valid findings are available for all major agro-ecological zones of the country. In order to interpret research findings in a local context and to be able to advise farmers as to where they possess a comparative advantage for specific commodities, extension personnel will require to be better trained in financial and economic issues and to be able to relate these to farming systems, rather than to monoculture.

(7) The shifts in research emphasis that are expected to take place in Repelita V will not only be dependent upon development goals but are also closely related to the size of the research budget and AARD's programming capability. It is necessary to recognize that a major part of the research budget is needed to maintain a steady flow of new varieties (especially cereals and legumes) in order to keep ahead of the rapid evolution of new strains of pests and diseases. At this point in time in the planning for Repelita V the most promising areas for major additional research effort, providing that adequate funding becomes available, are aquaculture (including mariculture), horticulture (including floriculture), and agricultural product processing. Appropriate policies will be needed to insure that additional research in these areas is supported by appropriate infrastructure so that positive research findings can be utilized by farmers.

(8) Finally, the whole scenario of research priorities (and also commodity prospects), notwithstanding the long time parameters of research, needs to be kept under constant and close review in the context of the rapid progress being made in biotechnology. The agricultural component of the national biotechnology program itself should clearly specify where Indonesia's comparative advantage and essential needs lie. The potential implications of biotechnology for Indonesian agriculture are complex and thus need to be kept under constant and careful review.

References

K. Altemeier, S.R. Tabor, B. Adinugroho, N. Daris and Soepani, 1987. "An Economic Simulation of Food Crop Policy Alternatives". Directorate of Food Crops, Ministry of Agriculture, Jakarta, Indonesia. Working Paper Draft, Supply/Demand Study, Sub-Study I.

Douglas D. Hedley, Stanley R. Johnson and Dibyo Prabowo, 1987. "Long Term Issues in Indonesian Agricultural Development". Paper prepared during the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia.

Faisal Kasryno, 1987. "Agricultural Factor Input Price Policy and Institutional Aspects". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (107 pp.)

Edi Guhardja, 1987. "Progress in Biological Technology for Indonesian Agriculture". Paper prepared for the Round Table on Indonesian Agricultural Development for Repelita V, Ministry of Agriculture, Jakarta, Indonesia. (13 pp.)

Barry Nestel, 1987. "Agricultural Research in Indonesia: Its Potential Role in the Development Process with Particular Reference to the Advancement of Biological Technology". Paper prepared for the Round Table on Indonesian Agricultural Development, Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (58 pp.)

Dibyo Prabowo, 1987. "Production and Supply of Agricultural Commodities". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (27 pp.)

Achmad Suryana, 1987. "Domestic Demand for Foods and Trade Prospects for Agricultural Commodities". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (44 pp.)

John F.A. Russell, 1987. "The Role of Agricultural Extension in Indonesia and Issues for the Next Decade". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (8 pp.)

Steven R. Tabor, 1987. "Marketing in Indonesian Agriculture: International, National and Regional Development". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. (36 pp.)

Steven R. Tabor, Lutfi A. Nasoetion, Achmad Suryana and Donald O. Mitchell, 1987. "Economic Issues for Agriculture in Repelita V". Paper prepared during the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia.

CLOSING REMARKS

ROUND TABLE ON INDONESIAN AGRICULTURAL DEVELOPMENT

Douglas D. Hedley

INTRODUCTION

The Round Table on Indonesian Agricultural Development has stimulated a great deal of creative thinking about the directions for the future of agriculture in Indonesia. The open atmosphere at the Round Table has been important in stimulating a frank discussion of some difficult and highly sensitive issues. The broad participation, the willingness to consider differing viewpoints and ideas, the support from the staff of the Bureau of Planning staff, the support of the Secretary General and of the Director of the Bureau of Planning have been exceedingly valuable in encouraging dialogue and interchange among the participants. The involvement of senior individuals from all parts of the Ministry, other Ministries and several donor agencies has added measurably to the discussion. A new basis for renewed dialogue among colleagues with a sincere interest in Indonesian agriculture has been established. All of the Round Table has been characterized by the interest and willingness of participants possessing diverse backgrounds and a broad range of knowledge to responsibly search for the means and directions to strengthen the agricultural sector. What we have learned about the scope of agricultural policy and the opportunity for coordinated action is the most valuable product of the Round Table.

These closing notes can only outline the alternatives and suggestions made throughout the ten days. A summary could not do full justice to information tabled nor is it possible to capture the array of policy alternatives and approaches discussed. Nonetheless, it is possible to draw central themes that appear to underlie the debate and discussion generated by the background and summary papers prepared during the Round Table.

THEMES OF THE ROUND TABLE

One cannot underestimate the importance of three words in the history, culture, society and politics of Indonesia. These words, growth, equity and stability, are deeply imprinted on the Indonesian consciousness and on the organization of the Indonesian economy. The prominence and ordering of these words has been at the heart of much of the policy debate over the past twenty years. Under different conditions in Indonesia, the ordering has been different, responding to the needs of the nation building and developmental processes underway.

During the first four Repelitas, growth has been recognized as the source of achieving equity. The commitment to growth and the resulting progress in equity has lead to a remarkable transformation in the Indonesian economy and in the agricultural sector. The sustained aggregate economic growth of 7.7 percent from 1967 to 1981 cannot be matched by many other nations. Rice self-sufficiency and the burgeoning exports of agriculture contribute substantially to the political and economic well-being of Indonesia. Growth has been the primary means of improving the quality of life across a broad spectrum of the Indonesian population. Equally, growth is understood as the means of achieving long term stability in establishing a nation containing diverse cultures, resources and climates. Stability is also derived from the progress in equity and the quality of life. The agricultural sector has been a major contributor to the growth, equity and stability in Indonesia. The sector must continue this contribution to the vitality of the economy for broadly based progress in the future.

From the Round Table, there appears to be a growing concern for the new sources of growth in agriculture. The international markets that play a growing role in the Indonesian economy are becoming more competitive and difficult. The GATT discussions create uncertainties for Indonesian agriculture. The domestic growth in the non-agricultural sectors has been slowing. Governmental budgets are restricted due to lower oil prices. Currency exchange rates have changed markedly in the past two years alone, suggesting different trading patterns,

requirements for economic adjustment and also some new opportunities in international markets. As the scope for economic policy increases, maintaining stability with the many uncertainties will require the development of good information systems on aspects of the economic environment that cannot be controlled by agricultural or non-agricultural policies.

The available technology in the agricultural sector is already being used very widely in Indonesia, limiting the growth in the future that can come from this source alone. New technology that can stimulate or replicate past growth in the sector may be some distance into the future. This new technology, its adaptation to the diverse biogeophysical conditions in the country and the ancillary input requirements will need major new investments at a time when budgets are restrained. Also, the requirement for a sustainable environment and natural resource base suggests that greater attention be placed on designing farming methods and the related policies to support continued growth in agricultural production.

The Round Table provided for a broad review of existing economic circumstances and requirements for growth under the very different conditions now prevailing in the Indonesian economy. The threat of more limited opportunities for growth under current policy directions was clearly recognized. With lower growth, the contribution of the agricultural sector to equity will diminish. Also, lower growth will begin to call stability into question in the longer run. This theme was present in all of the debate and consideration. A conviction that new sources of growth are required in agriculture lies at the core of the thinking during the Round Table and of the policy alternatives put forward.

THE OPPORTUNITIES

The 'positioning' of the agricultural sector by using specific policies and activities during Repelita V is seen as central to stimulating renewed agricultural growth. This positioning involves a shift in sectoral policies to emphasize productivity and efficiency as the primary sources for sustained growth. It argues against more rigid targeting of production and processing

and toward an agriculture driven more by market incentives agricultural sector. This argues for more decentralized decision making in the sector, leaving farmers and other agents with more latitude for responding to changes in relative prices, resource availability and trade opportunities. Nonetheless, the reliance on productivity and efficiency, supported by research and extension investment, as the future engines of growth will require new policies, to transform the current economic structure and buffer the adjustments required to move toward a more open economy now sought at the macroeconomic level in Indonesia. Repelita V provides the opportunity to begin this transition, preparing for the long term conditions expected to prevail for the country. In this sense, positioning of the sector through sectoral policies during the next Repelita is the critical issue in the search for new opportunities for growth.

Improved efficiency and productivity in the agricultural sector are necessary for long term growth. These criteria for the design of agricultural policy are consistent with the macroeconomic policies now being expressed and implemented for Indonesia. International and domestic market conditions also argue for efficiency and productivity in the sector. Equally, future growth on the basis of improved technology cannot be anticipated without substantially larger investments in research and extension.

Heavy emphasis has been placed on investments in physical, socio-economic, biological and bio-technological research and extension for sustaining growth in combination with more efficient and productive allocation of resources. The immensity of research required is daunting but the experience of other nations very strongly supports a much greater budgetary commitment to this fundamental engine of agricultural growth. Effective extension of technology to farmers and the rural sector more generally as well as stronger feedback mechanisms from extension to setting research priorities were equally recognized as important in organizing the research effort.

A different mix of public sector funding for agriculture has been proposed. Significant shifts away from subsidies on inputs that are increasingly less efficiently utilized, as a means of freeing

the resources necessary to mobilize growth, are required. Greater expenditures in research, extension, human and natural resource development, information systems to support farm and sectoral decisions, the documentation and measurement of the agro-ecological zones and environmental conditions are envisioned as the means for promoting efficiency and productivity.

Deregulation has received active consideration during the Round Table. Possibly a more accurate term is 'changed regulation'. Certainly a less regulated production milieu for agriculture is needed to allow the productivity and efficiency to foster growth, but at the same time, greater and different types of interventions are necessary to ensure sustained growth. New and different regulation will be needed to address environmental issues. Protection under patents and property rights for private industry will contribute, for example, to the stock of technology through research and quality requirements for making Indonesian products more competitive in domestic and international markets. As well, shifting to a more market driven economy will require better information systems to support farmer decisions. If left to the private sector alone, the information will be underproduced from a societal point of view; there is a role for government in organizing these information systems and in intervening and regulating them so that societal interests are served.

Employment growth is clearly recognized as a critical performance criterion in the Indonesian economy. Agriculture will be expected to share in the responsibility for generating an economic climate to support employment growth. The conclusion is that efficiency and productivity, not only in the production sector but also in the processing, handling, transportation, communications and food services sub-sectors hold the most promise to fulfill this mandate. The production sector alone cannot absorb the growth in the labor force; however, the synergy between expanded agricultural output and the value added beyond the farm gate holds great promise in achieving the employment of large numbers of people in the rural and urban sectors.

The Round Table provided substantial information on the changes in the composition of consumer demand and the related implications associated with income growth for the fisheries and livestock sub-sectors. However, the production aspects of the fisheries and livestock sub-sectors have not had the exposure and discussion during the Round Table that they deserve. Some actions need to be taken to assure that these sub-sectors receive the same attention brought to bear on the food crops and estate crops sub-sectors.

Indonesian agriculture has grown increasingly complex in the past two decades. This aspect of the agricultural sector places considerably more attention on the need for interaction among the sectors and sub-sectors of the economy in designing policy for the future. There were two broad themes throughout the debate on this topic. First was the recognition of greater interaction among the sub-sectors of agriculture. An example is the need for the food crops sector to generate and respond to the animal feed demands that are growing rapidly. Another example is the need for cropping systems that combine food crops, livestock and estate crops successfully and profitably for farmers while protecting the natural resource base. Second was the interaction required among Ministries on a scale far greater than in the past. Policies in the Ministries of Communications, Transmigration, Transportation, Transmigration, International Trade, Industry, Public Works, Education and Culture were mentioned as critical to the achievement of increased efficiency and productivity in agriculture. The compartmentalization of policy and public sector activity among Ministries may need rethinking to assure a growth environment for agriculture that includes more highly integrated production, processing, handling and transformation of the raw material generated from the soil. Along with the integration and interaction needed among Ministries' efforts, the integration among the production and distribution systems in the private sector is also required. In many commodities for which Indonesia would appear to have a comparative advantage based on climate, natural resources and labor costs, quality control through highly integrated production, distribution and processing systems has proven most productive in other countries.

In closing, the Round Table has attempted to seek a vision of the directions that will most likely sustain growth and vigor in the Indonesian agricultural sector, and continue to expand the sectoral contribution to equity and stability. The vitality that efficiency and productivity can offer, supported by the requisite investments in new technology, is the mainspring for establishing a truly "World Class" agriculture for Indonesia.

ABSTRACTS OF THE BACKGROUND PAPERS

PREPARED FOR THE

ROUND TABLE ON INDONESIAN AGRICULTURAL DEVELOPMENT

Boediono, 1987. "Indonesia: Past and Future Sources of Growth and the Role of Agriculture". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (34 pp.)

Abstract

The paper reviews the progress in economic development in Indonesia over the past two decades and continues with an examination of the growth prospects for the economy in the decade ahead. The growth since 1967 is divided into three distinct phases. The first is the period 1967 to 1973 in which economic recovery and rehabilitation dominated the growth. The second period, 1974-1981, was driven by the growth in oil exports, ending as the economy of Indonesia began to slow in the early 1980s. The third period, 1982 to present, is characterized by the slow and later more rapid decline in export revenues from oil and natural gas, giving rise to a nagging balance of payments problem. For the future, three binding constraints are discussed: the continued pressure on balance of payments, the diminished capacity of government to finance growth and the emerging growth requirement for employment. The primary criterion in searching for future growth is minimizing the domestic resource costs of production and services in the economy. This criterion provides for the greatest opportunity in expanding the net balance of trade through comparative advantage. The high import propensity being expressed as income growth occurs is noted as a significant constraint. The agricultural sector is seen to be lagging in generation of domestic savings and the linkages required to the processing and industrial sectors of the economy.

Edi Guhardja, 1987. "Progress in Biological Technology for Indonesian Agriculture". Paper prepared for the Round Table on Indonesian Agricultural Development for Repelita V, Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (13 pp.)

Abstract

The progress in biotechnology in Indonesia is examined and a comparison is made with progress in India. Biotechnology is defined in the paper to include genetic engineering, recombinant DNA, tissue culture including meristem culture, somatic cell culture, embryo culture, anther culture and protoplast culture. Examples of each are given for the Indonesian context. Applications for Indonesia are given as enzyme development, animal feed additions, improved plant varieties, increased specificity of pesticides, vaccines, plant growth hormones and diagnostic reagents. Applications of biotechnology are categorized by high, medium and low value and volume of products as well as by high, intermediate and low technological levels. The organization of biotechnology in Indonesia through LIPI, AARD, BPPT, the universities, the Inter-University Centers and the private companies is outlined. A review of activities across many institutions involved in biotechnology in Indonesia is presented.

S.R. Johnson and W.H. Meyers, 1987. "Domestic and International Demand for Agricultural Products: Indonesia". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (86 pp.)

Abstract

The paper provides a perspective for likely outcomes in the international markets in which Indonesian agriculture has traditionally participated and examines possible changes in the structure of domestic food demand in Indonesia. The historical pattern of food crop production and demand in Indonesia is

reviewed showing the major gains in production achieved as well as the increasing nutrient availability for the Indonesian population. Regarding the international markets, two major features are identified of relevance to Indonesia. These are the policies of the USA and other major exporting and importing countries and the macroeconomic conditions affecting economic growth, exchange rates interest rates and governmental debt. The implications for world markets of the 1985 U.S. Food Security Act are examined in some detail indicating downward pressure on world agricultural prices, particularly in the grain and oilseed crops, lower U.S. stocks and considerable pressure to expand exports with subsidies. Alternative agricultural program management in the U.S.A. designed to raise prices would likely lower farm income and is critically dependent on the level of stocks available. The review of recent demand parameter estimation for Indonesian food crops shows the rapid changes in income elasticities in recent years with more inelastic price elasticities emerging, lower income elasticity for rice and considerably higher cross price elasticities among the major food crops. Rice continues to dominate the food budgets although the growing cross-price elasticities suggest some substitution possibilities in Indonesian diets. Rice price changes also continue to exert considerable impact on the income distribution in the lower income groups. Income transfer programs designed to assist low-income households may have greater impact on demand for staples than on demands for other foods. A general increase in per capita income or a shift in income distribution skewed to high income groups is likely to be accompanied with a greater increase in demand for the income elastic food commodities, particularly animal products.

Faisal Kasryno, 1987. "Agricultural Factor Input Price Policy and Institutional Aspects". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (107 pp.)

Abstract

This paper reviews the wide range of evidence and analysis available on institutional aspects of technological change including land tenure, labor relations and income distribution. Following an examination of the changes in the Indonesian agricultural economy over the past two decades, the rural labor market and wage rates are explored indicating that the rural employment situation is changing very rapidly in response to the expanding employment opportunities and rising wage rates in both rural and urban areas. Mechanization has been occurring very rapidly, particularly on Java, limiting on-farm employment growth to greater crop intensities and higher production levels although mechanization is associated with rising wage rates. The subsidies on inputs, fertilizer, pesticides and credit are examined in some detail. The conclusion is drawn that while the mechanization and pesticide subsidies can be withdrawn quickly, the fertilizer subsidy will take considerable time to be reduced significantly. Fertilizer subsidies continue to play an important role in augmenting fertilizer use to complement the rice technology and also, the compensatory policy of raising rice prices to offset the reduced fertilizer subsidy would result in rice price increases much to rapid. The fertilizer subsidy reduction also would have a negative impact on many of the secondary food crops. Policy recommendations relating to employment opportunity, subsidies, productivity of farm households, farming systems approaches to future development of the farming sector and the development of secondary and tertiary processing activities conclude the paper.

Donald O. Mitchell, 1987. "Prospects for Agricultural Prices and Trade". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (16 pp.)

Abstract

This paper reviews the general conditions foreseen in the years ahead for agricultural prices and trade. The rapid decline in agricultural prices for most agricultural products since the highs in the 1970s appear to be over. The World Bank index of agricultural prices has shown a decline of 52 percent in real terms since 1974. Also, a sustained period of rapidly rising prices seems unlikely because of the combination of surplus production capacity and projected moderate economic growth. The pace of growth in agricultural exports has slowed dramatically with growth in the future of 2.8 percent foreseen. Developing countries are forecast to grow by 4.8 percent compared to 3.3 percent in the first half of the decade. The current GATT negotiations are noted, holding the potential for far reaching implications for patterns and levels of trade in agricultural commodities. Three sources of uncertainty are identified. First, the low fertilizer prices are leading to substantial reductions in fertilizer capacity in the world. Second, policy induced changes in supply within the developed world are a possibility. Third, the maturing of the green revolution suggests that many of the initial and easy gains from the technology generated have been already absorbed, indicating that further growth at past performance rates will be increasingly difficult to achieve.

Donald O. Mitchell, 1987. "Supply and Production of Agricultural Products in Indonesia". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (21 pp.)

Abstract

Production growth in the food crops in Indonesia has been particularly rapid in the past twenty years. With the exception of rice, the food crops have expanded more rapidly off-Java than on-Java although Java still has the dominant share of food crop production. Yield increases have been the primary source of growth although area increases have contributed significantly in the secondary food crops. Land availability is seen to be limited as a future source of growth implying that yield increases will necessary to achieve the production growth required for domestic demand. Producer prices have been steadily increasing in Indonesia, contrary to the world trends in these prices. The low fertilizer price in Indonesia appears to be an important factor in achieving the growth in the past.

Lutfi I. Nasoetion, 1987. "Agricultural Markets: International, National and Regional Development". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (22 pp.)

Abstract

Following a general review of performance of the Indonesian economy over the past several years, the changes in the domestic labor force and employment are examined. The labor force in the service sector of the economy has been growing very rapidly while the labor in agriculture has been declining as a portion of employment. Informal labor utilization appears to be growing quickly with urbanization. Clearly, agriculture is no longer a reservoir of unabsorbed labor in other sectors. Local marketing capability is identified as one of the most important components in expanding the wage goods of farmers. Nonetheless,

the unstable cropping patterns, limited storage capacities and lack of transportation can be disruptive to establishing markets as well as secondary industry. This is particularly evident in the transmigration areas. Horticultural crops, fisheries products and livestock products appear to have very promising prospects for international and domestic markets. The limits on poultry enterprise size attempts to protect the small farmers although not very effectively. Milk is expanding rapidly although the fresh milk industry remains very small as yet. For the future, the emphasis will need to be on comparative advantage by region and commodity to address the issues of regional investment and locational efficiency for production and processing. In international markets, diplomatic efforts will be needed to assure continued access to markets, new markets will have to be found to build upon the historic trade patterns and the East European countries should be examined as possible importers for Indonesian products.

Barry Nestel, 1987. "Agricultural Research in Indonesia: Its Potential Role in the Development Process with Particular Reference to the Advancement of Biological Technology". Paper prepared for the Round Table on Indonesian Agricultural Development, Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (58 pp.)

Abstract

The paper examines the rate of genetic progress that can be expected in each of the major and minor food crops during the next five to ten years, the biological constraints that need to be overcome in order to achieve higher yields, more efficient use of inputs and lower risks, the research priorities that need to be established to achieve continued growth and the investments required in research for the successful pursuit of these priorities. The biggest constraint confronting Indonesian agricultural research is the absence of any well articulated national policy that establishes a conceptual framework against which research programming can be developed. This is particulary important given the long developmental periods for usable

technology at the farm level. The case is presented for an expansion of agricultural research funding by five fold from 1987-88 levels, to enable productive use of the human and physical resources now available. The interaction between macroeconomic goals and the research effort to sustain agricultural growth is explored. Following a discussion of the major research requirements by crop, five priorities are identified. These are farming systems research, integrated socio-economic and biological research, research on sugar and other possible sweeteners, particularly off-Java, soybean research on all aspects of production, integrated pest management, seed production and agronomy and the development of a clearly articulated and implemented agricultural research policy with respect to biotechnology.

Dibyo Prabowo, 1987. "Production and Supply of Agricultural Commodities". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (27 pp.)

Abstract

This paper reviews the transition in the agricultural sector since 1970. In addition to examining the overall performance of the sector, the changes in each of the major food and estate crops are described. The regional production, area and yield of each of these crops is surveyed with regard to the natural resource base found in the heterogenous regions and provinces of Indonesia. The policy mix that has driven the growth in the agricultural sector is described focussing on the policies that have been directed to area expansion and yield improvement. Irrigation, import substitution, smallholder production schemes, fertilizer and pesticide subsidies and credit programs are examined. Several tables giving the historical development by crop are included.

John F.A. Russell, 1987. "The Role of Agricultural Extension in Indonesia and Issues for the Next Decade". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (8 pp.)

Abstract

Successful agricultural extension relies on three key ingredients: good supply of quality inputs (seeds, fertilizers and pesticides), an acceptable production technology and a market for his products supported by an adequate infrastructure. Other components are important although in a supportive role to these three. Indonesia has successfully combined all of the necessary components for success in rice over the past two decades. The difficulty lies in extending this success to other crops, livestock and fisheries. During the next decade, four major objectives are discussed: maintenance of rice self-

sufficiency, diversification of agriculture, reduction of rural poverty and the need to capitalise on the abundant labor resource available in Indonesia. Research is the key to maintaining rice self-sufficiency and continuing the diversification process. Better nutrition can be fostered with growing farmer incomes and the provision of technology to support this income growth. The human resource development presents some of the most difficult problems to Indonesia given the greater emphasis on management of production on farms in an expanding agriculture. Also, the natural resource base needs to be better understood and mapped to permit the adaptation of cropping systems to match the resource capability and availability. The principal issues facing agricultural extension are: the need to consolidate and strengthen the management structure, development of more appropriate and more cost effective technology messages for the farm community, a shift to an educational approach in extension rather than an imposed production program, better awareness of costs associated with production technology, greater farmer self-reliance, emphasis on value added at the farm level and in agro-processing and a change in the mix of skills in the extension service to meet the above requirements.

Achmad Suryana, 1987. "Domestic Demand for Foods and Trade Prospects for Agricultural Commodities". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (44 pp.)

Abstract

The paper reviews the data and differences found between the Susenas and food balance sheet approaches. The Susenas data contain much more regional and commodity detail with considerably lower per capita consumption estimates than the food balance sheet information. While average per capita intake of carbohydrates has increased measurably in the past decade, certainly the lower income groups remain below adequate levels. The consumption patterns for each of the major staples is reviewed and summarized. Projections of consumption of the major foods are given based on the IFPRI supply and demand

model. Of interest, the direct human consumption of corn is expected to fall although the demand for corn indirectly through animal products can be expected to expand rapidly. In international markets, the downward trend in real agricultural prices is expected to continue, placing considerable pressure on Indonesia to become more productive and efficient. New markets will need to be found since most exports from Indonesia of agricultural products depend on very few importers. Developing countries may prove to be one source of diversifying export buyers. Barter may be necessary to seek new markets in some areas.

Steven R. Tabor, 1987. "Marketing in Indonesian Agriculture: International, National and Regional Development". Paper prepared for the Round Table on Indonesian Agricultural Development. Ministry of Agriculture, Jakarta, Indonesia. Mimeo. (36 pp.)

Abstract

Economic growth in the rural sectors has led to an increasing commercialization of the agricultural sector in factor, product and consumption markets and increased the reliance of the farm community on the market for resource allocation signals. The net food import balance rose steadily during the 1970s until 1983. The reduction in rice imports with self-sufficiency turned this parameter downward since then. At issue is how to maintain this pattern of an improved trade balance for the sector as a whole. The historical pattern of policy relying on protection created as a conscious effort to channel resources in the extractive sector of the economy is described. Also, the more recent barriers to trade were erected to limit the impact of the high propensity to import as incomes and wealth increased. For the future, international prices for agricultural products are foreseen to decline in real terms through the end of the century. This places very great pressure on Indonesia to seek productivity and efficiency in production and processing of foods to enable continued improvement in the net trade balance. The argument for a more market oriented agriculture is developed showing the rapid changes in the income and price elasticities for major

foods, suggesting considerably more latitude for price policy and the use of market signals to drive the sector rather than the more directed and targeted production systems of the past. Indicative planning instead of targeted area and production levels by crop and region, coupled with regional comparative advantage approaches appear to hold the best potential for continued growth in the sector.

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ACRONYMS AND ABBREVIATIONS

AAETE	Agency for Agricultural Education, Training and Extension (see also Diklatluh and BPLPP)
AARD	Agency for Agricultural Research and Development (see also Litbang)
ASEAN	Association of South East Asian Nations
Bappenas	Badan Perencanaan Pembangunan Nasional National Development Planning Agency
Bimas	Bimbangan Massal Swasembada Bahan Makanan Mass Guidance Program for Self-Sufficiency in Foodstuffs
BIP	Balai Informasi Pertanian Agricultural Extension Information Office (under BPLPP, at provincial level)
BLPP	Balai Latihan Pegawai Pertanian Agricultural Extension Training Office (under BPLPP, at provincial level)
BPLPP	Badan Pendidikan Latihan dan Penyuluhan Pertanian (see AAETE and Diklatluh)
BPPT	Badan Pengkadjian Penerapan Teknologi
BPS	Biro Pusat Statistik Central Bureau of Statistics (see CBS)
Bulog	Badan Urusan Logistik National Logistics (or Procurement) Agency
BUUD	Badan Usaha Unit Desa Village Cooperative Unit

CADP	Center for Agricultural Data Processing (see also Pusdatik)
CAER	Centre for Agro-Economic Research (see also PAE)
CARD	Center for Agricultural and Rural Development (Iowa State University)
CBS	Central Bureau of Statistics (see BPS)
CGIAR	Consultative Group on International Agricultural Research
CGPRT	Center for Coarse Grains, Pulses, Roots and Tubers
CRIFC	Central Research Institute for Food Crops
DIP	Daftar Isian Proyek Approved Development Project (Development Budget)
FKPP	Forum Koordinasi Penyuluhan Pertanian Forum for Coordination of Agricultural Extension
GATT	General Agreement on Tariffs and Trade
GBHN	Garis-garis Besar Haluan Negara Broad Outlines of State Policy
IFPRI	International Food Policy Research Institute
IGGI	Inter-Governmental Group on Indonesia
Inmas	Intensifikasi Massal Mass Intensification for Self-sufficiency in Foodstuffs
Inpres	Instruksi Presiden Presidential Decree
IPB	Institut Pertanian Bogor

Ipeda	Iuran Pembangunan Daerah Regional Development Levy
IRRI	International Rice Research Institute
Keppres	Keputusan Presiden Presidential Instruction
KIK	Kredit Investasi Kecil Small Scale Investment Credit
Kupedes	Kredit Umum Pedesaan Village Investment Credit Programme
LIPI	Lembaga Ilmu Pengetahuan Indonesia Indonesian Institute for Science
Litbang	Badan Penelitian dan Pengembangan Pertanian (see AARD)
LKMD	Lembaga Ketahanan Masyarakat Desa Office for Strengthening Rural Society
NAEP	National Agricultural Extension Project
NAR	National Agricultural Research Project (World Bank)
NES	Nucleus Estate Program (See PIR)
PAE	Pusat Agro-Ekonomi (see CAER)
PIR	Perusahaan Inti Rakyat Nucleus Estate Programme (see NES)
PMD	Pembangunan Masyarakat Desa Rural Community Development
PPL	Penyuluh Pertanian Lapangan

	Agricultural Field Extension
PPUP	Penyuluh Pertanian Urusan Program Agricultural Extension Programmer
PPS	Penyuluh Pertanian Specialis Agricultural Extension Specialists
REC	Regional Extension Center
Repelita	Rencana Pembangunan Lima Tahun Five Year Development Plan (also Pelita)
Satpel	Satuan Pelaksana Bimas Kabupaten-level extension (Tingkat II)
Satpem	Satuan Pembina Bimas Province-level extension (Tingkat I)
SIAP	Sisa Anggaran Proyek Unspent Carryover of Development Funds
SPP	Sekolah Pertanian Pembangunan Agricultural Development School (formerly SPMA)
SURIF	Sukamandi Research Institute for Food Crops
Susenas	Survei Sosial-Ekonomi Nasional National Household Expenditure Survey
UDKP	Unit Daerah Kerja Pembangunan Office of Regional Development
UGM	Universitas Gadjah Mada
UI	Universitas Indonesia
UNDP	United Nations Development Program
UNHAS	Universitas Hasanuddin