

Report of the JICA/IFPRI Joint Seminar on  
IFPRI 2020 Vision  
and Development Assistance

*Report, Policy and Environment in  
South Asia and Sub-Saharan Africa*

5 March, 1996  
Tokyo

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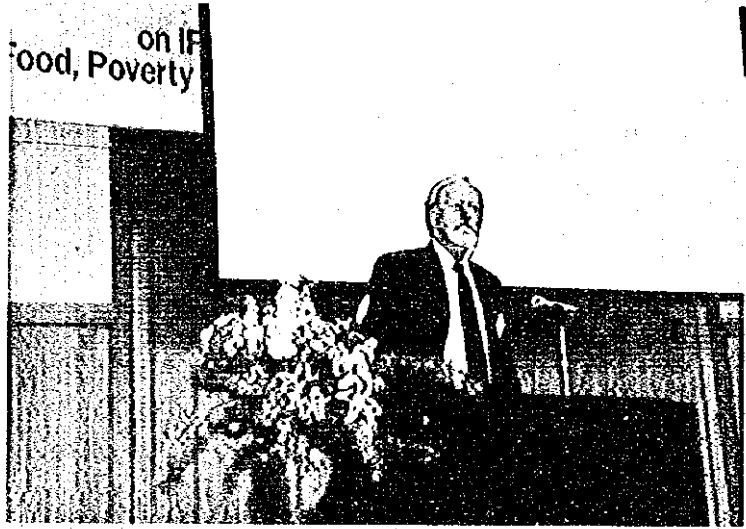
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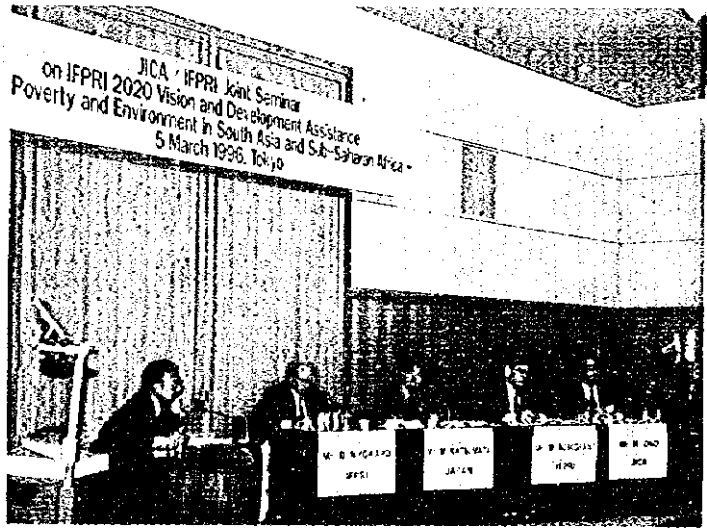
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**Opening Address:**  
**Mr. Hidero Maki**  
 Senior Vice President, JICA



**Keynote Speech:**  
**Dr. Per Pinstrup-Andersen**  
 Director General of IFPRI



**Panel Discussion: (from left)**  
**Dr. Fumio Egaitsu,**  
**Dr. David F. Nygaard,**  
**Dr. Makoto Katsumata,**  
**Dr. Mark W. Rosegrant,**  
**Mr. Hideo Ono**



**Report of the JICA / IFPRI Joint Seminar  
on IFPRI 2020 Vision and  
Development Assistance**

*Food, Poverty and Environment  
in South Asia and Sub-Saharan Africa*

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## PREFACE

The Japan International Cooperation Agency (JICA) and the International Food Policy Research Institute (IFPRI) held a joint seminar entitled the "JICA/IFPRI Joint Seminar on IFPRI 2020 Vision and Development Assistance — Food, Poverty and Environment in South Asia and Sub-Saharan Africa —." (IFPRI is an international agricultural research organization under the Consultative Group on International Agricultural Research (CGIAR).) This seminar was held at the JICA Institute for International Cooperation on March 5, 1996 with the support of the Ministry of Foreign Affairs and the Ministry of Agriculture, Forestry and Fisheries. This report is a record of the entire contents of the joint seminar.

IFPRI predictions on the outlook for world food supply and demand in the year 2020 are for an increase in the world overall per capita food supply volume. However, IFPRI also predicts the danger of serious shortages and malnutrition in the South Asia and Sub-Saharan Africa regions, unless sufficient consideration is given to factors such as economic policy, population increases, agricultural production technologies, and the environment.

In the face of such forecast, the world conference on the 2020 Vision was held in Washington, USA in June 1995. At that conference, reports were made on the results of regional workshops and research that had been conducted previously. Recommendations were also made on what actions governments and international organizations should take, in future, to address these issues.

Japan's development assistance has long emphasized cooperative activities in the agricultural field, aimed at stabilizing food supply and improving living standards in rural villages. Given this background, JICA and IFPRI held a joint seminar on agriculture and the environment in 1992, and have also subsequently continued to exchange information and opinions on agricultural and food problems in developing countries.

The seminar this time, came to fruition with the decision to hold follow-up conferences in various nations across the globe, in order to further deepen debate on subjects that were raised at the 1995 Washington conference held by IFPRI.

The aim of this joint seminar was to introduce the 2020 Vision in Japan, as well as to discuss forms of cooperation to address food, agricultural, and environmental problems including poverty alleviation, so as to promote sustainable development in the South Asia and Sub-Saharan Africa regions, based on the experience JICA has accumulated through past technical cooperation. In addition, discussions were conducted with the objective of contributing toward effective implementation of Japan's cooperation activities in the future.

Based on the results of this seminar, we will endeavour to promote even more effective development assistance in the areas of food, poverty, and the environment in South Asia and Sub-Saharan Africa.

In conclusion, we would like to extend our heartfelt thanks to all of the organizations whose support made this seminar possible, as well as to all of the participants.

December, 1996

Kazutoshi Iwanami  
*Managing Director*  
*Institute for International Cooperation*  
*Japan International Cooperation Agency*



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*Director General of International Food Policy Research Institute (IFPRI)*

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#### CHAIRMAN

Dr. Fumio Egaitsu

*Professor, Department of Agricultural Economics,*

*Faculty of Agriculture, Tokyo University*

#### PANELISTS

Dr. Makoto Katsumata

*Professor, Faculty of International Studies,*

*Meiji Gakuin University*

Mr. Hideo Ono

*Managing Director, Agriculture, Forestry and Fisheries*

*Development Study Department, JICA*

Dr. David F. Nygaard

*Director of Country Programs, IFPRI*

Dr. Mark W. Rosegrant

*Research Fellow, IFPRI*

# I. PROFILE OF KEYNOTE SPEAKER AND PANELISTS

## 1. KEYNOTE SPEAKER

### **Per Pinstруп-Andersen**

*Director General, International Food Policy Research Institute*

A native of Denmark, Mr. Andersen pursued a Ph. D. degree in Agricultural Economics from Oklahoma State University. He has served as an associate professor at the Economics Institute of the Royal Veterinary and Agricultural University in Copenhagen and Director of the Agro-economic Division of the International Fertilizer Development Center in Alabama. As a consultant, he has worked with a number of international agencies including the World Bank, the Food and Agriculture Organization of the United Nations (FAO), as well as with the governments of several developing countries. He assumed his current post in 1992.

## 2. PANELISTS

### **Fumio Egaitsu (Chairman)**

*Professor, Department of Agricultural Economics, Faculty of Agriculture, Tokyo University*

Prof. Egaitsu obtained a Ph. D. degree in Agricultural Economics, from University of Tokyo. His overseas research experiences lie in the same field at Thammasat University in Thailand and University of Oxford in England. He also served as a member of Price Policy Council, Government of Japan. Since 1985, he has been a professor at Tokyo University.

### **Makoto Katsumata**

*Professor, Faculty of International Studies, Meiji Gakuin University*

Prof. Katsumata earned his Ph. D. in Development Economics from Paris University. Prior to his current post started since 1985, he was a visiting professor at Dakar University in Senegal, London University, and Montreal University. He has also been involved as a member of the JICA Country-wise Assistance Research project.

**Hideo Ono**

*Managing Director, Agriculture, Forestry and Fisheries Development Study Department, JICA*

Mr. Ono graduated from Hokkaido University with a Bachelor degree in Agricultural Science (Animal Husbandry). He, then, has joined Overseas Technical Cooperation Agency (OTCA) which has reorganized as JICA. His overseas experiences are as a program officer for United Nations Development Program Office in Lesotho and a resident representative for the JICA Nepal Office.

**David F. Nygaard**

*Director of Country programs, IFPRI*

Dr. Nygaard received his Doctorate in Agricultural economics from University of Minnesota. He has been a Ford foundation's representative for the Middle East and North Africa in Cairo, Egypt and also the Vice President of the Agricultural Development council in New York. He joined IFPRI in 1994 as a Research Fellow in charge of coordinating the global initiative on the future of the world's food supply.

**Mark W. Rosegrant**

*Research Fellow, IFPRI*

Dr. Rosegrant earned his Ph. D. in public policy studies at University of Michigan. He has worked as an economist for the Integrated Agricultural Production and Marketing Project developed by USAID and Ministry of Agriculture, the Philippines and also as a researcher for the various types of agricultural projects. He currently holds a post as research fellow at IFPRI conducting research on agricultural and natural resource policies for developing countries.

## 1. OPENING ADDRESS

# II. SEMINAR

## 1. Opening Address

**Mr. Hidero Maki**

Senior Vice President

Japan International Cooperation Agency

It is my great pleasure to welcome you to the JICA/IFPRI Joint Seminar on the IFPRI 2020 VISION and Development Assistance. Allow me to say a few words on behalf of one of the sponsors, the Japan International Cooperation Agency.

First of all, I would like to extend my gratitude to Prof. Egaitsu of Tokyo University for acting as the chairman of this seminar and to Prof. Katsumata of Meiji Gakuin University for participating as a panelist. Also, I would like to express my sincere welcome to the distinguished members of the International Food Policy Research Institute (IFPRI), cosponsor of the seminar. Dr. Andersen, Director of the institute, will make a keynote speech, Dr. Nygaard, Director of Country Programs, and Mr. Rosegrant, who works as a researcher there, are joining this seminar as panelists.

Presently, the food supply in northern developed nations is more than sufficient. A long time has passed since the phrase "era of gluttony" was first coined. On the other hand, nearly 800 million people are undernourished in developing regions. The situation is particularly serious in South Asia and sub-Saharan Africa. Despite this, seeing that the total food supply in the world as a whole has been sufficient, the food problem has often been said to be a matter of allocation. However, partly due to poor harvests caused by climatic changes, the excess food stocks accumulated mainly in developed nations since the beginning of the 1990 have decreased remarkably. Thus, the situation has reversed itself, to a condition of tight supply. At the same time, elements of instability have emerged in some developing regions that have been making steady progress. Southeast Asia is one such region, and Indonesia, which achieved self-sufficiency in rice in the 1980s, has started to import rice. Furthermore, the world population is expected to increase considerably, mainly in developing nations, and to reach eight billion in 2020. The outlook for food security for such a large number of people should not be viewed optimistically. Moreover, agricultural land, on which food production is based, is becoming less fertile, deteriorating due to salt damage and other adverse effects. In addition, when desertification and urbanization are considered, an increase in agricultural land in the future cannot be expected.

The International Food Policy Research Institute (IFPRI), which studies world food supply and demand

## 1. OPENING ADDRESS

issues and proposes food policies and strategies, presented the IFPRI 2020 VISION last year. This is a perspective on world food supply and demand for 2020 and the relations between the problems of food, poverty and environment. The study analyzes the present situation, forecasts the future status, and proposes action guidelines for the future.

As its perspective on world food supply and demand for 2020 in this study, IFPRI forecasts that per capita food supply will increase in the world as a whole. However, unless sufficient consideration is given to such elements as economic policy, population growth, agricultural production technology, and the environment, food insufficiency will become more serious in South Asia and sub-Saharan Africa and undernourishment will prevail.

Also, six points are proposed in the study as action guidelines to enable future generations to lead healthy, productive lives based on sustainable food production. These are for strengthening the functions and capacity of government in developing nations, investing heavily in the poverty-stricken strata of society, strengthening mechanisms for research and diffusion of agricultural techniques, increasing agricultural production through sustainable, sound resource management, improving the food marketing system, and expanding development assistance.

Agriculture, forestry and fisheries not only ensure a stable food supply, but also form the most vital base for society and economy, particularly in developing nations. They are crucial factors in improving the living standards of local residents and promoting their independent development. Also, they are closely related to environmental problems such as tropical deforestation and desertification, and furthermore to issues that have a global scale, such as the role of women in poverty and participatory development. For these reasons, we should bear in mind the importance of promoting cooperation flexibly in each of our partner nations by considering their levels of development in agriculture, forestry and fisheries in our efforts to increase food production capacity of developing nations, making the stable supply of food possible, and raising living standards in farming communities.

For example, we have promoted the Kilimanjaro agricultural development project in Tanzania, over a period of some ten years. This project carried out the establishment of an agricultural base along with technological guidance and diffusion on a unified basis and has brought about stable rice crops. This is our typical pattern for cooperation in Africa.

In South Asia, we emphasize cooperation with the aim of independent development, by encouraging locals to play an active role in alleviating poverty in agricultural and mountain villages. Our village development project in Nepal with women as the focus can be offered as one such example.

## 1. OPENING ADDRESS

JICA and IFPRI held a joint seminar in 1992 to discuss the theme of agriculture and the environment. The seminar covered various issues ranging from food and agricultural development to technology, the environment and women. Since then, the two organizations have been exchanging information and opinions on agricultural and food problems in developing nations.

The intent of this joint seminar is to introduce the 2020 VISION to Japan and to discuss how to promote cooperation for sustainable development in South Asia and sub-Saharan Africa. The experiences and future perspectives we have gained through past technological cooperation will be referred to in our discussions of solutions to food and agricultural problems, environmental issues and poverty. In closing, I would like to express my hope that this seminar will prove to be a useful occasion for the promotion of effective cooperation in the future.

## 2. Keynote Speech

### **“Realizing the 2020 Vision for Food, Agriculture, and the Environment”**

**Dr. Per Pinstrup-Andersen**  
Director General,  
International Food Policy  
Research Institute

Thank you Mr. Chairman. Let me mention just a few points. The support that we are receiving from the Ministry of Foreign Affairs is of a critical importance to IFPRI's work. The supports and collaboration we receive from the Ministry of Agriculture, from JICA, from JIRCAS and from other institutions are equally important for IFPRI as we all proceed together to solve the problems before us. We are fortunate to have a board of trustees, a distinguished Japanese, Mr. Sano and we are fortunate to have on our International Advisory Committee for the 2020 vision initiative, a distinguished Japanese, Professor Hemmi. We also have on our staff Dr. Otsuka from the Metropolitan University, and we have several outstanding Japanese professionals who spend much time with us. We are beginning to develop a Japanese alumni for which we are very grateful. We look forward to maintaining contact with all of you in the future.

As you all know, the global food production has increased faster than the population during the last 25 years. The success in food production is one of the reasons why international food prices have decreased in real terms during the last 20 to 30 years. We are currently facing an increase in international food prices but we expect this to be of a short duration and that the long-term trend will continue to be decreasing real food prices. One of the reasons is the success that we have had in production but the other reason which is frequently forgotten is that more than a billion people earn less than a dollar a day. They don't exercise much pressure on the international food market. And as we all know, if consumers cannot afford to buy our products, the price will fall. So while we can be proud of the successes in food production, we have absolutely nothing to be proud of on the purchasing power side that more than one billion people, that is more than 1 in 6 people worldwide, earn less than a dollar a day and most of them are food insecure. We believe that about 800 million of those people are food insecure. That is, they do not have access to enough food to live a healthy and productive life.

One-third of all preschool children in developing countries are malnourished. They are underweight for their age. They do not grow well. And if they do grow and if they do survive, they grow up frequently to be adults with low productivity. They are frequently ill and about 40,000 children die from nutrition related illnesses everyday. That's the equivalent of a fatal crash of a 747 airplane every 15 minutes. Imagine how many airplanes would have to fall outside of Narita or elsewhere killing everybody on board every 15

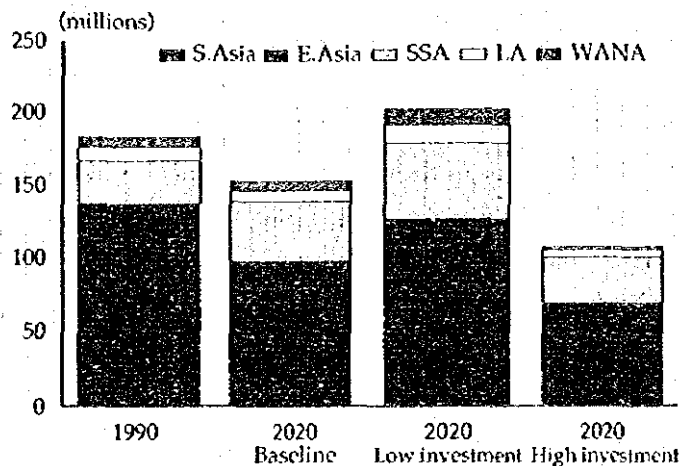
## 2. KEYNOTE SPEECH

minutes before we took action. Yet we permit this high degree of child mortality to continue.

It doesn't have to be that way. We at ICPRI have what we call a 2020 Vision. You may if you like call it a dream. The vision is a world where every person has access to sufficient food to sustain a healthy and productive life, where malnutrition is absent, and where food originates from efficient, effective, and low cost agricultural systems that are compatible with sustainable use of natural resources.

It's possible that we cannot achieve this vision by the year 2020 yet it is possible to do so if we choose. But whether we can or not, my suggestion is that by focusing sharply on this vision as the overriding goal or the economic development in developing countries, we are much more likely to move towards this goal than if we continue to pursue a large number of other goals simultaneously. The point that I want to make is that whether we achieve the 2020 vision is not a matter of whether we have enough natural resources. It is a matter of what action we take. And I would like to illustrate the consequences of alternative action (Figure 1).

**Figure 1 Number of malnourished children in developing regions, 1990 and 2020**



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

With business as usual, this is what we call the baseline on this slide, we project that the number of malnourished children will decrease between now and the year 2020 to a number slightly in excess of 150 million children. This is the second bar from the left. We will see large decreases in South and East Asia, but in Sub-Saharan Africa, the number of malnourished children will increase to more than 40 million children.

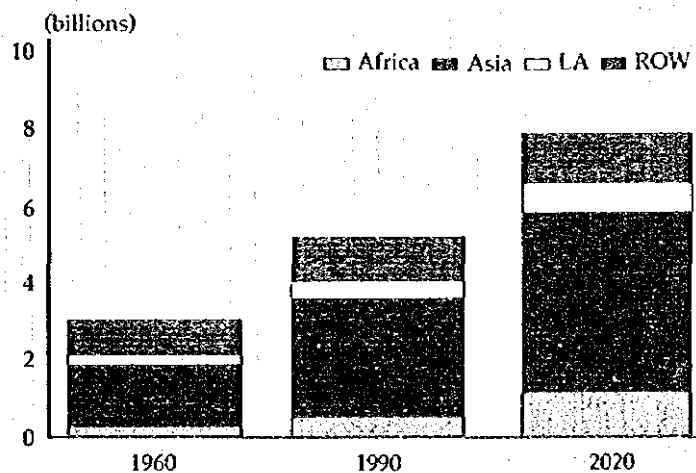
But business as usual isn't good enough. If investments in national and international agricultural research



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systems are expanded by about \$750 million per year, and if investment in primary health care and education is increased by 20 percent, and if nonagricultural income expands by 25 percent, that's the scenario that we have taken to illustrate the point. We can change these numbers if we wish to use different scenarios. If this happens, the world could decrease the number of malnourished children to 100 million. That is what we referred to in this graph as the high investment scenario but it isn't that high. It is certainly durable. Now let's suppose that we take the opposite position and we reduce investment in agricultural research, primary health care, primary education, and as a consequence incomes will fall. Then we end up with 200 million malnourished children. That's the difference between taking one set of actions versus taking another, both of which are perfectly possible. I'm showing you these results not to argue that a specific scenario is the one to be pursued. There are other scenarios out there that would lower the number of malnourished children to less than a 100 million. In fact, as I said before there is a scenario that will get rid of malnourished children over the next 25 years. I'm showing you this just to illustrate that what matters is not whether we have enough natural resources because we do. What matters is how we use them. Because the time will come when the capacity of natural resources will be insufficient to feed the world if we continue to misuse them as we are currently doing (Figure 2).

Figure 2 World population by region

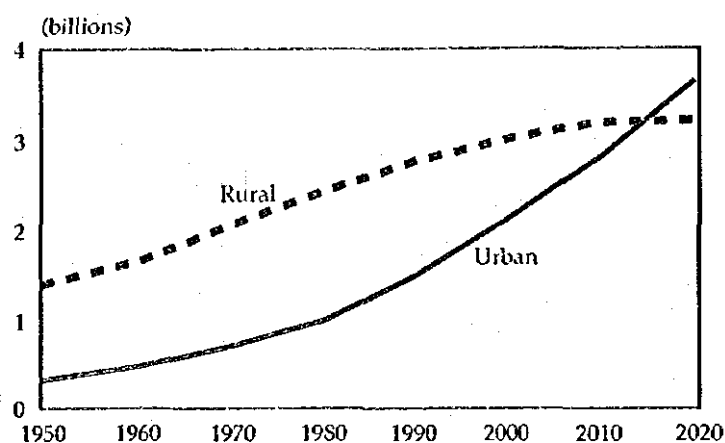


Source: UN (1993).

It is going to be a tremendous challenge to achieve the 2020 Vision. Between now and the year 2020, world population is likely to increase by about 40 percent to a total of 8 billion people. This amounts to a population increase of almost 90 million people per year. This is the largest annual population increase in human history. Although the rate of increase is falling the absolute number of people added to the world population every year is higher than it has ever been. Sub-Saharan Africa's population will double during the next 25 years, and the population of Asia will increase by 1.5 billion people. I wish it were million (Figure 3).

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**Figure 3 Urban and rural populations of developing countries, 1950-2020**



Source: UN (1993).

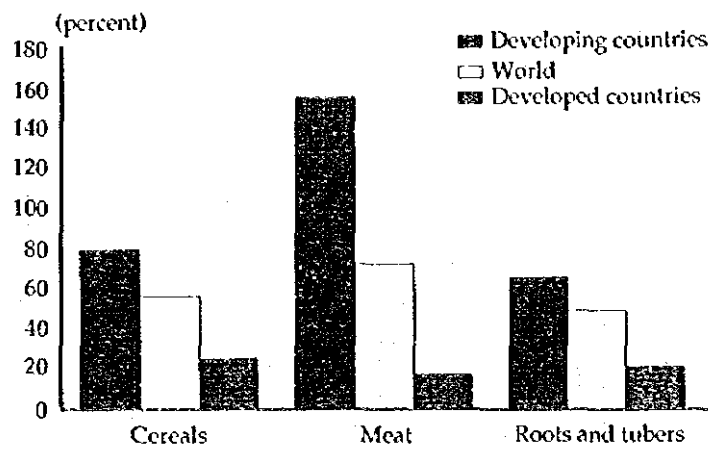
Note: Medium-variant predictions for 1990-2020.

Population growth is likely to be much larger in urban than in rural areas. By 2015, the population of the developing countries will be evenly split between rural and urban areas as shown in this slide. While the rural population will continue to grow, the growth rate will be much greater in urban areas. It is of critical importance that we accelerate investment in rural areas along the lines proposed in the 2020 Vision Action Program. We still have a window of opportunity to solve poverty and nutrition problems in the rural areas before they become urban problems, but this window of opportunity is gradually closing as more and more poor and malnourished people are moving to urban areas. We must resist the temptation and emerging pressures to shift resources from the rural to the urban areas in anticipation of rapid urbanization, because that will exacerbate the rural problems that lead to excessive rural to urban migration. I'm not arguing that rural to urban migration is bad. It is part of development. I am arguing that the speed by which it occurs has to conform to the employment opportunities in urban areas and right now it does not. One of the reasons it does not is that people are being pushed out of the rural areas because of extreme poverty, malnutrition, and related human misery.

Population growth, along with rapid urbanization, income increases, and dietary changes will result in increasing food demand over the next 25 years. As shown in this slide (Figure 4), developing countries are projected to increase their cereal demand by about 80 percent between 1990 and the year 2020, while the world as a whole will increase its cereal demand by about 55 percent. Meat demand in developing countries will increase by a staggering 160 percent, and world meat demand will increase about 75 percent. The percent increase in demand for roots and tubers will be slightly lower than that for cereals as shown in the slide. These increases are large and will put tremendous pressures on food production and marketing (Figure 5).

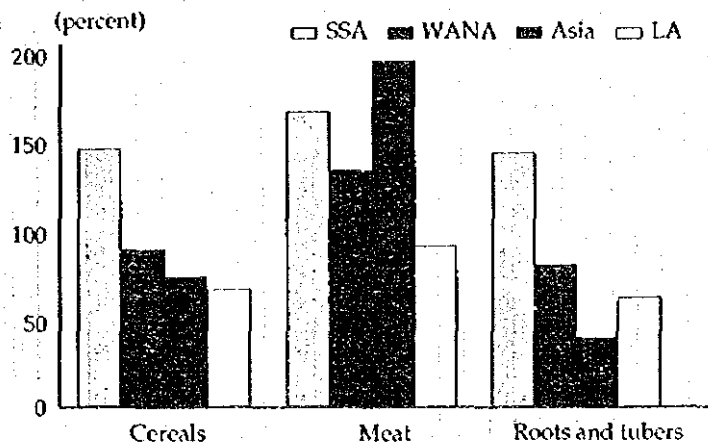
## 2. KEYNOTE SPEECH

**Figure 4 Percent Increase in total demand, 1990-2020**



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

**Figure 5 Percent increase in total demand in developing regions, 1990-2020**



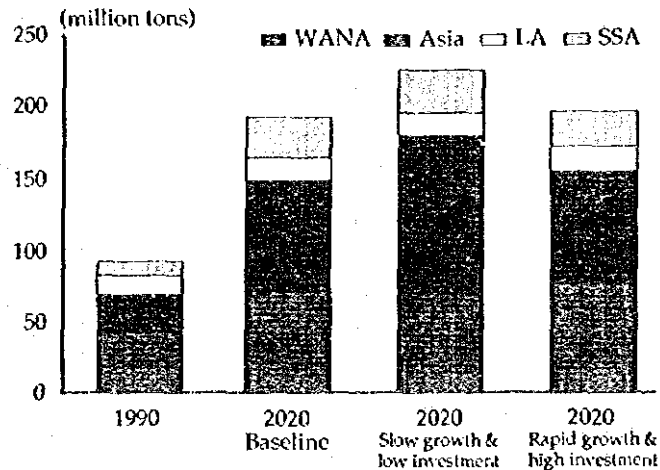
Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

The projected increase in the demand for cereals, meat, and roots and tubers varies significantly among developing-country regions. You can see the variation in the demand among the regions in this slide. Sub-Saharan Africa is projected to increase its demand for these three commodity groups by at least 150 percent. You should note the very rapid increase in meat demand in the developing countries of Asia.

So, how much of this demand is going to be fulfilled by means of developing country's own production? Let's take a look at the import requirements (Figure 6). In 1990, developing countries had net cereal imports, that is the difference between demand and production of around 90 million tons. We project that this will increase to between 190 and 200 million tons by the year 2020. This is under our baseline assumption. That's the second bar from the left in the slide. Because Sub-Saharan Africa is expected to continue its poor

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**Figure 6 Net cereal import requirements of developing regions, 1990 and 2020**



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

production performance relative to population growth, its net import requirements for cereals are projected to triple from 9 to about 27 million tons during this period. Now let's look at the two scenarios I briefly described before. Developing countries' import requirements will be considerably higher under the scenario of low growth and low investment while they will be slightly higher than the baseline under the scenario of rapid growth and high investment.

But there is a major difference between the two scenarios and that is that in the case of low investment, many of the developing countries will not be able to pay for this additional import, so much of that will have to be supplied as food aid. In the high growth scenario, more countries will be able to pay for more commercial import. It is in the interest of exporting countries to promote the kind of rapid growth illustrated in the high investment scenario. My colleague, David Nygaard, will give a bit more detail about these two scenarios so if you feel I'm glancing over it too quickly, bear with us. There will be more to come.

Let's look at the composition of these additional imports (Figure 7). Our research suggests that the net cereal import requirements of developing countries by the year 2020 will consist primarily of wheat and maize. There is also a very large increase in net imports of meat in response to more rapid economic growth in developing countries, especially in Asia (Figure 8).

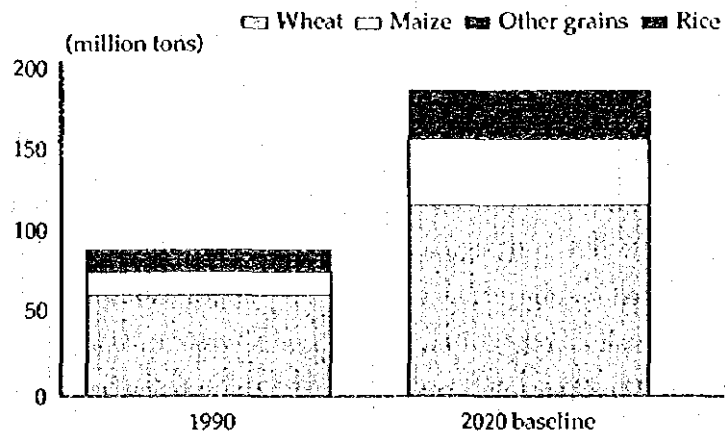
Let's assume that our projected production and import requirements are correct (Figure 9). What you see on this slide then is the per capita food availability by region. And as you see, it will increase in all regions during the 25-year period, but the increase is going to be very small for Sub-Saharan Africa. By the year 2020, average daily caloric consumption per person in Sub-Saharan Africa will still be only about 2,100

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calories as compared to 3,000 calories in Asia and 3,500 calories in the industrialized nations. The largest improvement is likely to occur in Asia as you can see from this slide and there is unfortunately strong evidence to suggest that some of this improvement will result in increasing obesity and related health problems, heart and respiratory diseases in that part of the world.

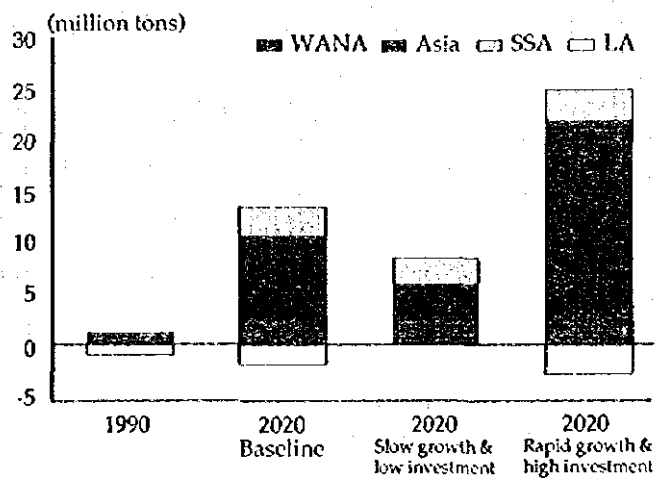
We have worked closely with the International Center for Living Aquatic Resources Management, ICLARM for short, one of our sister institutions in CGAIR as well as FAO to better understand the situation

**Figure 7 Composition of net cereal import requirements of developing regions, 1990 and 2020**



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

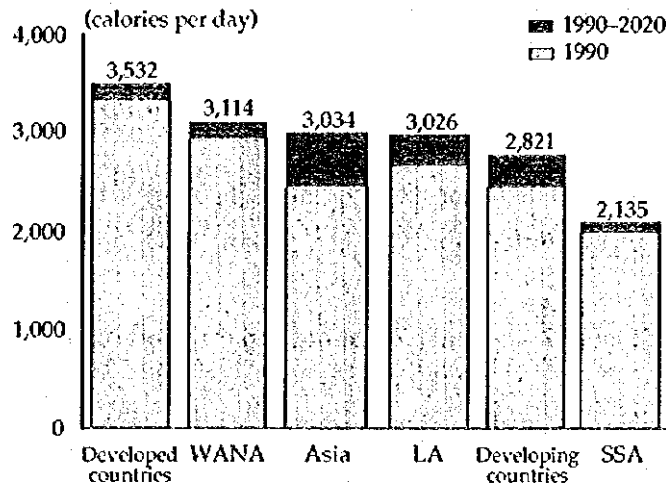
**Figure 8 Net meat import requirements of developing regions, 1990 and 2020**



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

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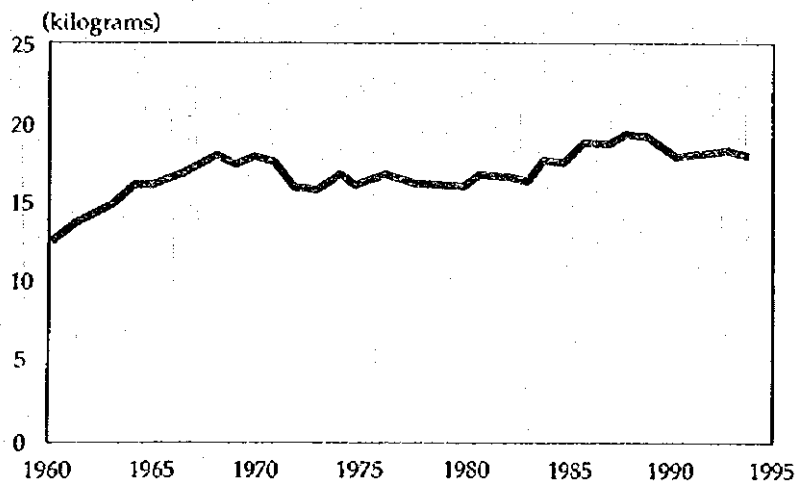
**Figure 9 Per capita food availability, 1990 and 2020**



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995).

surrounding future fish availability. We have come to the conclusion that the recent and current over-exploitation, of marine fisheries is such that it is unlikely that there will be an increase in the catch from marine fisheries between now and 2020 (Figure 10). The global per capita fish catch as you can see from this slide has remained unchanged for quite a few years and now appears to be falling. In fact, a great deal will have to be done, Fig 11, to maintain the current output as almost 60 percent of the world's main fish stocks are fully exploited (Figure 11), overexploited, or depleted. The problem is primarily one of virtually free access to fish stocks and rapid increase in technology leading to excessive capacity in the marine fisheries industry. Expanded investments and increases in the productivity of aquaculture are urgently needed along with international arrangements to avoid continued over-exploitation of marine fisheries. This is of course something that affects this country very much.

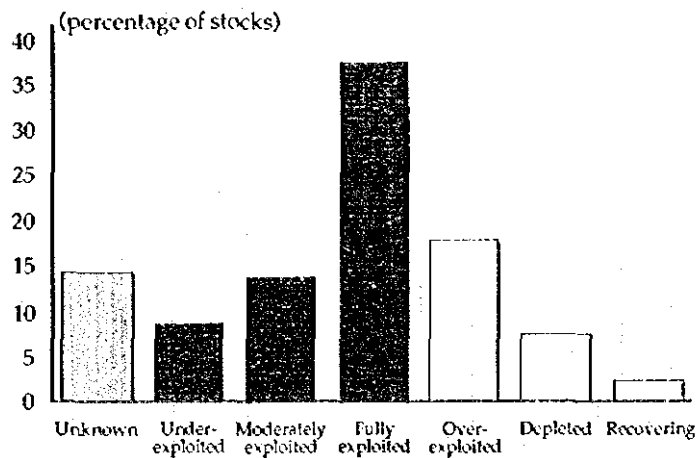
**Figure 10 World fish catch per person, 1960-94**



Source: Brown, Lenssen, and Kane (1995) based on FAO data.

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Figure 11 Status of the world's 200 main fish stocks



Source: Williams (1995) based on FAO data.

During the last year or so, we have seen rapid increases in cereal prices as I briefly mentioned earlier. Wheat prices adjusted for seasonal fluctuations have increased dramatically since the beginning of 1995. Falling futures prices provide some indication that the current high wheat prices are unlikely to reflect the new long-term trend. Maize prices show a similar pattern, although these prices are likely to continue to increase until the middle of this year and possibly beyond.

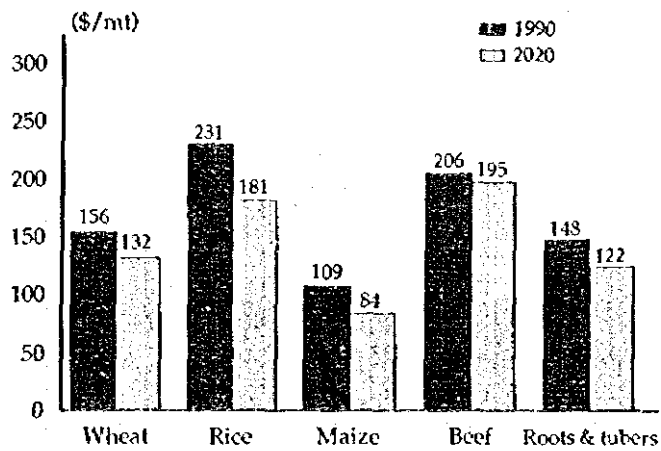
Notwithstanding these short-term price increases, we believe that the long-term trends for real food prices will continue to fall (Figure 12). As shown in this slide, we believe that prices for wheat, rice, maize, beef, and roots and tubers will fall significantly in real terms between now and the year 2020. This is a controversial issue and I'm sure we can have fruitful discussion on this later on today.

There is a school of thought that believes that the recent food price increase is the beginning of a new trend, a trend of increasing real food prices. As for another, old school of thought to which we belong, that's probably not going to be the case. The expert on the projections underlying the trends that I just showed you is with us, Mark Rosegrant, who will speak later this afternoon. If you think real food prices are going to go up year after year between now and 2020, tell him and make him defend his projection. But I'm not trying to get out of it. I think he's right.

What is true is that the world grain stocks have decreased markedly during the last 10 years (Figure 13). Both FAO and the U.S. Department of Agriculture project that by the middle of this year grain stocks will be down to about 13 to 14 percent of annual grain consumption. This share is lower than it was during the world food crisis 20 some years ago.

2. KEYNOTE SPEECH

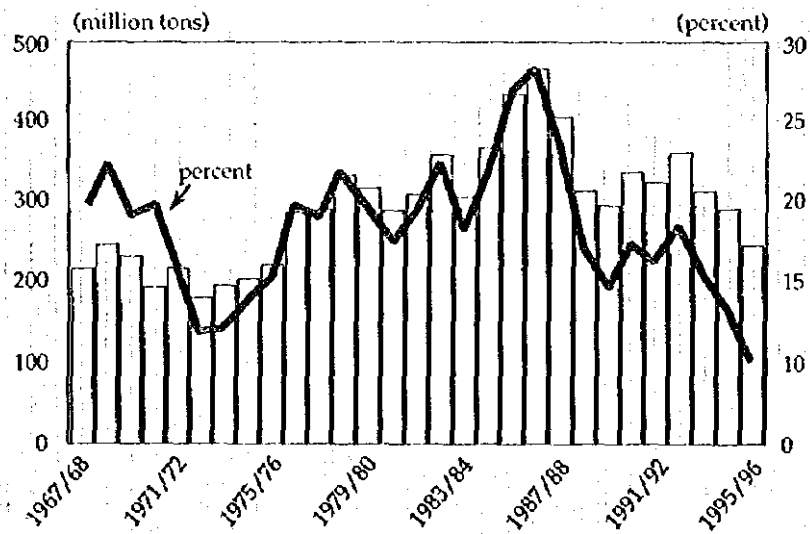
Figure 12 Projected world prices (In 1990 dollars)



Source: Rosegrant, Agcaoili-Sombilla, and Perez (1995)

Note: Beef prices are \$/100 kilograms.

Figure 13 Global grain stocks: Level and percent of consumption, 1967/68-1995/96



Source: USDA (1995a).

It is considerably below what FAO considers a critical minimum. And of course, there is a close interaction between the low stock level and the higher prices. One of the reasons for the falling stocks has to do with changes in the European Common Agricultural Policy and the GATT agreement, and it is likely that as world trade becomes more liberalized as we continue moving down the path initiated by the changes in Europe and the GATT agreement, it is likely that we will have to get used to lower levels of grain stock and higher degrees, higher fluctuations in grain prices because we can't get rid of bad weather and we probably



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can't get rid of bad policies either, although we may be able to get rid of some of them. So we will have changes in supply and demand, which if you have very little buffer stock, will result in fluctuations in prices. So we'll probably have to get used to a higher degree of price fluctuation in the future. It is not clear, however, that these lower stock levels will result in a higher level of price. There is no indication to support that so it will be increasing fluctuations but falling real prices in our humble opinion.

Let me talk a little bit about what we've done in the area of natural resource management or the environment if you like. We've had a great deal of interaction with soil scientists and others on the topic of land degradation and what we have found is that the information about the global magnitude of land degradation is extremely weak. We can almost pick a number and it's hard to argue that that number isn't as good as the other one we could have picked. It's not quite that bad. But the fact is that we really do not know how much land is degraded worldwide, neither do we know the productivity effect of that degradation. That does not mean that we don't think we have land degradation. We know there are lots of land degradation in particular locations. In the materials that have been distributed, we refer to those as "hot spots." There are areas where we know that land degradation is causing a great deal of productivity loss both now and for the future, so there is no excuse not to change our behavior with regard to land use even though we don't know what the global magnitude of the problem is. So the problem is not whether we have land degradation, rather it is a matter of the extent to which it occurs globally.

One of the findings from this work illustrates the tremendous importance of adding more plant nutrients to the soils in Sub-Saharan Africa and some other countries as well. Farmers are removing more nutrients than are being put back in the soil. That's not sustainable. That's misuse of natural resources. And one of the recommendations coming out of this work is that we must help the African farmers get access to more plant nutrients, whether it is through organic materials available locally or whether it is through chemical fertilizer brought in from the outside. It is the case, ladies and gentlemen, that for most of those areas, the environmental problem is too little fertilizers rather than too much. Now we must be careful we don't confuse the problems that we have in our countries with the problems that we find in the low-income developing countries. In my country, we're probably using too much fertilizer for the good of the environment. But to argue that the African farmers should use less fertilizer to protect the environment is to misunderstand the whole issue. Why am I making such a big deal out of this is because we hear time and time again that if developing countries would use less chemical input, the environment would benefit. That is not what we find in the case of fertilizers in Sub-Saharan Africa.

Another natural resource management issue has to do with water. Our research indicates that the most critical water issue is low efficiency of water use and related inappropriate allocation of water. We urgently need research and other actions to improve water efficiency and to treat water as the scarce resource that it is. It is not a free good contrary to what many farmers would like to believe and again, my colleague, Mark Rosegrant, will talk more about that later this afternoon.

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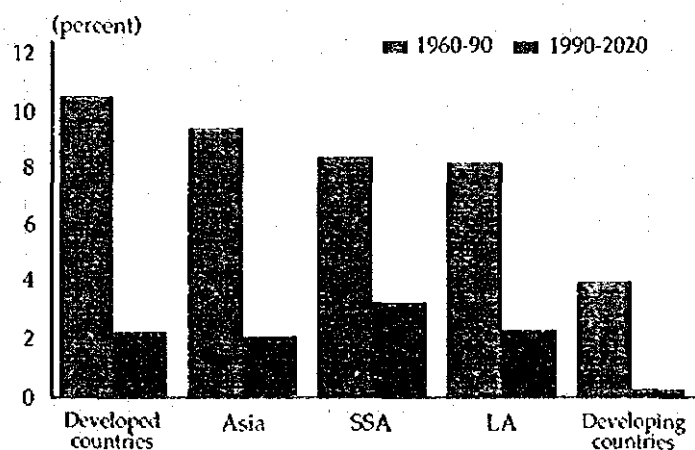
We have together with the International Fertilizer Development Center tried to project the future growth in fertilizer use. As you can see from this slide (Figure 14), growth rates are expected to be much lower during the next 25 years than they were during the last 30 years. The very low growth rate in fertilizer use for Sub-Saharan Africa as you see in this slide is alarming because it is grossly insufficient to deal with the soil nutrient problems that I just mentioned and it is grossly insufficient to support the needed production increases in that region. This is true even if better use is made of the organic materials available to African farmers.

We don't have projections for future growth in the use of chemical pesticides, but it is clear from our consultations and research that much more needs to be done to develop alternative crop production methods, including integrated pest management that will use significantly less chemical pesticides. We must gradually find ways of replacing most of the chemical pesticides, but until we have found such ways, we must give farmers access to the pesticides that they need to protect their crops.

Much of the increases, in fact, most of the increases in food production will have to come from yield increases. Some of the yield increases will occur as more inputs such as fertilizers are used and as production methods are improved. However, accelerated investment in agricultural research is essential to achieve the productivity increases that will be needed. And when we say that we think real food prices will continue to fall, we are making certain assumptions about the investments in agricultural research and related issues which again we can discuss later this afternoon.

Low-income developing countries invest less than 0.5 percent of the value of their agricultural production in agricultural research. This compares to a little less than 2 percent for middle-income developing countries and more than 2 percent for high-income countries. We propose that all developing countries should spend

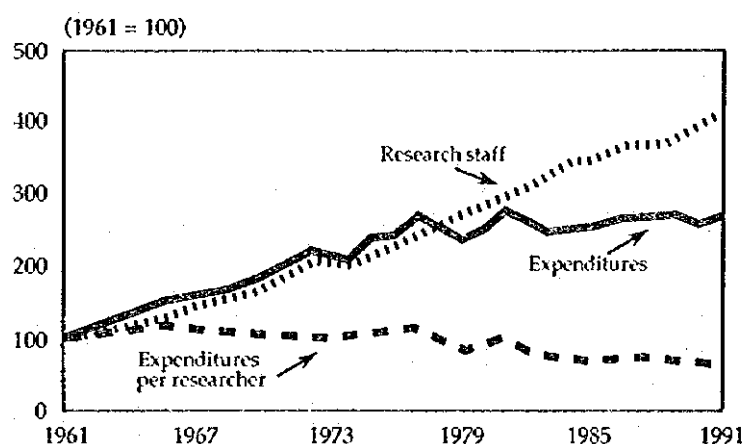
**Figure 14 Annual growth in fertilizer use  
1960-90 and 1990-2020**



Source: Bumb and Baanante (1995).

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**Figure 15 Research staff and expenditures, 1961-91:  
19-country African sample**



Source: Pardey, Roseboom, and Beintema (1995).

at least 1 percent of the value of their agricultural production in agricultural research, and they should pursue a goal of 2 percent within the next 5 to 10 years. We believe such an expanded investment in agricultural research is critical to achieve the 2020 Vision or the underlying goals.

The situation regarding investment in agricultural research is particularly bad in Sub-Saharan Africa where the annual growth rate in agricultural research expenditures decreased from about 6.8 percent during the 1960's to essentially no increase during the 1980's (Figure 15). And preliminary indications for the early 1990's indicate that they are in fact falling. Past investments in training of researchers caused the number of researchers to continue to increase. Therefore, since expenditures don't increase and the number of researchers does, agricultural expenditures per researcher have decreased significantly. To put it more bluntly, Africa has a large number of agricultural researchers who have no money to do research with. They have now been trained and they are now sitting in institutions that have very little money for them to do their research. In fact in many cases, there are no jobs for Ph. D.'s trained in agricultural sciences from Africa and some of them are driving taxis in Washington D.C., a terrific waste of resources.

It is of critical importance that agricultural research results in reduced unit-cost of production. Such cost reductions will make food economically accessible to low-income consumers, and permit low-income producers to increase their incomes. Now you will say yes but you cannot reduce the cost of production. Let me remind you that the "green revolution" caused a reduction in the production of rice and wheat per ton of production by 30 percent. Farmers could produce rice and wheat at a cost that was 30 percent lower than before. Most poor consumers spend 50 to 70 percent of their incomes on food. A 30 percent reduction in the price means an awful lot to them.

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Let me now Mr. Chairman move to the six areas for action that we from IFPRI are recommending. But let me preface this by saying that the appropriate strategy needed in a particular country has to be developed by that country, not by IFPRI and not by anybody else outside the country but by the country itself. What we can do is to assist the country in doing that. What I'm going to show you is the Six Point Action Program that we hope will serve as point of departure for deliberation at the national level, not replace the need for deliberation at the national level. The action program cannot be transferred from one country to the next. We cannot develop a generic action program that will be the best possible for all countries. So we have identified these six areas of actions which can serve as a point of departure. We have also worked with regional groups in Africa, Asia, and Latin America to develop strategies for each of the regions. Now let me quickly run through the Six Point Action Program.

First, we must selectively strengthen the capacity of the developing country governments to perform appropriate functions such as establishing property rights and promoting private sector competition in agricultural markets. We must also help governments get out of those functions where they don't belong such as trading agricultural inputs and outputs. The efforts of the past 10 years to weaken the governments of developing country must be turned around. We must be much more selective in assisting governments becoming strong in some areas and getting out of other areas instead of simply weakening the government across the board. A weak government is almost certain to result in little or no economic development and a number of other undesirable things. And if we think about those countries where we know there is a weak government, chances are that we will confirm that suspicion.

Second area for action, we must invest more in poor people. For a large share of the world's population to be malnourished, illiterate, sick, and without resources is not only unethical but it is economically wasteful. It's bad business. We must assure primary education, primary health care, clean water and sanitation for all people. We must help empower women. We must help improve access to productive resources and to expand employment. In other words, we must help countries invest in their poor people.

Third, we must accelerate agricultural productivity. This implies first and foremost an expansion of national and international agricultural research focused on developing countries. As I mentioned earlier, developing countries must increase their national agricultural research expenditures in the near term to 1 percent and in a somewhat longer run to 2 percent. National agricultural research must be supported by a vibrant international agricultural research system such as that managed by the CGAIR that undertakes research with large international benefits that economists call international public goods. These benefits or these public goods include research results that are applicable across country boundaries. Current investment in international agricultural research is grossly inadequate to provide the support needed by developing countries and they must be increased if the 2020 Vision is to be achieved. It is critical that modern science including that based on molecular biology be brought to bear on the agricultural problems

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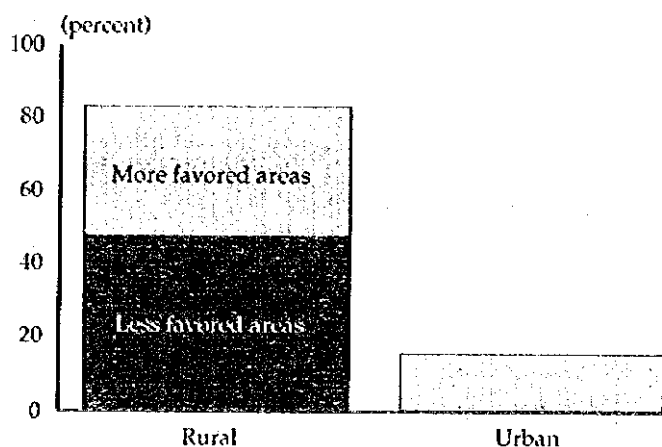
of developing countries. The tools and the techniques of molecular biology based research are currently being developed primarily in OECD countries and focus primarily on problems existing in OECD countries. There is very little biotechnology research or genetic engineering research aimed at developing countries' agricultural problems such as creating drought-tolerant maize varieties for West Africa, such as generating crop varieties that have a higher content of vitamin A. How about nitrogen fixation in grasses and grains? Is it a dream? Maybe. But modern science offers tremendous opportunities for dealing with the problems of developing countries' agriculture. And that modern science, to a very large extent, is being kept away from those problems not because anybody is malicious, but because most of these works are being done by the private sector, which focuses on those markets where it can make money. And there is nothing wrong with that. That's the way the system works. What we need is to have a more public sector investment in modern science to focus specifically on developing country agricultural problems. This is not something we've been dreaming of at IFPRI. We have had a great deal of consultation both with private sector, public sector, and with the NGOs and that's our conclusion.

The fourth area, we must assure agricultural sustainability and sound management of natural resources. I have already touched on some of those issues. We need to improve water allocation and water allocation efficiency. We must reverse land degradation where it has occurred. We must reduce the use of chemical pesticides, and we must rehabilitate and protect marine fisheries. Another controversial issue has to do with the relative investment in less-favored versus more-favored agricultural areas. It is our conclusion that investments in less-favored geographical areas, that is, areas with agricultural potential, but irregular rainfall patterns, fragile soils, and many poor people, must be expanded. Most poor people in developing countries reside in rural areas, and most rural poor people reside in less-favored areas. As you can see from this slide (Figure 16). That's the red bar. The 80 percent you find in rural areas. And about half of them or so you find in less-favored areas. The bar to the left has to do with rural, the bar to the right has to do with urban. Yet in spite of this situation, most of the investment in infrastructure, primary health care, and agricultural research directed at rural areas is spent in the more-favored or more favorable areas. The balance has to change. If we are serious about the goals of protecting natural resources and alleviating poverty, if those are the goals that drive our action, then we must invest much more in the less-favored areas than we've done in the past.

The fifth area, it is important to reduce the marketing costs of food. The cost of bringing food from the producer to the consumer is extremely high in low-income developing countries (Figure 17). This slide, although the numbers are getting a bit old, is still illustrative of what's happening in low-income African countries as compared to higher income Asian countries. Look at the tremendous difference in the cost of bringing food from the producers to the consumers. And keep in mind that most of these costs are transportation and storage. There is very little processing undertaken as part of these large bars to the left. And obviously it has to do with inappropriate infrastructure, very small markets, and a number of other things in which we have to help developing countries so that we can save the marketing costs in those countries.

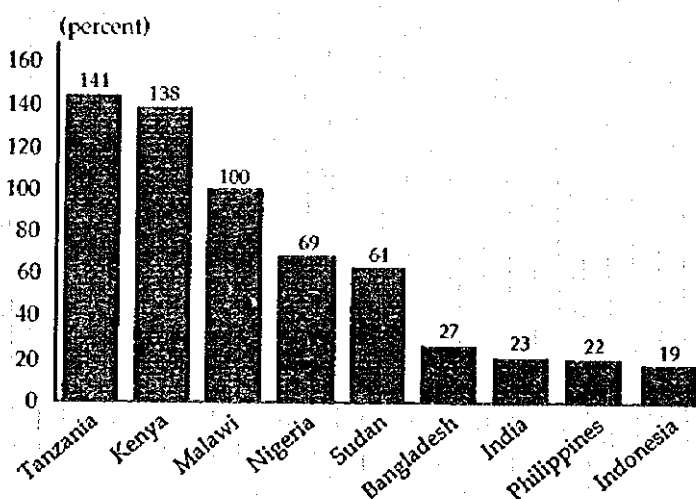
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Figure 16 Distribution of poor people in the developing world, mid-1980s



Source: Leonard (1989).

Figure 17 Marketing costs as percent of producer prices, late 1970s



Source: Ahmed and Rustagi (1987).

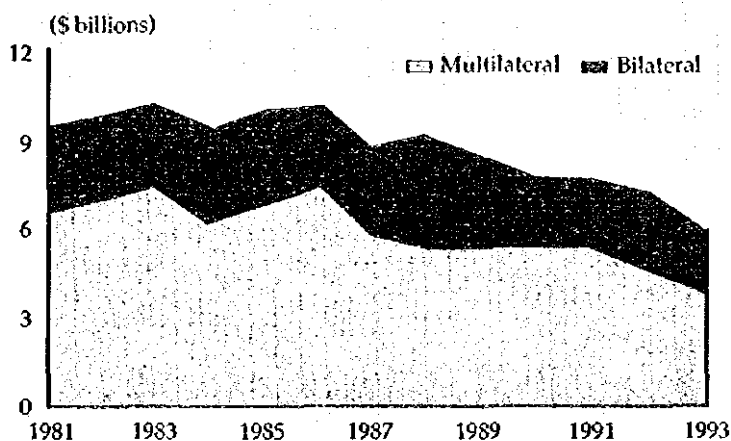
The sixth and last area for action, we are proposing that international development assistance be expanded and reoriented. This point is particularly valid for the host country of IFPRI, the United States, which now occupies the last place among OECD countries in terms of the proportion of gross national product spent on foreign assistance which I believe is now down to about 0.12 percent of the gross national product. Yet, the industrialized countries I believe got together many years ago within the UN and agreed that 0.7 percent of the gross national product was not a bad amount to give for foreign assistance. There are a few countries that give 0.7 percent but most do not. In fact, on the average within the OECD, foreign assistance accounts for 0.3 percent of the country's gross national product. That's less than half of what some of us thought we had agreed to. But not only must those countries that are lagging behind increase foreign assistance, and it

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doesn't look like it's going to happen in Washington tomorrow or the next day, but we have to keep talking about it, but not only must we increase foreign assistance, we must also reorient it, we must realign it so that it flows to the lowest income developing countries because the middle-income countries now have access to a very large international capital market whereas the lower income countries do not. It is a particular concern in this regard that the replenishment of IDA, the South window of the world bank, is suffering so greatly in the present negotiations because as we all know, the IDA money goes particularly to low-income developing countries.

Another important trend in foreign assistance that must be reversed has to do with international assistance to agriculture. This is an area where Japan has shown tremendous leadership. Japan is one of the only, one of the few countries, in fact it is the only major donor possibly with the exception of the European union, that has maintained a very strong focus on agriculture in its foreign assistance. Please hold on to that focus for a number of years, we are not quite there. We can't afford to ignore agriculture in low-income developing countries because if we do, we will see much more degradation in natural resources, we will see more poverty, and we will see stagnant economies. I'm talking about low-income developing countries. I'm not talking about Singapore, Taiwan, and South Korea. So Japan's leadership is extremely important in this area. When I want to annoy my American colleagues, I go to them, show them the figures, and ask them why is it that they're not following Japan's lead in this regard as the Americans in the World Bank are cutting back on assistance to agriculture. Whatever the reason may be, the World Bank is now revising its situation and it looks like the World Bank is going to put much more emphasis on agricultural and rural development for the future. There is currently a debate going on inside the bank but it looks like there's going to be much more emphasis on agricultural and rural development. Whether that might also happen at USAID depends on whether USAID comes out of these budget cutting measures in such a way that they have much to give away anymore.

Figure 18 Commitments of external assistance to agriculture  
(in 1985 dollars)



Source: FAO (1995).

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In conclusion Mr. Chairman, if I can have (Figure 18), this I forgot to call for, this shows the falling assistance to agriculture, the falling proportion of total foreign assistance going to agriculture both from multilateral and bilateral institutions. Let me conclude Mr. Chairman by saying that if the global community does not get its act together soon, we are going to see hunger and malnutrition and related illnesses and human misery. We will see natural resources be further degraded and we will experience increased conflicts over scarce resources such as water. For most of humanity, the world won't be a very happy place to live. It isn't them or us. We are in this together and we will all suffer. But it doesn't have to be this way. With foresight and decisive action, we can create a better world for all of us. We have the knowledge, we have the skills, and we have the necessary resources including natural resources. We have the capacity to feed 8 billion people by the year 2020 without destroying natural resources. My suggestion is that we act now and we act together to make this happen. Thank you Mr. Chairman.



### 3. PANEL DISCUSSION

## 3. Panel Discussion

**Moderator:** Ladies and gentlemen, time has come to resume. This is going to be our main part of the symposium, the panel discussion. First of all, I would like to introduce to you to the panelists. From your left on the podium, we have as panel discussion Chairman, Professor at the Department of Agricultural Economics at the Faculty of Agriculture of Tokyo University, Professor Egaitsu. Professor Egaitsu has a doctor degree in agricultural economics from the Tokyo University and some overseas universities such as Thammasat University and Oxford University to which he has been appointed as a research fellow and he is also serving as a committee member on various governmental councils.

Next, I will introduce to you to the panelists. From the left side of the Chairman, we have Mr. Nygaard, the Director of Country Programs of IFPRI. Mr. Nygaard has been with the Ford Foundations, stationed in Cairo, Egypt, and has knowledge in Middle East and North Africa. He also served as the Vice President of the Agricultural Development Institute. In 1994, he joined IFPRI and has served as the Director of the Country Programs and has been instrumental in defining the 2020 Vision.

Next to him is Professor Katsumata of the Faculty of International Studies at Meiji Gakuin University. Mr. Katsumata is a graduate of Waseda University and he has been with the University of Paris where he researched in the area of development economics. He has also worked at Dakhar University, London University, Montreal University, the French Social Research Institute and other prominent institutes around the world. He is also a member of the JICA's Study Committee on Development Assistance for Senegal.

The third person is Mr. Mark Rosegrant, Research Fellow at IFPRI. Mr. Rosegrant participated in the USAID funded Integrated Agricultural Production and Marketing Project in the Philippines, and has been participating as an economist in various research activities and he has also been instrumental in providing his wisdom to various international agricultural research activities. He has joined IFPRI in 1980 and is very knowledgeable on various areas of agricultural research in the developing economies.

Next to him is Mr. Ono who is the Managing Director of the Agriculture, Forestry and Fisheries Development Study Department of JICA. He has been with OTCA, the predecessor organization of JICA and he has served overseas in the past as the resident representative in Nepal. As of April last year, he took present post. This concludes my brief introduction of the panelists and we have a Q & A session set aside for the participants after the presentations of the panelists have been completed. We hope that you will join in this Q & A session actively. I'd like to give the microphone to our Chairman, Professor Egaitsu.

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Egaitso: Well then, we would like to go into the panel discussion session. We have 3 sub-themes to which we should address ourselves. The first sub-theme is on food security. The second sub-theme is on the sound and sustainable management of resources. And the third sub-theme is the joint promotion of agricultural research and extension. These are areas which were covered in the key note speech of Dr. Pinstруп-Andersen. 30 minutes are allotted to each of the topics. First of all, we will have two presentations from our presenters on each of the themes and after that, we would like to have comments from the panelists and discussions as well. The same procedure will follow for the three sub-themes. After that, there will be a brief wrap up and then we would like to open the session to the floor for Q & A.

Now I would like to first go into the discussion of sub-theme 1 which is food security. I would like to start off with the food security issue and to call upon the first presentation by Dr. Nygaard. Dr. Nygaard please.

Dr. Nygaard: Thank you very much Mr. Chairman. Good afternoon, ladies and gentlemen. Let me add to Per's comment that how delighted IFPRI is to be here and I'm also personally pleased to be a part of the IFPRI team. Several of you have asked me about the title "2020 Vision for food, agriculture and environment" and I thought it may be worth just adding an explanation because in English, it has a double meaning. Obviously the straight meaning is looking forward over the next 25 years to the year 2020 but as a play on words in English, 2020 Vision means perfect eyesight. When you go to the doctor and the doctor gives you eyeglasses, he is bringing your vision up to 2020 vision. So part of this effort is for IFPRI to add clarity as we look toward the future. We don't anticipate that it'll be perfect vision but we hope that it is certainly better than what it would have been without our effort.

As part of the 2020 Vision, we have commissioned some 40 different research reports on the various topics that we thought would be important and critical in determining the ability of the world to meet the challenges that Dr. Pinstруп-Andersen has just described to you. Many of these reports have been produced by IFPRI staff, several have been produced in collaboration with researchers from other institutions and a few have been conducted solely by researchers outside of IFPRI. We have made available for you some of the documentation of 2020 Vision. I would like to let you know that there are two more important sources for which we did not bring sufficient numbers of copies along with us but we would be happy to put you on our mailing list and make these available. The first is the 2020 Vision discussion paper series and today, we have some 10 of these publications. We have another 15 in the pipeline and we expect this vision series to include some 50 topics when we are finished.

The task that I have in the very few minutes that are available for me today is to give you some sense of the nature of this research and unfortunately, it's far too broad for me to do more than just touch on

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a few topics. My presentation will present some of the findings of our global food model and look at the implications that relate to human nutrition in developing countries with the particular focus on Africa. And in a moment, you'll see why we have chosen Africa.

This research was led by Mark Rosegrant and some of his colleagues. The beginning of the first part of my presentation will draw heavily from his reports. In addition, I will also if I have time, draw from other research on production, population, and land degradation. Again it relates to Africa.

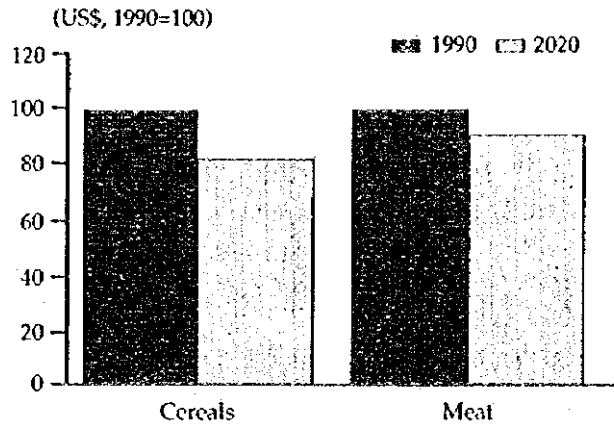
Perhaps the most interesting finding of the global analysis is the paradox posed by the emerging world food situation. The global model which projects to the year 2020 shows that the world will continue to have two different and contrasting situations. On the one hand, wealthy countries together with a number of rapidly developing third world countries will enjoy low food prices and food surpluses or they will be able to afford imports. On the other hand, poor, slow growing countries will, if present conditions and policies continue, make little progress on improving food security or reducing malnutrition in their countries. Fortunately, these projections also indicate there is a potential for significant improvement in food security in most developing nations, if the national and the international institutions increase their efforts on behalf of broad-based agricultural development in economic growth.

Just a word on IEPRI's model. IEPRI's world food model projects the production and prices of crops and livestock at the country level, the regional level, and the global level. It projects food supply and demand balances in imports or exports. It projects per capita consumption of food in calories and finally, it projects the number of malnourished children in the world. Models are simple tools that aid us in our understanding of a particular problem and this model is a useful tool we think because it provides us with a consistent framework to test the effect of different policies, different questions, different rates of crop growth, different incomes and population growth rates, and in the long term, food balances and food security throughout the world. The model covers 35 countries and regions. It accounts for virtually all world food production and consumption. It includes 17 commodities and this includes all cereals, roots and tubers, meats, and dairy products.

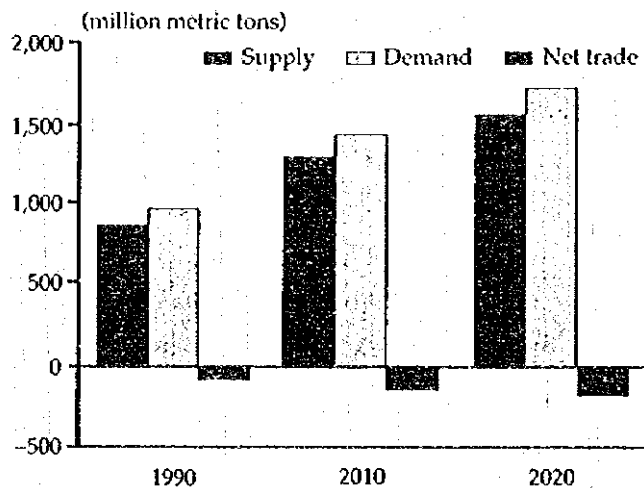
Let's look at a few of the results (Figure 19). The base line scenario incorporates our best assessment of the future growth in income and population and in productivity growth for crops and livestock. As you can see from the first transparency, the aggregate global food supply and demand picture is relatively good. Production growth will be sufficient to keep world food prices on a downward trend. The projected decline in real world prices of meat and cereal shown here are the real world prices with 1990 values equal to 100. As you can see, cereal prices are projected to drop by nearly 20% in the year 2020 and meat prices by about 10%. The decline in prices is accompanied by increasing

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**Figure 19 Projected real world prices for cereals and meat**



**Figure 20 Cereal supply, demand, and net trade, developing countries: Baseline scenario (1990, 2010, and 2020)**



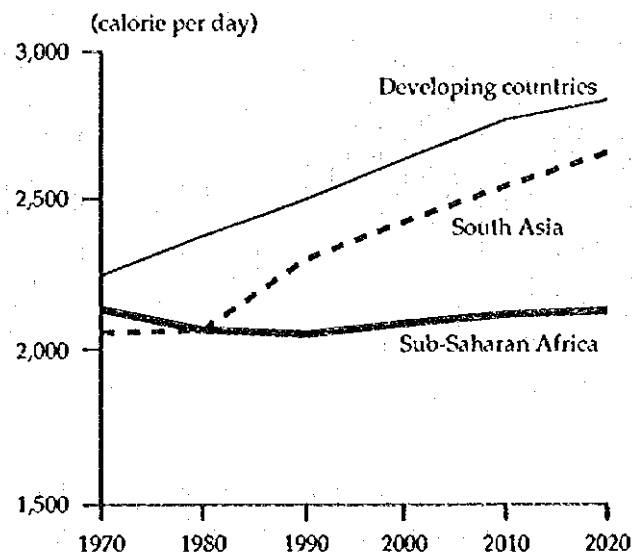
world trade in food with the developing world as a group increasing its food imports from the developed world. This can be seen in the next transparency which shows cereal supply, demand, and trade in developing countries (Figure 20). The net cereal imports of developing countries will double by the year 2020. Look at the bar on the right which is below zero. If you will recall from the previous slide showed by Dr. Pinstrip-Andersen in his presentation, this is divided up amongst different commodities, and remember from his slide how important cereal wheat was in the world trade in regard to rice, for example, which is hardly traded at all. These increasing trade flows are positive if they simply mean that rapidly growing economies are producing food when viable and importing food when it is cheaper. Indeed, this situation is true in East and Southeast Asia. However, increased imports spell trouble elsewhere, for example, in Sub-Saharan Africa, in a region where cereal imports are expected to triple

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over the next 25 years. What is worse is that Sub-Saharan Africa will not be able to pay for the growing imports needed. The international community will therefore need to devise appropriate combinations of financing in food aid to bridge the gaps in Sub-Saharan Africa for the foreseeable future.

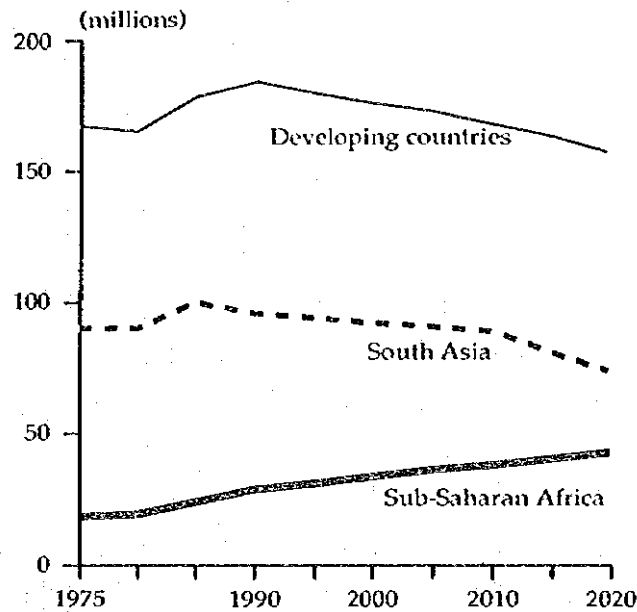
Let's go on to the next point. Despite the overall ability of the productive capacity to meet the effective demand for food, there will be little improvement in food security in many poor regions, particularly in South Asia and Sub-Saharan Africa. This transparency (Figure 21) shows the average per capita calorie availability. The results show that there is virtually no improvement in this measure for Sub-Saharan Africa. More progress can be seen for South Asia where income growth is slightly greater than population growth, but even here, there is no real gap, real closing of the gap between South Asia and the rest of the world. These trends in calorie availability imply a bleak projected future for food security in nutrition. Let's look at the next slide (Figure 22). This is driven home in this transparency, which shows the number of children under 5 years of age who are malnourished in the recent past and will be in the future. South Asia is home to more than one-half of the world's malnourished children. As you can see, there is slow improvement over time in South Asia mainly due to the gradual decline in the growth of population of young children. In Sub-Saharan Africa, however, the picture is worse. There is an increase of 14 million in the number of malnourished children projected by the year 2020. Even with relatively abundant food in the world, there is not enough growth and effective per capita demand for food in Sub-Saharan Africa to improve the food security situation there. The advantage of these models is that we can try different scenarios on them, and I would like to return to the scenarios that Dr. Pinstrup-Andersen mentioned earlier and look at them from a couple of different ways.

Figure 21 Per capita calorie availability



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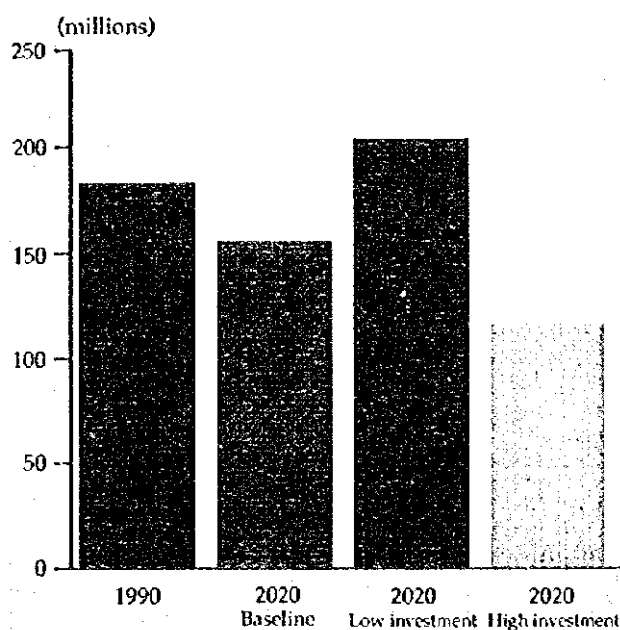
Figure 22 Number of malnourished children (0-5 years old)



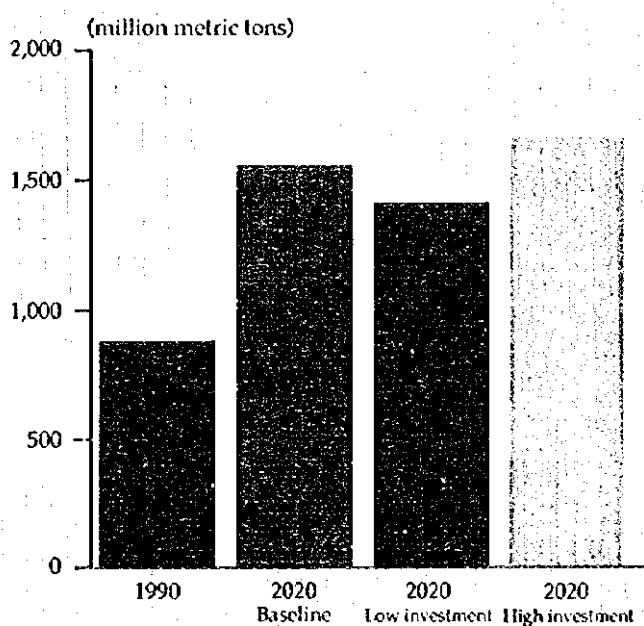
Let's consider two scenarios. The first we will call the "low investment, low growth scenario." It includes primarily three things: a 25% reduction in non-agricultural income growth. A reduction in the growth in crop productivity due to the elimination of agricultural research and that reduction in the investment in health, education, and sanitation leading to a worsening of projected indicators of female education, access to clean water, and social expenditures, and these reductions are at the level of about 20%. So we have the red bar illustrating where we are or where we were in 1990. The yellow bar is the baseline we have been talking about until now. The blue bar is a low investment scenario. We want to contrast this with the purple bar, the bar on the right, which is the high investment scenario. This is the flip side of the coin, the opposite side of the low investment scenario. It assumes a 25% increase in non-agricultural income growth. It assumes an increase in the investment in agricultural research, and it assumes an improvement in the indicators of female education, access to clean water, and social expenditures of about 20% by the year 2020. The next transparency (Figure 23) shows the impact of the alternative scenarios on cereal production. This transparency shows the impact of the alternative scenarios on cereal production in the developing world. You can see the highly negative effects of reduced public investment on food production, cereal dropping 10%. The hardest hit are staples, wheat, and rice, which suffer the biggest declines in productivity because of the big reductions in public investment and research. The high investment scenario on the other hand, shows that cereal production in the developing world would be 100 million tons higher mostly as a result of increased investment in agricultural research. How do these changes in population, production, income, and prices affect malnutrition? Compare the low investment scenario with the baseline: low investment and slower growth as 47 million children add to the ranks of the

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**Figure 23 Number of malnourished children (0–5 years old) in developing countries, 1990 and 2020**



**Figure 24 Cereal production in developing countries various scenarios, 1990 and 2020**



malnourished compared to the baseline in 2020 leading to an actual increase from 1990 levels (Figure 24). The increase is concentrated in South Asia and Sub-Saharan Africa where the prevalence of malnutrition is already high. On a more encouraging note, this transparency also shows that a sharp reduction in the number of malnourished in the developing world is possible if we go to the high investment scenario. In this case, look at the purple bar, the number of malnourished is reduced from

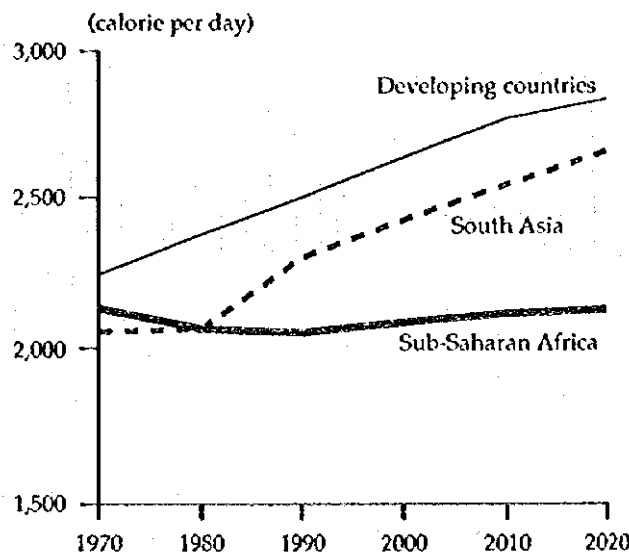
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184 million in 1990 to 117 million in the year 2020, a substantial reduction. Remember that this progress requires three forces to be at work: increased income growth to generate the demand for food, expanded investment in agricultural research, and higher expenditures on health, education, and nutrition. Such efforts will require increased national and also increased international commitment to agricultural development. This increased commitment on the part of the international community may not be as painful as you've heard in the international news in the past few months.

I would like to make more point, which shows the impact on food exports from developed countries as a result of technical assistance to third world agriculture. If we compare the value of food exports for developed countries under the baseline in low investment, it can be seen that the value of exports from developed countries drops very little under the low investment case. However, the high investment scenario results in an increase in the value of exports from the developed countries of \$6 billion relative to the base case and one billion relative to the low investment case. Clearly, increased agricultural investment in third world agriculture and improved growth in developing countries would benefit the agricultural exports from the developed countries.

Now let me quickly turn to Africa as a case in point. There are a number of reasons including the historical data from 1961 to 1990 that show how far Sub-Saharan Africa lags behind the rest of the world in just one measure, agricultural productivity growth for cereals. I could show you a number of slides if I had time in other kinds of productive activities in which Africa is indeed behind the curve. The impact of this (Figure 25), looking at calorie availability or cereal availability per person on a per capita basis given high growth rates in Africa show that you have a problem that is getting progressively worse. As part of the 2020 Vision, we held a number of regional meetings including

Figure 25 Per capita calorie availability





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one meeting of 25 African experts in Senegal in early 1995. They recognized this problem, and while their results were consistent with the kinds of things that IFPRI has been talking about, I would just like to very quickly show you the 6 recommendations that came out of that workshop that will get at some of these issues. They would like to recommend one, that we promote lower growth rates of population. As you know, Sub-Saharan Africa has the highest growth rates in the world. They are decreasing but they are not decreasing fast enough. Africans themselves have come up with this recommendation. Their second recommendation is to stop the process of world degradation, world environmental degradation. If we have time, I will come back and talk about a number of land degradation hot spots as well as some bright spots in Sub-Saharan Africa that address this issue, but this is their recommendation. Recommendation number three, achieve a 4% rate of agricultural growth. As you saw from the slide, there has been almost a flat trend over the past 20 or 25 years. They need to get it up to 4%. Our projections in 2020 Vision are that growth rates in crops are no more than 3% so there is a gap there that has to be dealt with, but these are the kinds of goals that they have set for themselves and feel that they must achieve. Number four, eliminate chronic malnutrition of children. They've looked at our studies and they've done studies on their own. This is a clear recommendation they would like to tackle. That is to reduce the number of absolute poor by half. There are a number of other things that one can get at. I would like to close my presentation and perhaps come back to some of these issues during the discussion.

To talk just about one issue on the demand side, that's the impact of AIDS, the deadly virus that is most prominent in Africa. The AIDS epidemic in Sub-Saharan Africa may in a rather perverse sort of way seem to be a way to relieve population pressure. The argument is that a fall in population growth rates can be seen as a way of removing some pressure to achieve high levels of economic growth just to maintain the welfare status. Therefore, according to this argument, AIDS is a tragedy. It's not a Malthusian type solution that will result in improvements in the ability of the world to feed itself. One of the 2020 Vision discussion papers, however, points out that the impact on the population of AIDS, even as deadly a virus as it is, it is going to be relatively small even in the countries in Africa where the incidence is highest. On the other hand, they have found that AIDS will much more heavily affect the output of agricultural productivity, particularly the labor productivity of Africans who have been smitten by this disease. So rather than being a way of increasing the food supply, it may very well have the opposite effect and be a great dampener of domestic production in these countries.

Mr. Chairman, there are a number of issues in respect to land degradation that I would like to touch on and will do so in the discussion session if I have time.

**Moderator:** Thank you very much Dr. Nygaard. Now I would like to call upon Professor Katsumata.

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**Katusmata:** I have only 10 minutes so I don't know how much I can present out of what I want to say.

However, first of all, I would like to say that I listened to the keynote speech by Dr. Andersen as something very encouraging and I do agree with most of the things he said today. He presented the 2020 Vision and what I thought first about this was that last year, there was a summit for social development, and in the charter adopted at that time, it also described 2020, in other words, 20% of the national budget should be used for social expenditure and 20% of development assistance expenditure provided by the developed countries should be directed to the alleviation of poverty and for the assistance of social development in developing countries. So with this in mind, I'd like to briefly touch upon three things.

First of all, when I think about food security, I wonder if we should treat food as just absolute goods or commodities, something which can be compared with one of the strategic commodities like oil. There are two major differences between foods and oil for instance. One is the fact that human beings have been living for many, many years without having access to oil but without food, people cannot live. When we say human beings, we are talking about all of us. We first have to realize the fact that everybody must have food to live. So food is a commodity and at the same time, we should regard it as an absolute good, in other words, without it, we cannot live. The second thing we have to keep in mind is that oil can be found in different parts of the world but is concentrated in some areas of the world. But food is obtained by different people in different parts of the world in accordance with their needs and local conditions so food is something we can call a "locally specific good". So we have to, I believe, keep these two facts in mind in trying to address the question of food security. Now in the Sub-Saharan African countries, it has been pointed out that food security is in a very poor condition. I do not have any figures or statistics with me. I have never calculated anything of that nature so I don't know but I can imagine and I can agree with the point that this food security condition is going to worsen in that part of the world. I met with a person from Western Africa, and he asked when our efforts in the post-independence period would end. In other words, their situation after independence, as far as food security is concerned, has not been very good. In other words, farmers were not taking advantage of the nation's independence.

Secondly, I believe that we have to think about food security in the broader context of the concept of human security. Over the last 50 years or so, we have seen the lack of food, acute shortages of food in African countries mainly due to drought and social unrest. Dr. Andersen said that we need to work on the improvement of seeds or crop varieties. It is true, but at the same time as you all know in many parts of Africa, we are seeing a number of possible seeds for social conflicts and this is due to the social and political conditions in that part of the world. There are about 17 PKO activities being carried out throughout the world and out of them, 6 or 7 activities are being carried out in Africa. So again, I would like to say that this food security issue should be considered as a very important part

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of the concept of human security.

Secondly, we also have to think about the local specificity of food. African people have a very wide variety of food consumption. Different foods are consumed and in order to increase the food security, I believe we need to think about the so-called "livelihood." Not all farmers are producing single or a few kinds of crops. They produce different types of crops. People may be engaged in fishing and hunting which are not considered to be a part of money or the cash economy. In West African countries for instance, many of the people go far away from home to work as migrant workers. So I believe people in any region should be able to have access to different kinds of means to support their lives. I like to call this "livelihood security."

Thirdly, I would like to talk about regional cooperation. Countries in a certain region must cooperate with each other to secure the food security of all these countries in the region in question. Sometimes foods go over the national boundaries in the form of the so-called "black market" trade in Southern Africa region, which has \$125 million of population, and food grains are produced and exported to other countries from certain countries like Zimbabwe and the South African Republic. I have been wondering if a proper market for such food items can be created at the regional level. In the future, if African countries are to acquire the ability to purchase food from other parts of the world, of course, their economies would have to grow, but it would be very difficult. It would be also very difficult for them to have such industrial power, for instance, to export goods in the Asian market or to attract private investment. Probably you cannot be very optimistic that other parts of the world will supply food to Africa and even ODA (Official Development Aids From Advanced Countries) is unlike to increase in the future to this region of the world. So in that region, they need to create a good viable market for food so that they can help each other and be self-sustainable. Thank you very much.

**Moderator:** Thank you very much Professor Katsumata. After this, we intended to have 10 minute Q & A session but we are behind schedule so we would like to end the discussion on this first theme. Later if we have spare time, then we would like to have an exchange of opinions on this first theme. But now, we would like to go on to the second theme of the discussion, that is, the sound and sustainable management of resources. First of all, I'd like to call upon Dr. Rosegrant and ask him to give a 10-minute presentation please.

**Dr. Rosegrant:** Let me first join my colleagues in saying how delighted I am to have the chance to address this really distinguished group here. In fact, for me, it is really one of the great side benefits, extra benefits in my job which does give me an excuse to come to Japan every so often, and I always enjoy my stay and my visit here. Because of the very brief time available, what I'm going to do here is to limit my remarks to the sustainable management of water resources, but many of the lessons that I

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*will draw here for the case of water can in fact be generalized to soils and other resources.*

As was already noted in the keynote speech today, the world faces severe and growing challenges to sustain the quality and to meet the rapidly growing demand for water resources. New sources of water are increasingly expensive to exploit, which limits the potential for expansion of new water supplies. However, with nearly two-thirds of the world's rice and wheat produced on irrigated lands, irrigation must remain the prime engine of agricultural growth for the future. Furthermore, the quality of the land in the water resource base must be sustained despite the mounting pressure to degrade these resources through water logging, salinization, ground water mining or over-extraction of ground water, and water pollution from industrial waste, poorly treated sewage, and run off of agricultural chemicals combined with poor household and sanitary conditions. Sanitary condition is a major contributor to disease and malnutrition in the developing countries particularly among children. The important challenges which are proposed by this growing water scarcity and by the degradation of the quality of water can be addressed through two types of strategies.

The first is supply management which involves activities to locate development and exploit new sources of water, in other words, building new dams, building new wells to pump water from the ground, or through demand management. And demand management refers to the incentives and mechanisms that promote water conservation and efficient use of water. To meet the challenges of water scarcity will require both demand management and supply management, of which the latter will involve highly selective development in exploitation in new water supplies. The appropriate mixes of supply and demand will vary obviously from country to country on the various conditions facing each country. But overall, there must be a shift in emphasis from expansion of new water supplies because they are so costly now, to an increased emphasis on demand management. And let me speak very briefly of some of the key principles that must be promoted in order to promote better demand management.

The task of demand management is to generate physical savings of water and also economic savings in the use of water by increasing the output per unit of evaporated loss of waters. For each unit of water used to grow rice or wheat or each unit of water to be used in industry or households, you need to increase the efficiency of use of that, to conserve the use of water and to increase the use of water before it is degraded or lost, for example, to the ocean or to other non-productive uses of water. There are four basic policy instruments that can be used to improve the efficiency of use of water. And again these same instruments can be applied to the management of other types of resources as well.

The first set will be what can be called "enabling conditions." These are actions to change the institutional and legal environment in which water is supplied and used. Policies here would include

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such things as the reform of water rights accessed as individual use of water, privatization of utilities or laws pertaining to water use associations.

The second set of policy instruments is the so-called "market base incentives." These directly influence the behavior of water users by providing incentives to conserve on water use and would include price reform, increase in the price of water for example, reduction in subsidies in urban water consumption, development of water markets, charges for causing pollution or other types of taxes or subsidies that are meant to influence the use of water.

The third set of instruments is non-market instruments, which in the past have been used a bit more often. These include such things as quotas, licenses for the amount of water you use, and pollution control.

The fourth are really direct interventions or direct investments. These would include such things as *conservation programs, programs to detect and repair leaks or investment and improve irrigation or urban water services.*

What are some of the key elements of the demand management strategy that would make use of some of these instruments? These of course would not be applicable to all countries and to all conditions, but let me run through 6 basic principles very quickly. Probably the most crucial step is the establishment of secure water rights which are actually invested in the individual water user or a group of water users. In many regions, these water rights should be made tradable so that a water user can trade water at various prices to other water users if he or she so chooses. If water is priced at its true scarcity value, instead of being given away free as it often is today as Dr. Pinstrip-Andersen mentioned in the first talk today, water users would respond in a number of different ways. First they may use less water on a given crop. They may adopt water conserving or water saving irrigation technologies such as using drip irrigation as opposed to continuous flow irrigation or they may shift completely from highly water using crops to more water efficient crops such as from rice to wheat or to fruits or vegetables. So giving people the secure rights to the water that they use is the first major step. The second related step is to devolve or turn over or decentralize the irrigation infrastructure and management to water user associations or to groups of farmers, in other words, to get the control away from highly centralized bureaucracies to more decentralized groups that are actually supported by inconsistent use of water. To do that particularly requires that you have a more supportive policy in the legal environment, monitor and regulate negative effects, and provide technical organizational support in training. The third related reform then is to privatize and regulate the urban water in sewage systems. Urban areas can be an important source of water savings. In most developing countries, the amount of water wasted and lost in urban distribution systems including homes, commercial establishments, and public facilities is often huge with water losses estimated in the range

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of 40 to 60% of the total amount of water released to these areas. There is considerable evidence around the world that privatization of currently publicly managed systems can achieve significant water savings by improving the efficiency of water use and by greatly reducing losses in urban areas. Together with turnover and privatization, you should then remove the subsidies to water uses that now characterize most of the urban and farming uses of water. Again, removal of subsidies or increases in water tariffs can have dramatic effects on water use. For example, doubling of the water tariff in Bogor, Indonesia in the early 1990's resulted in a 30% decrease in household demand for water. In the industrial sector, increased water prices also lead to investment in water recycling and conservation technologies. Fifth, conservation through the use of appropriate technology will be a central component for generating water savings. Again, as the value of water increases because water is becoming more scarce, then it begins to pay farmers and others to use advanced technologies such as drip irrigation, plastic pipes, sprinklers, and those types of systems. So by combining secure water rights with improvement in sanitation and use of water rights, you will in fact induce additional investment in water saving technologies. Finally, in the longer run, countries must devise strategies to meet the growing environmental demands for water. One thing I want to emphasize is that in many of the critically important aspects of water resource strategy, in fact there is no conflict between water use efficiency, economic efficiency, and environmental sustainability. In fact, these are in many ways fully complementary in that the same policies that can induce efficient use of water also reduce water pollution and overuse of water.

Just to sum up a bit, again I want to stress that supply expansion does have a role to play in meeting future demands for growth and water use. But even more important is going to be instituting a series of policy reforms to save water in existing uses and to improve the quality of water and soils. The most significant reforms would be to change the institutional and legal environment in which water is supplied and used to the one that empowers water users to make their own decisions regarding the use of the resource while at the same time providing a structure that reveals the real or true scarcity value of water and its environment. The key elements are establishment of secure water rights, decentralization and privatization, utilization of incentives including markets and tradable property rights, pricing reforms or reduction in subsidies, pollution charges, and finally non-market instruments such as licensing and regulation which can have an important part to play. Thank you very much.

**Moderator:** Thank you very much Dr. Rosegrant. We have many aspects to think about in regard to water resources. Now may I call upon Mr. Ono.

**Ono:** Mr. Chairman, I'm very happy to see that the JICA/IFPRI joint seminar has been realized. As one of the participants in organizing this seminar, I feel very honored to have this opportunity to speak as

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well. I'd like to briefly talk about the kind of food assistance and other types of development assistance that is implemented by JICA. As you know, the official development assistance by the government of Japan has been the highest in the world since 1989 except in 1990 and in 1993. The fifth mid-term objective for ODA has been established until the year 1997 and the equivalent of \$14 billion to \$15 billion is going to be spent each year. Also grant element of assistance is going to be improved and this has been already committed to international communities. JICA engages in manpower development, human resource development, and also institution building in developing countries by means of technical cooperation program as well as grant aid program. The actual technical cooperation in 1994 was worth \$3 billion and JICA spent about 55% or \$1.6 billion of that. In many developing countries, agriculture is still a basic industry and it is important to provide food to the population as well as provide income and employment opportunities for the people engaged in agriculture. Also, it is an important sector to generate export income. Of course, preservation and maintenance of the natural environment are also important roles played by agriculture. For many years, Japan has considered the importance of BHN in developing countries and also assistance in the area of food, agriculture, and the environment. In terms of assistance in the area of food, cereals like grains, rice, and maize have been provided as food aid including assistance to refugees. As of 1994, 14 billion yen or \$140 million has been spent. And in terms of assistance of fertilizers, agricultural chemicals, and agricultural machineries which are going to contribute to food production, the amount of the grant aid for increased food production was something like 29.2 billion yen or \$290 million. Besides, 53 billion yen, or \$530 million were spent for grant aid projects in agriculture sector. In terms of JICA's activities, agriculture constitutes a very important part. As of 1994, about 22% or 31.7 billion yen has been expended in the area of agricultural and forestry stock operation and 30% of expert dispatch programs expenditure was directed to agricultural sector. The sub-theme is about the sound and sustainable management of resources which I would now like to go into.

Agricultural production until now of course, has relied very much on expanding, arable land and increasing the productivity of that arable land. But of course, that contributed to a decrease in forestry. Particularly, there has been greater cultivation of land, but there seems to be a limit on how far such extension can continue. Of course, if you do not mind the cost, there are areas that are still possible to cultivate, but in terms of upgrading the production capabilities, crop rotations and double cropping are going to be important, and neutralization rates can be increased by such methods and crop unit yield can be improved by irrigation. This is the actual approach taken by agricultural development. With respect to the different modes of agricultural shifting, slash-and-burn farming and nomadic livestock farming have been the traditional types of agriculture, but limits have been imposed on traditional types of farming because of the population growth, while limitations have been imposed on agricultural land as well as preservation of the natural environment. I would like to show some examples in which we have encountered some problems.

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One is in the area of water management. Improper water management, over-use of ground water, salinization, and water logging are problems, and soil degradation also contributes to problems in water management.

In the area of farming technology, there is improper fertilizer application, improper pest management, lack of development of improved cereal seeds and their extension, lack of sound cropping pattern, and post-harvest loss. These are some areas which need to be improved. In the area of livestock farming and forestry, over-grazing, improper management of grassland, illegal cutting of trees, deforestation, and cutting of trees for fuel-wood and animal feed aggravate the situation. In developing the rural areas, planning is very necessary but it's important to solicit the participation of the local inhabitants who will benefit from these programs. In planning process of agricultural development programs, these kinds of aspects should be emphasized. I lived in Nepal for 3 years, so I would like to cite some examples that I encountered there. "Community Development and Forest/Watershed Conservation Project," which is being promoted in the forest parts of Nepal. People are involved in the project themselves in promoting the project in their local areas. With respect to the basic economic and social indicators of Nepal, the GNP per capita is US\$180 and food calories intake per day is about 2200 kcal. The annual population growth rate is 2.6% to 2.9%, which is quite high. The scale of farming is very small and a vicious cycle of poverty often appears in the rural areas of Nepal, which leads to problems associated with food shortage, malnutrition, and poverty and thus high illiteracy with low investment in education, low primary school enrollment, and poor health. These in turn lead to deforestation and degradation of land which in turn lead to low productivity. So agricultural production, population increase, environmental degradation, and increase in poverty are vicious cycle and therefore it is very important to break this vicious cycle. Agricultural development projects have been started in Nepal for this purpose and as Dr. Andersen has mentioned, soil degradation in Sub-Saharan Africa is very serious and we have to think of various measures which can be instituted right away. JICA also cooperates with countries of Western Africa and JICA intends to emphasize projects in these areas too. With this, I would like to conclude my presentation.

**Moderator:** Thank you very much Mr. Ono for your presentation. Now I would like to call on the discussion for sound and sustainable management of resources which is a very difficult topic. If any of the panelists would like to add a few words, we invite the panelists to respond first.

**Katsumata:** What is existing in the locality, I think is worthwhile. Sustainable production is to be insured within very strict financial limitations, but the question is how can this be achieved? Some countries in West Africa are utilizing the know-how, which exists in Japan, too. There is a certain river in West Africa, a valley which could be utilized. I think it's called the "valley-bottom rice farming" method in



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English. I think this method is viable for sustained food production. In future agricultural methods have to go towards intensive agriculture. I think that this method is one way of achieving this.

**Dr. Nygaard:** Obviously, when one talks globally about a continent as diverse as Africa, one needs to point out that there are a number of success stories. It isn't as if these people are not dealing with these problems, but one could raise a number of micro-examples which have been very successful. So I think in a rather bleak overview, we shouldn't underestimate the potential for changes and search for examples of successful cases in doing so.

**Moderator:** Thank you very much. Now we proceed to the third sub-theme which is the joint promotion of agricultural research and extension. First of all, Mr. Ono please.

**Ono:** The joint promotion of agricultural research and extension is the theme which I'm asked to address. As we have heard from Dr. Pinstrip-Andersen of IFPRI, agricultural research investment is going to provide food security and stabilization in food supply, and I completely concur with his view. JICA has been trying to promote agricultural research and extension programs at the same time. In the national agricultural research institutes in developing countries, we see that there are testing centers, extension people, cooperatives and also private sector participation in promoting new types of improved seeds, etc. The cooperation of all these sectors is essential for agricultural development in the developing countries. Looking at it from the farmer's side, there are many incentives which are provided by the government and it is important for these farmers to be able to get the needed access and technology to these proper programs which are provided by the government. Of course, there are a variety of programs that are available and there are those that make use of biotechnology, but with respect to increasing agricultural productivity, developing improved seeds, and farming technology, improvement is going to be very important. Improvement in plantation technology, harvesting and marketing, and in the infrastructure are very important. The mechanisms of providing these are going to be very important. Therefore, in that respect, comprehensive research and application of the research results are going to be important. At the moment, JICA has various technical cooperation projects. There are about 90 of these, of which 83 are package type projects in agricultural areas. Most of these involve research and extension activities as part of a comprehensive package, and the rural development projects are also incorporated. So this is a kind of a comprehensive project which has been instituted.

*As an example, I refer to the Indonesian Umbrella Cooperation program which has been instituted. In phase I of the program from 1981 to 1985, the aim was to increase rice production. All over Indonesia, various forms of aid have been utilized such as technical cooperation, loan assistance, grant aid, and assistance for increased food production. As a result, when phase I was concluded in 1986, the*

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Indonesian government declared that self-sufficiency in rice supply had been reached. In 1995, the third phase of the umbrella cooperation was initiated, and model regions with different agro-ecosystems were selected in Indonesia and projects were established to improve agricultural productivity and income. Very recently in 1995, Indonesia has been forced to import some rice from overseas.

Through this umbrella cooperation, research and extension activities as well as rural development activities have been combined to bring about a comprehensive effect on productivity. In Africa, adjustment programs have been instituted by donor countries. This has led to a decrease in agricultural research and extension activities because of the limitations in public expenditure, but as Dr. Andersen mentioned in his keynote speech, this cutting in the budget allocation by government is detrimental to technical cooperation projects that are instituted by JICA, which aim at human resources development and institution building.

In dry land farming in semi-arid areas, we do not have much expertise in Japan, but CGAIR has resources in this area related to the development of Sub-Saharan Africa. So it is very important to tie-up with these national and international agricultural research institutes so that we can promote a more efficient multi-bilateral cooperation for agricultural research.

JICA is of course interested in the development of LLDCs, and in that respect, investment in research in these areas and human resource development in extension personnel is going to be very important.

Moderator: Thank you very much Mr. Ono. Now I would like to call on Dr. Rosegrant to give us his views.  
Thank you.

Dr. Rosegrant: Thank you very much. A number of the speakers today have stressed the extraordinarily high benefits and extraordinarily high economic returns of agricultural research and extension. In the future, it's possible that these benefits could be just as high, but to achieve these high benefits will require significant reforms in the way we do business and agricultural research and extension. The change, the need for reform and that is changing the outlook for research and extension, is directly related to the change in nature of the "green revolution." The successes of the green revolution as probably all of us know, are due to rapid expansion of the use of modern varieties of crops, rapid expansion in the use of fertilizers, and the growth in irrigation investment and use of irrigation. However, we are now facing what could be called a "post green revolution period" that is, as I have already noted in my earlier talk, the expansion of irrigated areas or through new water supplies is likely to be very limited. Per Pinstrop-Andersen among others noted that the days of super rapid increases in fertilizer use seem to have passed, and it is now more difficult to develop new varieties of rice, wheat, and other crops that have significantly higher yield benefits. Instead of relying on this

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sort of development and promotion of new varieties and rapid expansion of inputs, we are now much more dependent on increasing the efficiency of use of different inputs and production processes. For example, technologies to implement integrated pest management or to improve the nutrient balance in the timing and placement of fertilizer applications are highly complex. They require a lot of knowledge and their quite specific location may vary from one micro environment to another. Because of this, the new technologies are much more demanding for both the farmer and the extension agent. They require more information and skills for successful adoption than we saw in the case with just the initial adoption of modern varieties in fertilizers. In addition, these new technologies do not give really large gains in yield of income than the initial adoption, say of IR8 or IR20 in the farmer's fields. The increase in income from these new technologies such integrated pest management is in fact quite sensitive to the farmer's skills and his efficiency in using these technologies. Under these circumstances of much more complexity, to get the necessary information and necessary training to farmers will require a considerable upgrading of the extension services and the delivery of research results to the extension services.

The poor performance of many existing research or extension services can be attributed to inadequate training, inappropriate organization structures, lack of incentives within the organizations or in many cases, lack of funding as described earlier. There's been a number of suggestions for reform of these services. One that's been put out a lot is privatization and I stressed earlier in the case of water policy that I thought privatization has a major role to play. I think in the area of extension services or even in agricultural research, we need to be a little more careful about how widely we apply the privatization role, for example, in the area of extension, for many crops, and I think one of the ideal examples is rice farming in most of Asia. Well, you might expect some improvement by contracting extension services to private companies. You may also cause a lot of problems. That's because there are such a large number of widely dispersed small farmers who grow rice under many different cropping systems. It's hard to imagine that a private company would ever be able to efficiently deal with, and actually make profit from servicing these small farmers. So there may still be a very large role to play for the public sector in cases like that. Privatization might be more successful if extension is linked to deliver a very specific technology, let's say highbred corn, to large and more homogeneous farmers; there you could expect the private companies to have a major role. Possibly a better solution that would have a little bit more applicability is again the decentralization approach, where you would combine integrated national planting of research and extension at the top level to assure proper coordination of budgets and strategies, but would also supplement that with regular interdisciplinary evaluation at the farm level of the various technologies and include also establishment of an organizational structure which encourages a bottom-up flow from farmers to the extension of research instead of the top-down approach that we see so often. If you combine the sort of bottom-up flow together with a decentralized research approach which is location-specific and

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adapted to the specific environments, you'll be a much bigger step along the way to the transfers of some of these complex technologies.

On the research side, in general as well, for most developing countries and I think particularly for the very large countries, there has to be greater emphasis placed on raising the quality of scientists in management skills and providing adequate operating funds as technical support for these scientists. You need to go after efficiency in science, not just the growth in numbers. And the kind of graphs we saw earlier from Dr. Pinstrop-Andersen on declining funds per scientist in Africa is an example of exactly what you cannot do. You cannot maintain the same staff resources. Again, to reemphasize the decentralization of research regionally and to the farm level would be a major help not just for extension but for research. This decentralization would be based on agro-ecological characterization of the regions and would offer the most effective solution to provide feed-in and feed-back mechanisms to upstream researchers and policy makers.

A regionalization of research stations is another technique that should be used more often to get the agricultural research stations in appropriate locations to reflect the wide diversity of environments that most countries have in their agro-climatic zones. A key there also is to get the good scientists out into the regions. You all know that many scientists like to stay in the most prestigious and central institution. You have got to be able to decentralize that more than it's being done now.

Finally, the linkages between research managers and extension managers and the people who make national policies must be strengthened so that we don't have again three groups. We have the people setting prices or setting investments at the central level, people doing research on the one side, and the extension agents doing something else often on their own. So the environment for research and extension is changing rapidly I think, with much higher demands on the systems because of this much greater knowledge, intensive technologies, and much more difficult technologies to apply. With the implementation of some of the selective reforms such as the ones I just briefly outlined, we should be able to continue getting very high rates of return for research and extension.

**Moderator:** Thank you very much Dr. Rosegrant for talking about research activities and also how to connect those to actual farming on the ground. There are a number of questions to be addressed and problems to be solved. As Mr. Rosegrant just mentioned, we do have an experience called the "green revolution" and on the basis of the past success of the "green revolution," we must consider what do we need to do in the future. So we have some time left and we'd like to ask somebody else other than the two presenters to give us their opinions. Professor Katsumata?

**Katsumata:** Well if I may, I should just like to make one point. Mr. Rosegrant talked about scientists. Now

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with regards to the definition of "scientist," I was talking earlier in the area of foods and the local characteristics associated, and he said that local specific approaches are necessary. This is the same point that I'd like to make. In the case of such a project, rational scientists and rational farmers may not be thinking in the same way. The rationale for the scientists and farmers may not be the same. Cultural, religious, regional and family elements are associated with farming. In this respect, social scientists like sociologists and anthropologists can contribute to understanding these local factors of food production. The "scientists" here should not be limited to natural scientists.

**Moderator:** Perhaps I could ask someone else Dr. Nygaard?

**Dr. Nygaard:** On the role of the private sector, the role of governments, one of our recommendations in 2020 Vision is recognizing that. I think as we move toward encouraging third world countries to privatize, sometime we've gone overboard on that reaction. One of the reasons why we stress the role of strong governments or governments playing the roles that they are required to play well was for that reason. In my view the best example which has come up in this afternoon is this question of biotechnology and whether the private sector will do it and will do it on crops that are important to the third world. In one of the sessions leading up to the June conference for the 2020 Vision, it was very clear that private sector farms that were represented from the developed world from Europe and from the United States in this case were not giving any priority to third world development because they couldn't capture the benefits from research in that direction. It was our conclusion that the only way that biotechnology could be brought to bear on third world agricultural production was for the third world national agricultural programs themselves to have that capability. And that just illustrates the point Dr. Pinstrip-Andersen made in his remarks to not lose sight of that role and indeed the importance of the role that the public sector will have to play and continue to play in issues like this.

**Moderator:** Thank you. We have had two contributions. There are many issues associated with the collaboration of scientists, a collaboration between the public sector and the private sector. Each is a very critical issue. We do have another 5 minutes at our disposal, perhaps Mr. Ono or Mr. Rosegrant or anyone else may wish to add something. Yes, Mr. Ono.

**Ono:** The food production focus on Africa is very serious with it's increasing population. Per capita food availability is also very bleak according to the data. Concerning food production in Africa, I think there are two points to be mentioned. One is self-reliant agriculture or self-sufficient agriculture. I think this should be the basis and that is one aspect. And the other is if possible, there should also be contribution to producing crop. In Kilimanjaro Region of Tanzania, we have been implementing an agricultural development project which I would like to talk about. In 1975 or there about, for about a

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15-year period in Kilimanjaro Region of Tanzania, we conducted agricultural development especially in rice irrigation production. Rice was the important crop, both as a cash crop as well as for its own consumption. And the project proved to be successful. In Africa, rather than rice, maize, or other cereals or main crops, in order to maintain subsistence farming, the minimum assistance is required for semi-arid land. I personally have a livestock production background. In low green lands of Africa, that seems to be good for agricultural production, people who are working in their livestock farms suffer from infectious diseases like malaria, schistosomiasis, and tripanozoma, or sleeping sickness, and this leads to productivity decrease. Therefore, livestock and farm or agricultural production and other related areas such as health care need to be looked after together in order to improve the production base in Africa.

**Moderator:** Thank you Mr. Ono. Are there any other contributions? We have successfully concluded the presentation of the short three sub-themes. On the first theme, because of the time constraint, as chairman I had to cut any discussion, but because we are a little bit ahead of schedule, let me see, let us now ask the four panelists to give a conclusion based on what has been discussed so far. To our great surprise and satisfaction, we have such a large audience that we should like to give the floor to the audience to ask any questions for about 30 minutes. And if there is more time left, I should like to take about 5 minutes to take the floor myself.

With regard to today's theme, the role of government, of course, is important, not to mention the importance of the private sector in the market mechanism. From the perspective of development assistance, what are the points that we need to bear in mind when we talk about the role of governments? With this in mind and based on the keynote address given by Dr. Andersen, I should like to ask each panelist to give a conclusion on all the discussions we have had so far. Let's start in the order as seated. Dr. Nygaard, you take the floor first.

**Dr. Nygaard:** The first thing I would like to do is differentiate between self-sufficiency and food security. It should be obvious but we don't want to confuse those two terms. There are examples where countries need food security but don't have to be self-sufficient to do so. An interesting case in point is Egypt which until recently was importing 80% of its food. It did not feel secure doing that and rightly so. On the other hand, Egypt grows some of the finest cotton in the world and exports of that fine quality cotton can do a lot toward insuring their food security in spite of the fact that cotton is not eaten. So let's make sure that we are talking about food security and not taking it to the illogical extreme of talking about all these countries being self-sufficient.

The second thing I would like to point out, and I wish that I had more time to do so, are some of the success stories to be found across all of these countries we've been talking about. There are a number

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of them in Africa and we seem to have focused more on the problems. I think we can take a lot of hope from the lessons that are out there. There are certain examples of particular countries in Africa where agricultural production has done well. There have been breakthroughs. Zimbabwe is one case in point. There is certainly a number of local situations in various countries where there are success stories in capturing water, in taking care of particular pests in other ways. And I think one needs to look at those, pay attention to those, and build on those as we also worry about the difficult problems there are to solve.

One of the points I would like to mention in the case of Africa is the enormous problem of infrastructure or lack of infrastructure. In Dr. Pinstrip-Andersen's paper, he showed the costs of marketing African agricultural products relative to the costs of marketing similar products in Asia and the gap is enormous. Some research which has been done with IFPRI has looked at the cost of building up the infrastructure: primarily roads in Africa, given the low population density in many parts of that continent, will be very expensive to build. That doesn't mean we shouldn't start doing it. We should. We have to do something to get those costs down. On the other hand, one may want to think of other kinds of direction of agricultural development or agricultural research that will use local products and increase agricultural productivity in spite of the fact that they can't transport huge amounts of fertilizer, pesticide, insecticide, and these kinds of things into remote areas. So at least in the short term, something has to be done with agricultural research that is more adaptable to the particular region that they are located in.

My final comment is just to illustrate the point that you made about the role of government and the role of the private sector. I think we get carried away or have gotten carried away in the past 10 years with what the private sector can do. The private sector can do a lot in many countries that need to do more but it can't do everything. So let's keep a balance between the two. Thank you.

**Moderator:** Thank you so much. Mr. Katsumata please.

**Katsumata:** I would like to point out a few points based on what has been discussed. One is, as I said at the very outset and something which has been stressed by a number of speakers today whether it's Africa or South Asia, is the problem of food access. Not considering self-sufficiency or self-reliance of food but on an individual basis, food is an absolute goods, something that is absolutely necessary for human beings. If food is not available and accessible, it is a global issue that needs to be addressed for the 21st century. If this recognition is absent, there arise arguments that we have to support the countries and projects most likely to be successful, in the international assistance arena. But, I believe that we should regard the food security as a human right, and a matter of human security.

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Let me go into the specifics. In Africa today, in both extension and research, there is a shortage of man power and human resources. If a developed country like Japan wants to conduct a project in African countries, is there a mechanism in which African scientists or researchers or local NGOs can be mobilized? There are outstanding African scientists who are working outside of their home country, and we heard this today from Mr. Rosegrant. The people who remain in their home countries are forced to work in jobs outside their area of expertise. So I have a recommendation. Why can we not have these researchers and scientists mobilized from the planning stage of the project? Is there any mechanism to enable this? I think if this is possible and if we can draw on the wisdom of the African people and African scientists for the sake of the Africans, it will be valuable because if this is not possible, I do feel that it is a great waste.

The third point is also associated with what I just said. When I talk about scientists, I'm talking about a broadly defined people who are locally aware of, for example, the technology which is suitable to the locality and about scientists or people who have insight or the capacity to analyze what is suitable to the region. I think, of course, this is an area that is better done by the Africans. We need a mechanism whereby these people can also be mobilized. I often read in reports that African people receive the greatest number of recommendations in the world. But when it comes to implementation, there is a need for the commitment of the Africans themselves whether it is scientists or researchers. But there are very few such African researchers and scientists.

**Moderator:** Mr. Rosegrant, we do have 15 minutes left. So you have plenty of time. Take your time.

**Dr. Rosegrant:** I will also be very brief here. I think really this afternoon in the very first talk Dr. Pinstrup-Andersen sketched out quite a comprehensive program for appropriate development including the implications for development assistance. So what I want to do is to reemphasize some of the points that he made and then expand upon one or two points quickly.

The first point is to remember that development assistance really can make a major difference in the future of agricultural development and food security in developing countries. The decisions that are made by the major international donors, particularly such as Japan, will have a tremendous influence over future development patterns. As shown in some of the analysis earlier, a difference in expenditure on the order of \$1.5 billion a year can make a difference between hunger and food security for something on the order of 40 million children in the world. That's a lot of benefits for not a very large amount of money if you add across the development assistance that can be provided by all developed countries.

The related point is that when you are spending that money, what should be the priority. I think it's



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emerged time and time again that probably the number one priority would be broadly defined as agricultural research and extension activities. The second would be on population programs to slow the population growth rates in those areas where the growth is very rapid. The third area of investment would be in policies to improve the natural resource base. And I think foremost among those from my own work and also from others who have talked today would be in the area of water resources and water quality. Let me just expand a little bit on how you go about developing an investment or development assistance program in the area of water policy reform. It is worth noting that I sketched out a program which relied mainly on demand management or how you increase the efficiency of use of water rather than greatly expanding supplies. A number of observers including a lot of donors have incorrectly claimed or assumed that this kind of increased emphasis on demand management is a substitute for the spending of real money on irrigation or urban water supply. But in fact, implementation of effective demand management policies not only for water but for other resources will require significant new investments in appropriate water delivery, control, measurement technologies, water treatment, and quality enhancement. Perhaps more important, we need to take into account the equipment that we need and the structural adjustment funding in order to reorganize and reform the existing government irrigation and water bureaucracies and institutions. In other words, to develop the appropriate institutional and legal framework for water management or for land management you do need a substantial investment in ongoing institutional development. Together with the program of research and pilot testing, you need to assess alternative future policies in investments in this area.

Finally, and this really is a concluding comment, I think it's worth pointing out the issue again as mentioned earlier today that we are now in the 15th year since probably 1980 or 1981 of declining real investment in agricultural development in food security enhancing activities. Only a few of the developed countries, Japan certainly foremost among them, has fought against this trend of declining expenditures. There are some encouraging signs as Dr. Andersen noted, and finally, the donors are becoming interested in agriculture again. There seems to be some light in the tunnel perhaps. But I think it's necessary that we do continue to point out and through careful analysis, show where investment should be made and what policies and development assistance expenditures really do pay off in the long run. It urges us all to maintain vigilance and to point out effective strategies for development assistance in the future.

**Moderator:** Thank you Mr. Rosegrant. Last but not least, I'd like to ask Mr. Ono.

**Ono:** IFPRI 2020 Vision has portrayed a very severe food supply situation in the world in the future. From JICA's perspective, in other words, from an agricultural technical assistance point of view, I'd like to share with you four experiences that I have gained through my work.

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One is focused on assistance for sustainable development. With regards to Sub-Saharan African regions, they will continue to have low economic growth and low agricultural growth, and land degradation and poor education will continue. These are the factors which impede agricultural development. There must be ways to reverse this situation, and one example is the Kilimanjaro Agricultural Development in Tanzania which has been going on for 20 years. We offered assistance throughout this period and the land at the foot of Mount Kilimanjaro has been turned into very successful rice production site. And then in West Africa, there is serious degradation due to desertification, an issue that deserves great attention. Continuous cooperation is very important in areas like this.

The second point I would like to share with you is that JICA's cooperation is divided into sectors like agriculture, health, sanitation, and so forth. However, food, agriculture, environment, pollution, or education, are all interrelated and in this respect, there ought to be a package type of cooperation which goes beyond different sectors. And in fact, in the interests of making good use of limited resources, this inter-sector approach is being recognized as increasingly important in JICA.

The third point is in the agricultural sector. Many comprehensive agricultural and rural development projects have been conducted, with the aim of self-reliant development of rural villages. They are participatory type of development project which expects self-help and self-reliance of the villages and farmers. For JICA, however, the community-participatory type of project is still in the early stage. But having said that, I'd like to add that basically, JICA's assistance constitutes only a part of the development plans activities of the given country. We want to provide development assistance which will serve as a model for the entire locality. In this context, we believe that self-reliant type of development is the most important.

Concerning the regional approach to agricultural development, I did cite some examples in West Africa on semi-arable land. Agricultural research on semi-arable land in West Asia has only started in Japan, while in South Syria, there is ICARDA, CGAIR member and specialized research center which has conducted extensive agricultural development of semi-arable land. And of course, this is done in collaboration with the African national institutions. JICA, on a bilateral basis, would like to have close ties with these international and national research institutions, by taking advantage of their research results, for example. We also avail of the South-to-South cooperation, a new scheme of development assistance provided by the Japanese government. Based on this, we would like to build a regional base and conduct research with the neighboring countries. We believe that this approach is also worthwhile. That's all for me. Thank you.

**Moderator:** Thank you so much for your very concise conclusion. And since we do have such a large

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audience today, we would like to open the floor for questions. Please raise your hand and the microphone will be given to you. Excuse me, I'm sorry the microphone is towards the back of the hall. Yes please.

**Audience:** My name is Yoshinaga and I'd like to direct a question to two of the people from IFPRI. The first question is with respect to the point made by Dr. Andersen. There were 6 recommended actions pointed out by Dr. Andersen. The first action related to property rights and education which are very much related to institutional aspects and governing policy. So if first action doesn't go well, there is the possibility that the other action programs which are to follow may not go very well. The important thing is thus to succeed with first action. So in that context, we should not treat the first action on the same dimension as the other five. And it's going to be essential for recipient countries to strive themselves to improve first action. Without any improvement in this area, we won't be able to expect much of the other proposed actions. And a scenario based on this model, I think, becomes ambiguous if this first action is not thoroughly implemented.

The second issue is to do with food security. With respect to food security and self-sufficiency, the point was made that two separate points should be considered. Food security is dealt with by the OECD and FAO, and FAO will hold a conference on food security in Autumn. There are also some other international organizations which are involved in food security issues. The manner in which food security is dealt with varies by country. So if IFPRI could address food security more and come up with a clear definition of what food security means, then international discussion could continue in the proper direction. So I would like you to define food security in your own terms. These are the two points I wanted to raise and have your comments on.

**Moderator:** Well, Dr. Rosegrant would you like to take this point up first?

**Dr. Rosegrant:** Regarding the first question, the central nature of getting property rights, institution, and government in place is almost a precondition for the others. I personally tend to agree, I think you can get something done without that, but for true success, you will need those. I think that was the emphasis even in my talk at a more micro level, looking at water. To get the institutional basis to get the property rights to water is necessary before you can do all these other things. So I think in general, I would agree with that point.

The food security verses self-sufficiency, I think what David will add there is that you can have food security at the country level without being self-sufficient in every given crop, so food security does not imply a no-import policy where you're essentially trying to produce very rapid, very high rates of growth or all your food no matter how economically efficient just to maintain security. So at the

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national level, food security is different than self-sufficiency. At a household level, food security has much more to do with the ability to properly feed, educate, and raise a healthy family so it has a much broader dimension as well. I don't know if Per wants to give a more precise definition of that or David.

**Moderator:** Dr. Nygaard, would you like to add anything to the point just made by Dr. Rosegrant?  
Dr. Andersen?

**Dr. Andersen:** Let me just add a short comment on Mark Rosegrant's answer to the first question. The non-governmental organizations are extremely important as a component of promoting development as of course is the private sector. The point that I was trying to make is that those two sectors, that is the private sector and the non-governmental organization, should be as effective as possible. We need a strong public sector in certain areas. Where we don't have that, the non-governmental organizations are very limited in what they can do, and the private sector may not be able or will not be able to fulfill its roles. Just one illustration. In all three of the regional meetings that I referred to earlier, that is the meetings in Latin America, Sub-Saharan Africa, and South Asia, a great deal of emphasis was put on the importance of law and order in rural areas. That emphasis came from people from the region not from people from outside. A weak government cannot keep law and order, and if you don't have law and order in rural areas, you won't have food security no matter how many non-governmental organizations you have. If property rights are not appropriately specified, you end up with free access to natural resources and that is virtually certain to create degradation and misuse of the environment. Those are just illustrations. So the point is that no government is going to do the full job but without a strong government, it is not likely that the job will get done. Thank you Mr. Chairman.

**Moderator:** Thank you very much. Now I'd like to see where the microphone is going.

**Audience:** I'm Takase of the International Development Center. I was very much interested in the presentations which have been made. I'm very interested in the area of biotechnology. Dr. Nygaard mentioned that efforts were made to try to approach the American private sector companies to try to get them involved in biotechnology, but if that is the case, then the public sector must come in to help. When I visited New York in September, there was this ISAAA, International Service for the Acquisition of Agro-biotech Applications, an institution based in Cornell University. This is a private institution but it does contribute greatly to the development of developing countries. At least that's how I viewed the institution so I'd like to know what this institution is actually doing.

The second point I would like to make is that public institutions can play an important role in research. CGAIR is also one of those very important organizations. Does IFPRI have a specific view as to what CGAIR should do? I think IFPRI has the authority on these matters so it can give

directives to the kind of research activities done at CGAIR. Can you establish a kind of framework for CGAIR about what kind of biotechnology research assistance can be conducted in that institute?

And the third point is that biotechnology is considered to be something like a treasure box but is it really so? In the 1960's, there was a call for a "green revolution." But does this have enough power as a "green revolution" concept? Is the second "green revolution" now being invited under this concept? I would think that it would probably take 10 years. I think I read in an IFPRI report that maybe 10 years will be necessary. These are three points that I'm very much interested to hear your views on.

**Moderator:** So three points were raised in relation to biotechnology. I'd like to ask Dr. Nygaard to start off responding to these three points.

**Dr. Nygaard:** I'd also like both of my colleagues to make a comment. Mark has done some work on when the impact of biotechnology will start to be felt, say in rice in Asia, and maybe he can comment a little bit about if it is a second "green revolution." Whether we should be telling the CGAIR what to do based on IFPRI research, Per will answer that question. Let me just tell you what we did.

First, I probably should emphasize that we had a seminar to which for-profit private companies were invited. So let's differentiate between for-profit private organizations and non-profit private organizations. The for-profit private organizations, I think it is okay for me to tell you this, that were represented at this meeting were Ciba Geigy, a Switzerland based company, Pioneer Seed Company based in Iowa in the United States, Monsanto based in Iowa, and Zeneca based in the U.K. We had a few other smaller companies represented there, but we had four rather large companies. We sat together for a couple of days and talked about pesticide use and alternatives. Then we spent one day talking about biotechnology and the role it will have in the future. Two things were clear from the private sector side. Firstly, they were doing research on things where they could capture returns on their investment. They were doing research on quality, they were doing research on taste, they were doing research on issues that add value to crops primarily horticulture and food crops. They were doing almost nothing in terms of increasing the amount that was available. They indicated interest in continuing to do that. They were not apologetic about that. What struck us though was that the amount of money was enormous. Monsanto in a presentation that they made to this group indicated that their annual budget for research and development was about \$120 million as a private sector company. Pioneer said that "ours is about that much too." It turns out that Ciba Geigy was probably a little bit more than that. So here, out of the hundreds of agrochemical companies that we could have invited to this seminar, three of them put together had a budget as large as CGAIR. Now if those organizations are not going to have anything to do with cassava, with rice, with wheat, or with maize, maize may be the exception, it's going to be left to the non-profit or non-private international

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public organizations like IFPRI and other CGAIR centers and national programs to look at crops that will benefit from the biotechnological revolution that will be ignored and to develop seed capacities in the third world. One exception to that is the Rockefeller Foundation Program which has put about \$10 million into biotechnology for rice and I think they are seeing signs of success, and some of that success was indicated Mark, by the work you did on when those returns would come in. And maybe you can say a word on that.

**Moderator:** Mr. Rosegrant please.

**Dr. Rosegrant:** Let's remember a little bit about what biotech really is. It's not a really magical or mysterious thing as you know Mr. Takase. It's really a set of techniques for identifying useful genes and then transferring them into crops that you want to incorporate that gene.

There are two things that it really does that conventional plant breeding cannot do. One is that it allows researchers to identify certain genes in plants that do not so-called "express themselves" in that plant. For example, you might have a wild rice variety that has very lousy yields. It doesn't yield very much grain at all but it may have a recessive gene for a characteristic that gives high yield, but it would never express in that plant. Through biotechnology techniques, you can identify that recessive gene, put it into a modern variety where that gene will express itself, and you'll get higher yields from that.

The second is that it does make it much easier to put genes from very different species into one plant. And again you can get various kinds of combinations that can be useful. You know they talk about putting a gene from a frog into a rice to develop something resistant to some diseases and you can actually do things like that. So it's actually a very useful tool kit that extends what plant breeders can do. I doubt that it will end up being the kind of huge increase in yields you saw from the first "green revolution" simply because you're reaching to the physiological capabilities of most of the plant types, so you might be able to go from 9 tons of rice per hectare per crop to 12 tons over time, but that will take a while. Going back to the amount of timing, in our sort of assessment of these things, because of this Rockefeller yielding program, the first yield gains are likely to be in rice but that could be like 2005 or 2010 before those come through. But at that stage, almost all your yield gains are likely to be from combinations made under biotechnology techniques rather than conventional techniques. The other CG crops like wheat and maize are far behind because there has not been that much investment. My assessment, and this is not an official IFPRI position, is that the CG is greatly under-investing in biotechnology and there should be far more investment in that. They've been too relaxed saying the private sector will do it all because the for-profit private sector will not do it for the kind of crops in conditions that we see in the developing world.

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**Audience:** My name is Oga from the International Agricultural Forestry Research Institute. This is not a question but I'd like to make three comments.

*First of all, Dr. Pinstrip-Andersen made a 2020 prediction and I would have to say that it is very, very optimistic. I wonder how you can be so optimistic about 2020. Mr. Rosegrant talked about new crops and that there will be not many new crops. He also mentioned a number of other dark sides of the prediction and you said that there are no conditions that would bring about the second "green revolution" as we have seen in the first "green revolution." You also said that biotechnology is not going to bring so many drastic changes. Yield increases are not being addressed, I understand, by biotechnology. That's what I gather from the discussions among the scientists. I think on this issue we have to include biotechnology specialists in the discussion. Most of the people here are social scientists or laymen as far as biotechnology is concerned. Many of the biotechnology specialists say that they have not discussed anything of this nature. I would like to say that we should not have much of a hope or great hopes for biotechnology. I think we need to increase research in this area. In Sub-Saharan countries and Southern Asian countries, of course, there have been many successes and you said there is a difference between self-sufficiency and food-security. Asian countries have been placing emphasis on self-sufficiency. My impression is that African countries have not placed as much emphasis on the sovereignty of the countries whereas Asian nations have had a very clear policy on the self-sufficiency or security in the sovereignty of the country. I think IFPRI should clarify the importance of sovereignty for Sub-Saharan countries. We cannot be talking about just laissez-faire. If we do, something like that taking place in the former Soviet Union will occur.*

*Another thing I'd like to mention is that we are placing too much emphasis on the very high level of science. We need to have middle-level or lower-level education. In Japan, we have a very good systematic education infrastructure starting from primary through junior high, senior high, and university. If you only put great emphasis on the top level, then it doesn't really enable the country to have good educated people at different levels throughout the country so I believe that emphasis should be placed on lower-level or middle-level education in each country. These are not questions but comments. Thank you very much.*

**Moderator:** We heard three comments from the gentleman from the floor. One was about the future of food production. Maybe we cannot be too optimistic about that. Also the view on biotechnology may be too optimistic. The other point was about food self-sufficiency or production inside each of the country. As to how we are going to evaluate each government's food policy. Maybe Asian countries have been successful in securing food sufficiency and food security because they have clear policies. The third comment made was about greatly emphasizing education at the lower level anybody like to make a comment on this? Yes, Dr. Nygaard.

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**Dr. Nygaard:** I would like to comment on the second and the third and start with the third. It is true that this discussion is not emphasized as adequately as it should. We apologize for the importance of education across all levels. One of the recommendations that came out of our June conference that was held in Washington D.C. last year was in the context of population. But in fact, it was quickly broadened to have a very wide range of the possible impact and that was the recommendation to educate young girls. And the suggestion is that it is probably the most effective way to reduce the fertility rate in developing countries and those concerned, particularly in Sub-Saharan Africa. But in doing that, you're also potentially having a tremendous impact on agricultural productivity because in Africa, it is primarily the women that produce food and almost entirely in parts of Western Africa. The women that market food and the better educated literate group of people at that end could have a tremendous impact on improving living conditions in those countries. So I agree with you that requires emphasis and I believe in our overall 2020 Vision work it is emphasized.

The question of food self-sufficiency and comparison between Asia and Sub-Saharan Africa is a difficult one. Let me only touch on it here by saying that some of the issues that make this problematic is that in Africa there are over 56 countries. With the exception of Nigeria, most of them are very small, 7 to 10 million population, and in a couple of cases, it's less than a million. And issues of food security in those kinds of situation are very different from issues of national food security when we talk about countries like Thailand, Indonesia or the Philippines. The magnitude is very different. The geographical variety in those countries is much more limited, and it would be very difficult. The way those boundaries were drawn was primarily colonial division and not some other kind of more natural division. So Africa is particularly problematic in that sense. And I think when you think about food security, I'm a little bit hesitant to make a comparison between that in Southeastern Asian countries.

**Moderator:** Thank you very much. Anything else? Anybody else who'd like to make comments? I'd like to solicit more questions and comments from the floor.

**Audience:** I'm not an agriculturalist but I spent 6 years in Rwanda, and 12 years at the World Bank just to mention my credentials. I was sort of surprised to hear Mr. Katsumata mention that Africa has received a lot of advice but they don't have the people to implement it. I think what he really meant to say was that Africa receives a lot of advice but all bad advice. If you look at what aid has been done in Africa, certainly the present situation is no proof that aid has been successful. On the contrary, they are in an even worse state. So repeating Mr. Nygaard's advice, we should be careful about what we mean when we talk about development.

Now the subject of this seminar is not only food but poverty and the environment. And



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unfortunately, not much is spoken about South Asia. But my concerns are for Sub-Saharan Africa so I will concentrate on that.

Let us suppose we put more investment into food in Africa. What happens? You'll have surplus food production. How do you deal with that? Japan has a subsidy program for rice producers and providing the surplus in the form of aid. Same thing with European wheat. Same thing with American agricultural production. If we are talking about food production in the third world, without discussing the question of food aid to the third world, I think the discussion is not complete even though for humanitarian reasons, of course, it's popular. On the other hand, it also destroys the development of the local food market.

My second question or problem is that very little was mentioned about industrialization as such or commerce. In most cases, especially in monsoon countries and rainy season countries like South Asia and Africa, agricultural production is limited or constrained by the seasons so you have certain seasons when man-power is active and certain seasons when it's inactive. This means that over the years for your total production, no matter how hard you work in the busy season, you won't work in the rainy season. Now how do you fill the gap? This is applying to those sectors which don't depend on the weather. Although this does not affect large industries like the aircraft industry, it hits simple activities that probably wouldn't be classified as industry. But diversification of activities to overcome the season of gap is not happening. This gap is rarely mentioned but still in my opinion is one of the biggest causes of underdevelopment in the third world because the roads, the factories, the warehouses, the trucks, all remain idle. But you have to have a certain level of them to counter the peak season. So here are examples which show that if you want to have food production in the context of overall development, you have to look at the industrial sector as well. After all, the whole issue is poverty. Thank you.

**Dr. Nygaard:** A discussion that we could have perhaps after the break, I would just like to say obviously there is a role of balance, but in post-colonial Africa, the emphasis on industrialization was there and failed, and failed miserably and had to regroup and figure out ways to develop the real sector where most of its people lived on subsistence basis. And till those people are brought into the economy, you are not going to be able to generate the kind of industrial base that you're talking about. So it seems to me that we're talking about some kind of a balance between the two and we haven't hit it right yet.

**Moderator:** I'm afraid it's time for us to wrap it up so I have to call it the end of the day but lastly, I would like to make just a few comments briefly.

The first thing I'd like to say is about food security, which is one of the main themes we have taken up

for today's seminar. In Japan, many people tend to think about food security in relation with wars and disasters and so on, however, it is not so. Considering the entire world situation today when we talk about food security, we have to realize the fact that there are so many people in the world and an increasing number of people who do not have access to food everyday. This I believe is the most important point made here today, but this doesn't mean that we are going to face shortages of food due to environmental limitations and so on, but it depends on national policy and the attitude of international organizations that can change the situation. We can have bright prospects or poor prospects depending upon what we do, what we can do, and what the governments of the world will do. This is the second very important point that was made today. Over the last few years in OECD countries, they have been reducing or have not been increasing the budget or investment in research and development in agriculture. I believe some of you did not know this fact and improvement has to be made in this area and we need to put more emphasis on the work of extension which would bring benefits to the farmers themselves. Based on the successful experience we had in the first generation "green revolution," we need to increase investment in the second generation "green revolution" research and development work. African countries, especially countries in Sub-Saharan Africa which are very far from Japan, require greater attention. With this, I'd like to conclude this discussion and I'd like to thank the panelists and the audience. Thank you very much. I'd like to express my special appreciation to all of you for participating in this seminar. Thank you very much.

