FOOD SECURITY - GLOBAL TRENDS AND PERSPECTIVE

AFRO-ASIAN RURAL DEVELOPMENT ORGANIZATION (AARDO)
NEW DELHI
REPORT OF THE 32ND RECA SEMINAR

ON

FOOD SECURITY – GLOBAL TRENDS AND PERSPECTIVE

held at IDACA, Tokyo, Japan, 12-25 July 2010

AFRO-ASIAN RURAL DEVELOPMENT ORGANIZATION (AARDO)
NEW DELHI
The report has been prepared under the kind guidance of H E Dr Abdalla Yahia Adam, Secretary General, AARDO by a team consisting of Mr A W Anwer, Executive Secretary, Mr Khushnood Ali, Technical Officer II and Mrs Suman Dhingra, Technical Officer III, AARDO.
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The Afro-Asian Rural Development Organization (AARDO) was established by the far-sighted leaders of Africa and Asia in 1962 as an inter-governmental Organization in order to provide a forum for the countries in the continents of Africa and Asia to jointly discuss their problems, exchange views, ideas, experiences and information in the field of rural and agricultural development and to make concerted efforts, wherever possible, to improve the quality of life of the rural people. To achieve these mandates, AARDO focuses on three broad areas, i.e. human resource development, financing of development pilot projects and dissemination of information. The Organization in this way is contributing towards and promoting South-South cooperation and Afro-Asian solidarity for about five decades.

In its technical activities, AARDO has stressed on strengthening of human resource development through international and regional training programmes, workshops and seminars, deputation of experts, study visits and action research. Besides, AARDO provides financial assistance to implement development pilot projects which could make significant contribution in the rural economy of member countries and help effectively in their poverty alleviation programmes. Collaboration with international organizations, strengthening of regional offices and linked institutions and dissemination of information through publications, internet and other means are other activities of the Organization. AARDO also envisions strengthening itself by doubling its technical activities in order to extend more benefits to the member countries.

Organizing RECA (Research and Education Centre of AARDO) seminar at the Institute for the Development of Agricultural Cooperation in Asia (IDACA), Tokyo, Japan has been one of the important and regular activities of the Organization since 1967. So far thirty two (32) seminars including the current one have been organised by AARDO at IDACA. The 32nd RECA Seminar on Food Security – Global Trends and Perspective was held at IDACA, Tokyo, Japan, during 12-25 July 2010. The primary objectives of the Seminar were to provide a forum to review and deliberate on global situation of food security - trends and perspective; to share information on the best practices and technologies being applied to achieve the food security in the member countries; and to formulate policies and an action plan to overcome the current and potential challenges to ensure food security.

In fact, food has been central to human existence and hence, food security has been the cornerstone of the policies of all the countries which are faced with the situation of hunger and malnutrition. Food security first emerged as a concept with the rapid increase in food prices in the 1970s that led to the global food crisis. The problem of food (in) security in the developing countries was brought in on the forefront at the FAO World Food Summit, 1996. The issues afflicting food security mainly population, environment, agriculture, gender, etc., were highlighted by this Summit in order to sensitize the international community about its obligations to eradicate hunger and malnutrition from this planet. It led to a common acceptance to the definition of food security as: “food security exists when all people, at all times have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (World Food Summit Plan of Action, 13 November 1996).

Thus, the attention has been focused on food availability, food quality, food accessibility and use and, most recently, the human right to adequate
food as advocated by the World Development Report, 2008. Generally, the world is food secure, means producing enough food to meet the dietary needs of total global population. Yet 850 million people are still food insecure as they do not have sufficient income to buy food.

Population growth is one of the important factors demanding increase in food production. According to the latest UN population statistics, the world population is projected to grow by 34 percent from 6.8 billion today to 9.1 billion in 2050. Income levels will be multiples of what they are now (FAO Report on World Summit on Food Security, Rome 2009). Thus, the increase in both population and income will require additional food production and also a shift in the types of food to be produced.

The estimates highlighted in the ‘World Summit on Food, 2009’ indicate that the shares of grains and other staple crops in the diets will be declining; those of vegetables, fruits, edible oil, meat, dairy, and fish product will increase. The global demand for food by 2050 is projected to be 70 percent higher than today, involving an additional annual consumption of nearly 1 billion tonnes of cereals for food and feed and 200 million tonnes of meat.

A set of factors will condition the world food prospects in the new millennium starting at the environmental end of the spectrum towards the more social and institutional end. The above set of factors that condition the world food prospects need to be addressed in interrelated manner in order to secure food security globally. New strategies and policies might be thought to optimize food production and secure food supply. Against this backdrop, Afro-Asian Rural Development Organization (AARDO) organized the 32nd RECA Seminar on “Food Security – Global Trends and Perspective”. The main objective of the seminar was to share the experiences of food security in member countries. The Organization brought together four resource persons and fourteen participants from twelve member countries. The papers presented by resource persons and participants formed the basis of the deliberations of the seminar. These papers provided invaluable information on food security situation in Afro-Asian counties. Apart from the presentation of the papers, field visits to JA Hyogo Prefecture Union was organised. Participants were taken to Hyogo Life Centre, Kasai Agricultural Extension Centre, JA Hyogo Minami, and Yamata Farm Management Association where they were enlightened about agricultural activities.

I wish to reiterate here that the lively and interesting discussions were held during the course of the seminar that resulted into some extremely useful recommendations for the member counties on how to further strengthen their agricultural development programmes. This report of the seminar would be an addition to the existing literature on food security. The presentation of expert and country papers which have been reproduced in this report for wider circulation would surely invoke further deliberations on the theme which are highly significant for Afro-Asian countries. I hope that the report would be useful to the policy makers, academicians, researchers and other stakeholders.

New Delhi
Dr Abdalla Yahia Adam
November
Secretary General
ACKNOWLEDGEMENTS

The 32nd RECA Seminar on “Food Security – Global Trends and Perspective” was organized in collaboration with the Central Union of Agricultural Cooperatives (JA-Zenchu) and the Institute for the Development of Agricultural Cooperation in Asia (IDACA) in Japan during 12-25 July 2010. The successful organisation of the seminar could become possible only through the continuous support and cooperation extended by the collaborating institutions who provided their valuable services.

First and foremost, AARDO extends its sincere thanks to the Central Union of Agricultural Cooperatives (JA-Zenchu) and the Institute for the Development of Agricultural Cooperation in Asia (IDACA) for their kind support for successfully organization of the seminar.

AARDO sincerely acknowledges the cooperation and support extended by Mr. Miyazaki Kenjiro, Managing Director, IDACA and the excellent support and organizational skills of his able colleagues in making excellent arrangements and efficient coordination that resulted into logical conclusion of the seminar. AARDO wishes to extend its sincere thanks to Mr. Fujii Akihiro, Manager, International Cooperation Office, JA Zenchu for sparing time from his busy schedule for the opening ceremony of the seminar. Special thanks are also due to Dr Yukio Abe, Seminar Coordinator, IDACA who coordinated the seminar including the field visits successfully.

The seminar was well organised and provided an opportunity to the participants to learn from the vast experiences of Japan in ensuring food security. The presentations made by the resource persons from R.O. China, India, Japan and Sudan on the subject were highly useful that provided an insight about the food security and challenges ahead. AARDO extends it gratitude to them for their analytical, informative and thought provoking presentations, which helped in formulating the appropriate recommendations of the seminar. At the same time, AARDO takes this opportunity to thank all the chairpersons of various technical sessions for useful interventions and smooth conduct of the seminar.

AARDO wishes to convey its profound thanks to the governments of twelve (12) participating countries, namely, People’s Republic of Bangladesh, Republic of China (Taiwan), Arab Republic of Egypt, Republic of Ghana, Republic of India, Republic of Iraq, Hashemite Kingdom of Jordan, Republic of Malawi, Federal Republic of Nigeria, Sultanate of Oman, Islamic Republic of Pakistan and Republic of the Sudan for sparing the services of their senior officers to participate in the seminar. The presentations of country papers and their participation in group discussion immensely helped in arriving at the appropriate recommendations of the seminar.

AARDO also takes this opportunity to express its sincere thanks to the JA Hyogo Prefecture Union as well as Government Offices for sparing services of their senior officers to spend precious time with participants to acquaint them with agricultural activities and extension services in Japan. AARDO sincerely acknowledges the valuable contribution and cooperation extended by Mr. Nubohiro Mantani, Deputy Director, Agricultural & Environment Affairs Department, Hyogo Prefecture Government during the field visits. Special thanks are due to the senior officers and staff of Hyogo Life Centre, Kasai Agricultural Extension Centre, JA Hyogo Minami, and Yamata Farm Management Association who enlightened
the participants about their activities and addressed their queries.

AARDO also places its thanks to Mr. Nishi Waki, the progressive farmer of JA Hyogo Minami who enthusiastically briefed the participants about the cropping pattern of various crops and their productivity and pleasantly responding to the queries of the participants.

Last but not the least, the Organization extends its profound thanks to everyone especially kitchen and hostel staff of IDACA in making comfortable and pleasant stay. The cooperation of all those who worked tirelessly behind the scene to make this seminar a great success is also greatly acknowledged.
1. PROCEEDINGS OF THE SEMINAR

1.1 Inaugural Session

The proceedings of the Inaugural Session of 32nd RECA Seminar on Food Security – Global Trends and Perspective were held at the IDACA Conference Hall at 10.45 A.M on 13th July 2010. Mr. Miyazaki Kenjiro, Managing Director, the Institute for the Development of Agricultural Cooperation (IDACA), Mr. Akihiro Fujii, Manager, International Cooperation Office, Central Union of Agricultural Cooperatives (JA-Zenchu), Mr. A.W. Anwer, Executive Secretary on behalf of the Secretary General, AARDO and Dr. Y. Abe, Seminar Coordinator, IDACA addressed the participants during the inaugural session of the seminar.

Mr Miyazaki Kenjiro, Managing Director, IDACA in his opening remarks on behalf of IDACA, welcomed the participants from Asia and Africa. He first and foremost, expressed his heartily thanks to distinguished participants, resource persons and AARDO officials who has come all the way to attend the seminar.

The Managing Director mentioned that he is very grateful to Mr. Akihiro Fujii, Manager, International Cooperation Office, Central Union of Agricultural Cooperatives (JA-Zenchu), apex body of agricultural cooperatives in Japan who kindly attended the opening ceremony, sparing time from his very busy schedule. He also thanked JA-Zenchu for their patronage and warm support to our activities both physically and spiritually. He said that RECA seminar has been conducted every year in our Institute based on the agreement concluded between JA Zenchu and AARDO. This year the seminar marked 32nd since the first seminar held in March 1968 and can be regarded as one of the most traditional seminar with 42 years’ of history. It has been conducted under such themes as agriculture/rural community development and empowerment of rural women etc. After the year 2000, there was a case in which IDACA and AARDO took up “WTO Negotiations” as the theme of the seminar.

This year it was decided that the theme “Food Security – Global Trends and Perspectives” to be taken up as the main subject. He stated that food security lies in preparing food supply for the worst before a crisis occurs by way of studying measures for securing food and ways of addressing aging farming community in the event of its possible far reaching impact owing to unpredictable incidents.

In this context, it is the fact that there are a number of countries that can hardly provide food supply to the people in case of emergency as well as secure it due to various reasons. He keenly hoped that this seminar will be of much relevance to all the participants from the perspective of establishing the appropriate food security measures.

Taking advantage of the opportunity, he mentioned that IDACA is a training center established by Japan’s agricultural cooperative organizations including JA Zenchu, overall guidance organ of Japan’s agricultural cooperatives with a view to fostering personnel engaged in the promotion of agricultural development in different countries centering in Asia.

He said that IDACA marked 47th year of its establishment and hitherto had received 5,500 participants involved in the agricultural and cooperative development from 109 countries centering on Asia and Africa, Middle and South America, Europe, etc. He mentioned that the participants may be aware that former participants...
from your countries have also undergone a training
or seminar on the promotion of rural development
and agricultural cooperatives in the Institute.
IDACA is further committed to making humble
contributions to the development of agriculture and
agricultural cooperatives as the international
institution down the road. He concluded his
address by wishing comfortable stay during hot
summer season. He also wished fruitful
discussions.

Mr Akihiro Fujii, Manager, International
Cooperation Office, Central Union of Agricultural
Cooperatives (JA- Zenchu), while addressing the
participants mentioned that as a member of
AARDO he heartily welcomed all to Japan. He
mentioned that Japan’s economy developed with
minimum natural resources but some people start
doubting whether this trend will continue. He
added that JA-Zenchu is of the opinion that food
security for Japan and its people is very important,
hence it must focused on ensuring full food security
to each and every citizen of the country. This may
also apply to the participating countries of the
seminar. He wished all the success to the seminar.

The welcome address of H E Dr Abdalla Yahia
Adam, Secretary General, AARDO was delivered
by Mr Abdul Waheed Anwer, Executive Secretary,
AARDO on behalf of the Secretary General. While
thanking the IDACA and JA-Zenchu for jointly
organizing the RECA Seminar, he welcomed all
the resource persons and participants from
member countries. He also thanked Mr. Akihiro
Fujii, Manager, International Cooperation Office,
JA-Zenchu for his august presence during the
Inaugural Session of the Seminar. The address
gave a brief introduction of the Organization and
its activities; historic relations between JA-Zenchu
and AARDO in promoting agriculture and
agricultural cooperatives in member countries by
holding the RECA seminar since 1967.

Further, address also focused on the concept of
food security which emerged in the 1970s following
the rapid increase in food prices that led to the
global food crisis. Since then food security is
closely linked with human security and hence, it
has been the focal point of the policies of all the
countries facing the problem of hunger, malnutrition
or dependence on imported food. The FAO World
Food Summit, 1996 defined the food security and
placed the emphasis on - equitable access to
land tenure; resource rights and; responsibilities;
 improved market access; regional trade, market
infrastructure and economic integration; and
livestock development. Therefore, the attention
has been focused on food availability, food quality,
food accessibility and use and, most recently,
the human right to adequate food as advocated

The prevailing situation demands improvement in
the agricultural scenario both in production as well
as distribution. This can be achieved through
adoption of modern technologies and practices
for optimizing food production. Transformation of
farmers’ communities through institutional
development has also become imperative to
handle the situation. The issues of rural – urban
migration and less engagement of people in
agriculture, ageing of farming communities and
lack of succession and small scale family farming
which threaten optimization of food production
needs to be addressed. Besides, development
of rural infrastructure (roads, electrification and
irrigation) to boost food production and provide
access to food need to be given priority.
Distribution related issues such as storage,
processing, post harvest losses and increase in
the purchasing power of poor people are to be
addressed.

The issue of food security has been debated over
the years and has assumed critical importance
because of widespread hunger and malnutrition.
Therefore, the above mentioned factors that
condition the world food prospects need to be
addressed in interrelated manner in order to
secure global food security. There is a need to devise sound strategies and policies to optimize food production and secure food supply. Against this backdrop, Afro-Asian Rural Development Organization (AARDO) organized the 32nd RECA Seminar on “Food Security – Global Trends and Perspective”

Before concluding, he once again expressed his sincere thanks to JA- Zenchu and IDACA for their continuous support in successfully organising the RECA Seminars. He also thanked the member countries for sparing the services of their senior officers to attend this Seminar and wish them pleasant and comfortable stay at IDACA. Full text of the address is placed at Annexure at 5.1.1.

1.2 Objectives

The Seminar was organized with following objectives:

• To provide a forum to review and deliberate on global situation of food security - trends and perspective;

• To share information on the best practices and technologies being applied to achieve the food security in the member countries; and

• To formulate policies and an action plan to overcome the current and potential challenges to ensure food security.

1.3 Participation

The Seminar was attended by fourteen (14) participants from twelve member countries besides four (4) resource persons and three AARDO officials. The resource persons were from India, Japan, Sudan and R O China (Taiwan). The participating countries include People’s Republic of Bangladesh, Arab Republic of Egypt, Republic of China, Republic of Ghana, Republic of India, Republic of Iraq, Hashmite Kingdom of Jordan, Republic of Malawi, Federal Republic of Nigeria, Sultanate of Oman, Islamic Republic of Pakistan and Republic of Sudan.

1.4 Technical Sessions

The technical sessions of the seminar were held from 13-16 July 2010 in which five experts and twelve country papers were presented. Presentations of the papers were followed by questions and answers/observations/clarifications from the resource persons and participants.

1.4.1 Technical Session I : Presentation of Expert Papers

During the first technical session, three (03) expert papers were presented by the Resource Persons from India, Sudan and R.O. China. Summary of the expert papers is as follows

**Expert Paper 1 : “Food Security: Global Trends and Perspective with Special Reference to Asia”** by Prof. R.K. Sharma, India

**Chairperson:** Dr Yukio Abe, Seminar Coordinator, IDACA

In his presentation, Prof. Sharma mentioned that aggregate food security in the world has been improving markedly over the past half a century due to increasing food availability per capita and declining real food prices. However, at individual level hunger, malnutrition and food insecurity remain widespread. Many countries of the world has implemented food assistance programme, however, many of these have proved to be expensive and ineffective or both. Recent global crisis is the product of sudden spurt of food price caused by various factors like imbalance in demand and supply, diversion of food grains for bio-fuel, adverse weather conditions, increase in crude oil prices, and role of speculators and hedge
funds and so on. However the accompanying financial crisis made things worse. Prices started easing but due to the downward stickiness of prices, yet many countries including India continue to suffer from food inflation. Therefore the issue of food security at the global level has suddenly come back on the world agenda. Food security is linked to consumption, production and marketing of food. Higher productivity requires more investment in agriculture, more machinery and as well as more skilled and better trained work force and better functioning of markets or supply chains.

He further explained that the analysis shows that at the global level there is no major threat to food security, however at the national or individual level, this is a serious issue as the required redistributive mechanisms are not in place. Therefore even the comfortable situation of food availability at the global level cannot be translated into food security for all.

He added that the major constraint on food security at global or country level will depend on the possibility of area expansion which has almost exhausted and any further expansion of area will have serious consequences for environment. However area under cereal crops may expand but will be at the cost of other crops. The problem is further compounded because of lack of access to food by nations or individuals due to lack of income or stable income sources by the people. The only savior could be the access to yield increasing technology in agriculture. Although the population growth rates have been declining they should not made us complacent and we must act and try to contain the rising population like that of China. The hotspots of food insecurity are also having relatively higher concentration of population and growth in countries like India these growth rates add large numbers which can only be fed with tremendous efforts.

Prof. Sharma mentioned that the food insecurity was widely viewed as a problem of insufficient and unstable production. As he has already pointed out food availability is a necessary but not a sufficient condition for food security. Major challenges in ensuring food security in the future will be that of climate change and rapidly rising energy prices.

After the presentation, the chairperson thanked Prof. Sharma for his elaborate and comprehensive presentation. He added that issues raised in the presentation are very relevant to food security and experiences of Japan, Taiwan and Korea can help in addressing them. He invited the questions/comments from the participants.

Mr. Sheikh Gazanffar Hussain, distinguished participant from Pakistan asked whether supply side has been more stable in India in recent times. Replying to his query Prof Sharma mentioned that due to consistency in Government policy, the supply of food items has been quite stable, though there can be shortfall due to seasonal factors. To the query from the chairperson, the speaker informed that not much attention had been paid in creating and maintain buffer stock.

While addressing the query of Mr. Mohammad Nazrul Islam from Bangladesh, regarding contribution of India towards global food security, Prof. Sharma informed that India has lot of arable land with huge population. It is true that India can play very important role towards global food security. But in spite of these resources, the rate of agriculture production is not as expected. Besides, in some of the fertile areas of India, the food production is declining because of excessive use of land and water resources resulting in lowering of water table specially in the regions of Punjab and Haryana. He further added that we must apply some better technologies.

Chairperson: Mr. Gazanffar Hussain, Pakistan.

Prof. Babo Fadlalla, in his presentation explained that food insecurity is a function of both quantity and quality of food. Livestock are important in terms of both availability and quality of food. In Africa, total world livestock population, its contribution to world production of meat, milk and eggs is modest and does not reflect the large number of animals found in the continent. He further stated that the issue of food security in Africa with emphasis on livestock is very critical. Africa hosts a relatively large share of the world’s population of livestock, it embraces about 20% of the world’s cattle; 27% of the sheep; 34% of the goats; 2.8% of the buffaloes; 85.0% of the camels; 2.8% of the pigs and 7.4% of the poultry. Despite these large numbers, production of livestock products in Africa is extremely low, not comparable with numbers. For example, in 1995 Africa produced only 4.5% of world meat, 4.3% of the milk and 3.6% of the eggs. In 2007, its share was 4.4% of the world’s meat production, 5.0% of the milk and 3.2% of the eggs.

He added that per capita consumption of livestock products of Africa was also very low compared with world average and with other regions. World yearly average per capita meat consumption was 35.7 kg in 1995 which increased to 41.2 kg in 2005 with an annual growth rate of 1.5%. The figures for developed countries were 77.3 kg in 1995 and 82.1 kg in 2005 with an annual growth rate of 0.6%. North Africa per capita consumption was 22.5 kg in 1995 and 23.3 kg in 2005 with an annual growth rate of 1.2%. While Sub-Saharan Africa consumption was 12.4 kg in 1995 which increased to 13.3 kg in 2005 showing an annual growth rate of 0.7%. In 2005, per capita consumption of meat for North Africa was 56.6% of world average. Sub-Saharan Africa per capita consumption of meat was 32.3% of world average but only 16.2% of that for developed countries. Annual growth of per capita consumption for Sub-Saharan Africa was 46.7% of world average and that for North Africa was 80% of world average.

A similar trend was reported for milk and eggs consumption. In Africa, this may be attributed to the introduction of improved dairy breeds in many parts of continent. Africa’s contribution to world milk production was only 4.3% in 1995 and 5.0% in 2007. World per capita milk consumption was 75.6 kg/year in 1995 and 81.2 kg/year in 2005 growing at 0.8%. Consumption in developed countries was 198.3% in 1995 and 207.7% in 2005 growing at 0.5% during the same years. In comparison, North Africa had a consumption of 68.2 kg in 1995 and 83.4 kg in 2005 and a growth rate of 2.0%. Sub-Saharan Africa per capita milk consumption was 27.9 and 30.1 kg/year with a growth rate of 0.7% in the two years respectively. This was 37.1% of world average and only 14.5% of that of developed countries in 2005.

Prof. Babo stated that in case of production of eggs the situation is not better from that for meat and milk production. North Africa eggs consumption was 64.4% of world average in 2005 while that of Sub-Saharan Africa was 17.8%. He further stated about the factors contributed to the low African production and consumption levels i.e. enhancing livestock based food production; nutrition as a major contributor to level and cost of production; livestock diseases control; enhancing capacities in livestock production research and extension; increased use of bio-fuel and climate change, recurrent droughts and hostile environment.

He emphasised that in order to mitigate the constraints to Africa’s poor production and consumption of livestock products persistent efforts need to be applied by African governments.
and other stakeholders. These efforts should address issues like the transformation of traditional production systems capitalizing on the adoption of advanced appropriate technology such as improved genetic stock and water management; land reform to allow more investment in animal and agriculture; enhancement of technology generation and transfer capacities; control of diseases; improvement of animal and crop husbandry practices; drought preparedness strategies; alleviation of poverty and mitigation of conflicts.

Thanking the speaker for the informative and valuable presentation on livestock in Africa, the chairperson opened the floor for discussion. Dr. Anwar distinguished participant from Egypt asked about the consumption of livestock in comparison with the production in Africa. While addressing his query, Prof. Fadlalla informed that paper mainly focuses on the production aspect of livestock and that the consumption of livestock is less in Africa in comparison to world consumption.

Replying to the question of Mr. Emmanuel, the distinguished participant from Ghana regarding low level of consumption of meat in Africa, speaker mentioned that cattle are held for security and other purposes including prestige, etc. Production and consumption of meat will however increase when economy as whole will increase, in turn, it will enhance the purchasing power of the people. Mr. A.W. Anwar from AARDO stated that in Africa large track of land remain uncultivated due to low return and risk involved. He cited the example of Zambia where large agricultural land remained uncultivated as small farmers find it difficult to compete with big farmers.

Expert Paper 3: “Food Security – Global Trends and Region Perspective with Reference to East Asia” by Dr. (Ms.) Ching-Cheng Chang, R.O. China.

Chairperson: Mr. Mohammed Nazrul Islam, Bangladesh.

In her presentation, Dr. Chang stated that the demand and supply side gave more concerns rise to the distribution of food and access to food. Recently, the food price change has reflected precarious food insecurity for many low income countries. The increase in food prices would be negative development for low income, food deficit countries, many of which are becoming more dependent on imported foods and food ingredients. The sharp increase in global food prices during 2007-2008 has triggered the awareness of food insecurity problems and their impacts on the low income, food-deficit countries many of which are located in the East Asian countries. The food security situation was good in relative terms given that the percentage of carbohydrates consumed is slightly lower than the world average while proteins and fats consumption are higher than that of other regions.

She further explained that particularly for developing countries, FAO states that the current economic turmoil is different in three important aspects i.e. (i) the crisis is affecting large parts of the world and thus traditional coping mechanisms used to focus on several countries in particular regions are likely to be less effective than they were in the past; (ii) the current economic crisis emerged immediately following the food and fuel crisis of 2006 to 2008. While food commodity prices in the world market declined, they remained high by recent historical standards; and (iii) developing countries have become more integrated, both financially and commercially, into the world economy than they were 20 years ago.

Dr. Chang explained that the region’s food security is largely driven by domestic production performance and despite the doubling of import volume during the last decade, Asia remains the least dependent of all regions on food imports. She further mentioned that recent cyclones, flood and droughts in addition to the continuing conflicts and civil strife affected most regions in East Asia. From 2000 to 2006, based on FAO statistics, only
Cambodia, Indonesia, North Korea, Laos and Philippines received continuous food aid. In China, the harvest of the 2009 secondary spring wheat crop was completed in August and output is estimated at record 6 million tons and in Japan, agriculture is in a freefall decline. The food supply and market access difficulties exits in Myanmar and in North Korea and the food security remains precarious because of political problems.

She further stated that agricultural production is rather vulnerable to climate change, in particular, temperature and precipitation changes. The impact of climate change on rice production in Asia is of particular policy interest considering that rice is the most important component in millions of Asian’s diet. Food security in East Asian region was good in relative terms as it is largely driven by domestic production performance subject to climate anomalies. There are some policy implications, (i) policy measures aimed to effectively alleviate food security problem should take into account the geographically diverse impact; (ii) most government response focus on short term measures such as reducing food prices through trade or price control and (iii) risk of facing a long term food insecurity exists which may render national action inadequate and require multilateral cooperation.

While thanking to Dr. Chang, for the presentation especially focusing on impact of the climate change, chairperson said that Bangladesh is one of the country to be worst affected by climate change. Thereafter he invited the question from the participants. While replying to the question of Dr. Anwar distinguished participant from Egypt regarding the assessment of government policies, Dr. Chang informed that we do not have such assessment but she emphasized that there is need to properly evaluate these policies. Answering to the question of Mr. Emmanuel Garti, distinguished participant from Ghana, Dr Chang mentioned that an assessment is needed to determine the best mix of strategies to ensure that food security is not sacrificed to energy needs and vice-versa. While addressing the second question of Mr. Emmanuel regarding use of marginal land for bio-fuel production, she replied that it could be a viable option to meet the energy needs with out compromising the food security.

Ms. Reena Saha, distinguished participant from India enquired about the factors taken into consideration in the study of climate change in Asia while assessing its impact on rice production. Replying to her query, Dr. Chang mentioned that the study by Rosenzweig and Iglesias was adopted to provide the yield response to temperature and precipitation changes because the study considered differences across regions and the crops. She further elaborated that the sea level rise is not taken into account; therefore, the effect on the coastal regions in Asia is not available. Dr. Abe enquired about the relationship between food security and organic farming as many developing countries are showing interest in organic farming. This may affect total food production at least in short run. The speaker replied that some countries are advocating the use of agricultural waste to produce organic manure. In the short run it may affect the productivity and can disturb food security.

Mr. A.W. Anwer, AARDO thanked the speakers for their informative presentation and sharing their rich experiences with the participants. He also thanked the chairpersons for conducting the session in a very professional and academic environment.

1.4.2 Technical Session II: Presentation of Country Reports

Chairperson: Dr (Ms) Ching-Cheng Chang, Republic of China

Second technical session was held in the morning of 14th July. Five country papers namely,
Bangladesh, R.O. China, Egypt, Ghana and India were presented. Paper presentation was followed by discussion. Summary of the papers and discussion is given below.

Bangladesh

The first presentation of the session was made by Mr. Mohammad Nazrul Islam. He focussed on his presentation the important factors for determining food security, to identify the nature of food security problem and draw distinction between chronic and transitory food insecurity. In his paper, he attempted to reveal the current trends in food production, availability, access and consumption situation at the national level. He mentioned that Bangladesh has achieved from ‘self-reliant to surplus’ position in aggregate food (mostly rice, wheat, maize) production in recent times and has declared Food Security as a vitally important feature of its national policy contributing to its socio-economic stabilisation and development. Despite the growth in food production and its availability, food insecurity is still a major problem mainly because of the lack of purchasing power thereby causing inability to access to food, especially for the ultra poor. Transitory food insecurity occurs when households face a temporary decline in access to enough food. Famine is the worst form of transitory food insecurity which can result from one or more causes like flood, drought, crop failure, market failure, loss of real purchasing power by group of households etc.

He further stated that measuring food security is better if assessed by nature and extent of the food security situation and the possible ways to improving it at the national, local, household and intra-household level. The ultimate goal is to meet the food requirements of the people at all levels i.e. at the national level which is determined by the availability of enough resources for the whole population; at the sub regional level by which food security can be measured by comparing regional nutritional requirements with availability of dietary calories per head; at the household level where food security is dependent on a household’s access to enough food; and a food sufficiency indicator shows the number of individuals living in a household whose access to food is sufficient to provide a dietary intake adequate for growth, activity and good health.

He mentioned that poverty is considered the root cause of chronic food insecurity. Transitory as well as chronic food insecurity is prevalent now in Bangladesh as per spatial, seasonal and income group distribution of poverty. Average population diet in the country is deficient in energy by 15 percent and is imbalanced with inadequate intake of protein, oil/fat, fruits and vegetables. Regarding intake of essential food nutrients, average urban population is in better status than the rural. From gender and age group perspective, nutrient deficiency is more in women and children. The poor have a just adequate intake of grains and 85% of vegetables and less than 50% of protein requirements. The top 15% of the households consume five times more and their consumption level is two-thirds higher than the minimum consumption norms.

Mr. Islam said that the overall production, availability, requirement and food security situation can be analysed by taking into account population growth, income growth and the consequent food demand patterns. Bangladesh has achieved moderate success in checking population growth. Current population growth in Bangladesh stands at a moderate level of 1.4 percent, which is not a bad achievement in developing world context. This growth rate however needs further decline if future food supply to the growing population has to be sustained from domestic productions. A drastic change in the pattern of food demand would occur if per capita income could be accelerated to the range of 3.0 and 3.5 percent per annum. In that
case, with increased income people’s food options will change, thereby food demand would shift from cereals to more valuable food items like meat, fish, milk, milk products, eggs, fruits and vegetables. Thus, this may have serious implications on current predominant practice of crop agriculture.

He also talked about the need to keep relative food prices unchanged, and aid that supply of various types of food to be grown at the same rate as the increase in demand. He also mentioned about the jute invention which will help to know all the genes and gene sequence that govern traits of jute plants and with the help of biotechnology high fiber quality, disease resistant/improved jute varieties at low cost can be developed. He concluded that with the innovations in different high yielding and salt tolerant varieties of rice, adoption and application of biotechnology in crops, vegetables and plants the country will achieve higher level of production.

Congratulating Mr. Islam for very informative and academic presentation, chairperson mentioned that with the application of tissue culture and high yielding varieties in agriculture in Bangladesh, there is a window of opportunity for all of us and invited the comments/questions from the participants. Mr. Ghazanfar Hussain, the distinguished participants from Pakistan asked why is there a resurgence in demand for cultivation of organic jute when there are substitutes available and jute is not even used as food. Replying to his question, speaker informed that new research has led to increase in yield and there is now demand for the jute. Moreover, there is general trend in the world to go for through organic rather than artificial production. He further elaborated that demand for organic product is high and farmers are getting better return. With the increase in income and purchasing power of farmers by growing jute, they have better access to food. The participants from India clarified that the demand of jute is increasing as people are discouraging the use of artificial fiber material and the word organic jute had been used in the context of material rather than as organic food. Prof. Babo also added that people are discouraging the use of synthetic clothes especially for children.

While addressing the query of Mr. A.W. Anwar regarding the cultivation of jute instead of food products, presenter informed that there will be some diversion in land use, but Bangladesh is increasing productivity of its land with the application of new technologies. He cited some examples of the application the RDA Bogra’s newly innovated technologies such as low cost Deep Tubewell Technology and its spectacular success in supply of pure water for different uses at a nominal cost and use of new innovative varieties i.e. stress and salt tolerant variety of rice and potato tissue culture. Introduction of these technologies made Bangladesh self sufficient in these crops.

R O China

Ms Miao-Fang Chou in her presentation highlighted the issues of increasing global population, increasing food demand in the developing countries, high petroleum price and promotion of bio-energy, increase in global crop prices since 2002. The trend was accelerated after 2006 and reached a peak in mid 2008. She mentioned that the food self-sufficiency ratio of Taiwan is the key indicator of security level of domestic food supply and higher self-efficiency ratio represents the country’s capability of producing and supplying food. The ratio of Taiwan appears decreasing due to changing consumers’ behaviour, free trade trend, small size of farmers and aging of agricultural labour force. In 1970, the major exported products were replaced by canned asparagus, canned mushrooms and bananas but the major food exports had become aquatic products, pork and preserved vegetables. The
increase in agriculture imports is mainly explained by two reasons i.e. the imports of dairy products and beef and rapid increase in imports of cereals and fishmeal.

She further mentioned that presently 22% of the total area of the island is used for agricultural and food production. The average farm size was less than 1 ha. according to the 2006 census and these farms were a major bottleneck to the enhancement of productivity in Taiwan’s agriculture and only because of this the agricultural employment has decreased from 1667 thousand persons to 740 thousand persons during the same period in 2008. She said that agriculture in Taiwan is currently facing various challenges, both domestic and abroad, including trade liberalisation, increasing concern about food safety, food security and environmental conservation and to overcome these challenges the government has taken major actions.

Ms Chou stated the major food security policy and actions in Taiwan taken by government are, raising purchasing prices of rice; enlarging farming scale; securing the inventory of prime farmland; encouraging farmer to plant the import substitution crop; encouraging the consumption of local-produced food; improving food production efficiency and quality; encouraging rational use of fertilizers; promoting exports of agricultural product and securing the food stocks. In her concluding remarks she said that food security is an important issue with world-wide concern. Facing the challenges brought by the climate change and the burdens resulting from ever-growing global populations, more collective efforts from international community are required to tackle a broad range of problems in agriculture production.

Chairperson thanked Ms. Chou for the presentation and opened the floor for discussion. Mr. Ghazanfar Hussain, distinguished delegate from Pakistan enquired that on one hand people are being encouraged to consume locally produced food but at the same time export of food products is also promoted. How are the two statements reconciled? Replying to his question, presenter explained that people are encouraged to eat more rice which is in surplus in the country and take less meat which has to be imported. At the same time export of horticulture products is encouraged to maintain balance between import and export, she further said. Chairperson added that rice is in excess supply and livestock products are in short. Now under WTO obligation, Taiwan has to import rice. Currently, government is encouraging the farmers to diversify crops. For export, high value crop such as flowers, mango are being encouraged to ensure balance in food self sufficiency.

**Egypt**

Dr Anwar, in his presentation, briefly defined that food security exists when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food which meets their dietary needs and food preferences for an active and healthy life.” To achieve food security, the main four dimensions must be considered i.e. food availability; food access; utilization and stability. Prices of food and other basic goods and services, which constitute the consumption of the poor, increased much faster than the prices of non-essential goods and services. The agriculture sector contribution is over 30% of the employment opportunities. According to sources, farm incomes (crops and livestock) account on average about 25-40% of total rural income; agricultural related off-farm incomes account for additional 20-35%; while non-farm revenues including wages account for about 40% of rural household incomes.

He said that despite the annual economic growth, most Egyptian households have suffered the effects of major international shocks from 2006 to
date – the avian influenza epidemic, followed by the Triple F crisis. The avian influenza outbreak compelled government to oversee major culling of the poultry stock throughout the country, severely affecting a major income source for poor Egyptian households, particularly women and reducing egg and poultry consumption by half, thereby impacting the nutrition and income of consuming and producing households. The current food subsidy system in Egypt covers: i) baladi bread (Country Style) available to everyone; and ii) Ration Card: that allows families to obtain pre-determined monthly quotas of subsidized commodities, especially cooking oil, sugar, tea and rice.

He further mentioned that the cost of the minimum food basket increased by 47% in 3 years, much faster that the overall CPI (31%). The sharp increase of food goods led to the increasing importance of subsidized food commodities, especially for the poor to cope with the food price increases. In addition to expanding the coverage and quantities of commodities made available at subsidized prices, the government separated the production and distribution of baladi bread to improve people’s access to bread. The Government of Egypt also piloted the smart card system for distribution purpose and increased social assistance to more beneficiaries.

He also focused on major challenges threatening food security in Egypt including (i) rapid increase of population with limited land and water resources; (ii) scarcity of arable land represents just less than 3 percent of the total land surface, while permanent crops cover 0.5 percent. The agriculture is almost entirely dependent on irrigation; (iii) scarcity of water (iv) increased fragmentation and scattering of agricultural holdings; (v) deteriorating land efficiency (Classification of Land Resources); (vi) climate change threatens like drought, temperature stress, water stress and coastal flooding; (vii) challenges facing food safety nets and (viii) Governmental Programs to Improve Food Security.

Thanking Dr. Anwar for lovely presentation, the chairperson mentioned that threats to agriculture in Egypt due to climate change are same as highlighted in Bangladesh paper and required some serious thinking. She also mentioned the safety net programme of the Egypt will help in ensuring the food security of the people. Thereafter she invited the questions from the participants.

In response to the query of Mrs. Sphiwe Mauwa, distinguished participant from Malawi on staple food of Egypt, the presenter informed that the staple food of Egypt is bread made from wheat and it is highly subsidized by the government. Government did not raise its prices for a long time despite sharp increase in wheat prices. Addressing to the question from Prof. R.K. Sharma, Dr. Anwar informed that bread production is decentralized and 1800 bakery units are engaged in its production. But now government is thinking to centralised its production in order to reduce the leakages.

Replying to the question of Mr. Nazrul Islam from Bangladesh regarding rise in sea level due to climate change, presenter mentioned that with increase of one meter sea level, Egypt may lose its 30% of agriculture land in the northern region. However, he mentioned that this is a global problem and it would be addressed globally with the help of international community.

Ghana

Continuing the presentation, Mr Emmanuel Kwesi Hedzro-Garti from Ghana presented his country paper. He mentioned that the essence of food security in the era of economic slow down has dire consequences for countries in the Afro-Asian region. The need to meet the daily nutritional needs for all people calls for governments to put in place the needed mechanism to enhance self sufficiency in the production of staples consumed most. Food security among others has become
a critical political and economic issue. The need to consolidate a country’s ability to feed itself is more of a national security issue.

He said that Ghana faces the challenge of making substantial progress toward food security because average yields have remained stagnant. Rainfall is a major determinant in the annual fluctuations of household and national food output. This creates food insecurity at household levels, which can be transitory in poor communities and chronic in distressed areas. Malnutrition is a serious problem among children, adolescents and pregnant women due to insufficient levels of food intake and or diets not providing an adequate nutritional intake. Adverse weather conditions often exacerbate drought-related crop failures, especially through bush fires that have a disproportionately severe impact on small farm enterprises. Current food security situation in Ghana is on the basis of household’s food consumption and 5% of the population or 1.2 million people have very limited access to sufficient and nutritious food for an active and healthy life and are defined as food insecure. Concepts such as income, population, bio-fuels, land and climate change when not dealt with critically with a well defined policy framework will not auger well for sustained food security. Ghana’s effort at enhancing sustained food security is well crafted Food and Agriculture sector development policy and specific implementation manual called the METASIP. Targeted government programmes such as the Fertilize Subsidy scheme and the Block Farm Programme are well placed to deliver on food security. Targeted interventions have also been made to make land available for investments in the Agriculture sector though the establishment of the Land Administration Project (LAP 2000) to ease land acquisition and utilization. A national climate change committee has been established to prepare and present the report, and to evaluate national and international policies on climate change.

Mr. Garti explained that land acquisition in Ghana can be cumbersome because the individual will have to go through several processes to secure the land and also climate change has gradually gained publicity. Rainfall had decrease in most parts of the country and is however expected to increase in the forest zone. To ensure sustainable food security there is the need to supplement the efforts that the national buffer stocks, improved food redistribution, crop insurance schemes, food pricing marketing mechanisms, the reduce price fluctuations to facilitate access by households in all income categories. He lastly said that climate change is a development issues that requires a multi-sectoral approach backed by reliable information.

Chairperson thanked the speaker for presentation and invited questions. Mr. Oshadya distinguished participant from Nigeria asked that who issue the title of deeds on lands which is in the custody of the traditional chiefs. Answering to his question, presenter informed that the title is only issued by the state government on the lands being controlled by them. In Ghana constitution recognized the tribal chief but they are not issued any land title.

While addressing the query of Dr. Anwar distinguished participant from Egypt regarding land tenure in Ghana, he informed that only 18% of land is under the control of government and 80% of land is controlled by the traditional chiefs in the country and only 2% of land is in the hand of private owner.

India

In her presentation, Ms. Reena Saha explained that agriculture provides significant support for economic growth and social transformation of the country. As one of the world’s largest agrarian economies, the agriculture sector in India accounted for 15.7 percent of the GDP in 2008-09, compared to 18.9 percent in 2004-05 and
contributed approximately 10.2 percent of total exports during 2008-09. In the recent past, the impact of various food, financial and economic crises has been felt across the world. This has compromised the lives, livelihood and food security of the people especially the poor. Government has several scheme for providing production and distribution of agricultural inputs like seeds, fertilizers, credit, irrigation, insurances, agricultural machinery etc. Cropping activities go on all round the year in India provided water is available for crop. In northern India there are 2 distinct crops namely, Kharif and Rabi.

She further stated that growth in production of agricultural crops depends upon acreage and yield. Limitations of expansion in agricultural land suggest that multiple cropping to be a means to increase the gross cropped area and the main source of long term output growth can only be improvement in yields. She said that food consumption pattern has been changing with wider availability of food choices, sustained economic growth and increasing urban population. These changes influence the food choices and their demand. There has been an increased diversification of the food basket in India with increased demand for high value commodities like vegetables, fruits, milk, animal protein and sugar. She also explained that chemical fertilisers have played a significant role in the development of the agricultural sector. The per hectare consumption of fertilisers in nutrients terms increased from 105.5 kg in 2005-06 to 128.6 kg in 2008-09. The government has taken a number of measures to improve fertilisers application in the country. To encourage the balanced use of fertilisers, the concept of customised fertilisers has been introduced in the FCO, 1985. These fertilisers are soil and crop-scientific and contain secondary and micro-nutrients, besides NPK.

Ms. Reena mentioned that the government has taken many policy initiatives to strengthen the farm credit delivery system for providing credit at affordable rates of interest to support the resource requirements of the agriculture sector. These policies include: institutional arrangements; revival package for short term cooperative credit structure; kisan credit card; rate of interest on agricultural loans and flow of credit. A number of centrally sponsored schemes are funded and monitored by the department of agriculture and cooperation for increasing the production and productivity of agricultural crops. These schemes are to be implemented by the states in accordance with the district agriculture plans developed under the Rashtriya Krishi Vikas Yojana.

The chairperson thanked the presenters and invited questions from the house. Dr Anwar, distinguished participant from Egypt asked about the efficiency of labour force in India since 52% people are employed in agriculture and their contribution to GDP is only 15.7%. Replying to his question, she explained that 80% are small farmers and they produce for their own consumption. She also added that the size of GDP had grown manifold and accordingly agriculture share to GDP is declining.

1.4.3 Technical Session III : Presentation of Expert Paper

Expert Paper 4 : “World Food Security- Global Challenges and FAO’s Activities” by Dr Mitsuhiro Yokoyama, Director, FAO Liaison Office in Japan

Chairperson: Dr. Y. Abe, IDACA

During the session held in the afternoon of 14th July 2010, one expert paper was presented. The summary of the paper and session proceedings are as under:

Mitsuhiro Yokoyama in his presentation focused on the structure of the FAO, its activities under each department. On food prices, he said that
the soaring food prices in 2007 and 2008; world economic recession since late 2008 had created food insecurity. As a result of these, number of undernourished people surpassed one billion and long-term challenge is how to feed the increasing population under environmental and resource constraints. He also elaborated the reaction of the international community such as organising expert meetings to discuss issues relevant to world food security; supply/demand trend; climate change and bio-energy; foreign direct investment; farm support; Sub-Saharan Africa; technology; food security and financial crisis; global governance etc. He also gave the definition of food security and its dimensions. Long term trend of agricultural production, long-term trend of food prices, long-term trend of food consumption and human right issues to food were explained. Further, he also elaborated goal of the international community and said that combined effect of long standing underinvestment in agriculture and food security, price trends and the economic crisis have led to increased hunger and poverty in developing countries, plunging more than a further 100 million people into extreme poverty and jeopardising the progress achieved so far in meeting the Millennium Development Goals.

Highlighting the factors responsible for soaring food prices he said that bio-fuel production, cost increase due to rising oil prices, economic growth of emerging economies, population growth; low cereal stocks; inflow of speculative money, export restriction; stagnation of agriculture in poor countries; lack of investment, declining share of ODA going to agriculture, shortage of R&D fund, stagnant yield growth are some of the important causes. On Foreign Direct Investment, he expressed his concern on lack of investment – underlying cause of food crisis and need to fill the investment gap. He quoted the recent trend in the investment.

In order to combat the problem, he advocated the introduction of contract farming, technology transfer; employment creation, income generation, infrastructure development, respect for land, water and resource rights; transparency, good governance and enabling environment etc. Climate change adaptation must be tailored to local context; local people, policies, research efforts. He also listed Five Rome Principles for Sustainable Global Food Security

- Principle 1: Invest in country-owned plans, aimed at channelling resources to well designed and results-based programmes and partnerships.

- Principle 2: Foster strategic coordination at national, regional and global level to improve governance, promote better allocation of resources, avoid duplication of efforts and identify response-gaps.

- Principle 3: Strive for a comprehensive twin-track approach to food security that consists of: 1) direct action to immediately tackle hunger for the most vulnerable and 2) medium and long-term sustainable agricultural, food security, nutrition and rural development programmes to eliminate the root causes of hunger and poverty, including through the progressive realization of the right to adequate food.

- Principle 4: Ensure a strong role for the multilateral system by sustained improvements in efficiency, responsiveness, coordination and effectiveness of multilateral institutions.

- Principle 5: Ensure sustained and substantial commitment by all partners to investment in agriculture and food security and nutrition, with provision of necessary resources in a timely and reliable fashion, aimed at multi-year plans and programmes.

After the presentation, the Chairperson thanked
the speaker for his very useful and elaborative presentation on the issue of food security. Thereafter, he invited questions from the participants.

Answering to the question of Mr. Ghazanfar Hussain, distinguished participant from Pakistan, speaker informed that the definition of food security has been devised by FAO and adopted by the member states in World Food Summit held in November 2009. Dr. Malek Mahadin, distinguished participant from Jordan asked about the conditions for providing financial of US$ 20 billion by the G 8 countries for food security of developing countries. Presenter informed that there are no conditions envisaged in this regard.

While replying to the question of Dr. Anwar from Egypt regarding incentives to increase investment in food sector, speaker informed that no such incentives have been promised, FAO just estimated the investment needed in the future. Responding to the question of Mrs. Sphiwe Mauwa from Malawi regarding food surplus, he mentioned that at international market, there can be food surplus but may not really trickle down to the poor people.

Addressing to the question of Mr. Mohammad Nazrul Islam from Bangladesh regarding impact of climate change on food security, presenter admitted that global warming has been posing serious threat to the food security of the low lying countries. He further elaborated that FAO has been working on to sensitize and generate public opinion around the globe in favour of climate change mitigation. FAO has a long term plan to come up with financial support to the severely affected countries.

While replying to the question of Mr. A.W. Anwar from AARDO regarding cost benefit analysis of Jatropha cultivation for bio-fuel, he informed that there is a study conducted by FAO which is available on its website (fao.org). Ms. Miao-Fang Chou, the participant from Republic of China asked that is foreign direct investment win-win measure between investing and invested countries?. Addressing to her question, he mentioned that the foreign direct investment is not only concern to food security but also the resources to invest.

Prof. Babo Fadilalla, the resource person from Sudan enquired about the impact of an increase in bio-fuel production on food security. While agreeing, he mentioned that USA has diverted his 30% of the corn produced for bio-fuel production which had an impact on food security of the people of developing countries. It has to be reviewed, he further mentioned.

Dr. Ching–Cheng Chang, the resource person from the Republic of China asked about the FAO forecast for 70% increase in food demand by 2050. Answering to her question, Mr. Yokoyama informed that FAO has proposed five principles during the World Food Summit held in November 2009. He further mentioned that if all member countries follow these principles, there should not be any problem to meet the food demand as projected.

Dr. Yukio Abe enquired that can organic farming replaces the conventional agricultural chemicals to liberate farmers from the bondage of debts resulting from high inputs costs? Replaying to his question, he mentioned that it will not replace agricultural chemicals because there is a limit in productivity in case of organic farming. He further mentioned more food will be required to feed the increasing population of the world. Concluding the session chairperson thanks Mr. Yokoyama for sparing time to deliver the presentation. The presentation had given a good food for thought.

1.4.4 Technical Session IV : Presentation of Country Reports

Chairperson: Prof. (Dr) Babo Fadilalla

Fourth technical session was held in the morning.
of 15th July. Five country papers namely, Iraq, Jordan, Malawi, Nigeria and Pakistan were presented. Paper presentation was followed by discussion. Summary of the papers and discussion is given below.

**Iraq**

The session started with the presentation of Mr. Sami Gheni Khudhair Attrah from Iraq. He said that after-effects of war, a general economic slowdown and further accelerated by 12 years of economic sanctions, have adversely affected Iraq’s food security. The prevailing climate of insecurity and political uncertainty further complicated the situation. As a result, large parts of the population continue to depend on the monthly food ration provided under the Public Distribution System (PDS) which was introduced by the Government of Iraq in 1991 and managed by the Ministry of Trade. The PDS is designed to provide all Iraqis with a monthly food and non-food rations at a heavily subsidized price.

He discussed about the causes and the main factors affecting food insecurity in Iraq consisted of wealth status; income and expenditure; education level of the head of households; geographic location (urban vs. rural); and sex of household head (female headed more vulnerable). The International Compact with Iraq launched a five-year national plan with two goals in the Compact: (i) Social Safety Net – taking care of the poor and vulnerable and (ii) Reforming Subsidies – phase out inefficient, large-scale subsidy programmes while ensuring delivery of services to the poorest.

Mr. Sami further stated that Iraq is one of the largest oil-producing countries in the world and traditionally 95 percent of Iraq’s foreign exchange earnings are from the petroleum sector. The country developed a solid infrastructure and a well-performing education and health care system during the 1970s, widely regarded as the best in the Middle East. The UN Oil-for-Food programme (1996-2003) allowed the export of oil in exchange for food, medicine, and other humanitarian goods.

He also discussed about an important indicator of food security that is food security patterns for whom who frequently consume a wide variety of foods are more secure than people who only eat bread everyday with some vegetables and rarely eat meat. To develop the food security profile of households in Iraq, information on dietary diversity and the consumption frequency of foods was analysed at the household level. Households were categorised into three food consumption groups according to their score: poor food consumption; borderline food consumption and good food consumption. He continued with that it should be stressed the fact that while the study provides information based on recent trends, the overall situation in Iraq remains highly volatile. While, hopefully, the situation will continue to improve, thus permitting the consolidation of these positive trends, any reversal in the security situation may impact negatively particularly on the performance of the PDS.

Thanking the presenter for nice presentation, chairperson mentioned that Iraq is a good example of how rich countries can cope with the substantial increase in prices of agricultural produce. Iraq handled the situation very well in spite of the fact that country is still suffering from logistic and technical problems.

While answering to the question of Mr. Nazrul Islam distinguished participant from Bangladesh regarding production of dates, presenter replied that due to warfare and turbulent situation, the dates trees have suffered shocks and production has decreased substantially. But of late planting and nurturing of date trees have been started afresh and it is hoped that Iraq will be able to attain its position of export of dates in the coming time.
Dr. Chang from Taiwan asked that what was the impact of 2007-2008 economy crises on PDS operation in Iraq? He replied that due to high oil prices, Iraq economy was not affected by the global crises. Answering to her another question regarding the coverage of small population under the PDS, he mentioned that PDS only provides food for the survival but cannot help them to leave the poverty line.

Jordan

Dr. Malek Y.H. Mahadin from Jordan in his presentation said that Jordan’s status as an importer of both food and fuel, along with the limited potential for food self-sufficiency makes it particularly vulnerable to food price shocks. Jordan depends heavily on imports to feed its population. With the global food crisis in 2008 the Jordanian government made immediate attempts to alleviate the effects of fast-rising commodity prices on the population through several measures and set out to develop a national food security strategy.

He mentioned that Jordan is a country of limited agricultural resources and the area of arable lands does not exceed 4 million dunums, i.e. less than 1 dunum per person. The lands cultivated under rain-fed conditions constitute 80% of the total area of agricultural land. The special programme for food security in Jordan was formulated in collaboration with the FAO of the UN aiming at improving food security for poor rural households, mainly through improvement of agricultural productivity and production, increasing employment opportunities and promoting income generating activities. Objectives also include stabilising farming income and enhancing the role of women as partners in rural development. He said that subsidies for food and fuel impose significant fiscal strain and there is a widening recognition in Jordan that there is a need for replacing these general subsidies with more targeted interventions based on accurate identification of the vulnerable sections of the population and maintaining or improving their access to food.

Dr. Malek talked about the main objectives of National Agriculture Strategy which were to diversify and improve rural livelihoods by improving access of the rural population to available technology and resources. The strategy to support and develop the rural areas in the highlands, Jordanian Badia and the Ghor is based on three main thrusts i.e. achieving sustainable agricultural development in its economic, social and environmental dimensions; achieving food security and reducing poverty in rural areas through the optimum use of natural resources such as soil and water; and making rural financial and marketing services available to farming households. The availability of food in Jordan depends on the amounts of food produced and imported, as well as, the amounts used for seeds and amounts lost due to post harvest losses as provided by the FAO food balance sheets. The World Food Programme identified key risks to food security in Jordan’s as follows: (i) lack of job opportunities and low income; (ii) decline in economic indicators; (iii) agricultural land degradation; (iv) self insufficiency in food products, especially cereals and (v) water scarcity, with Jordan ranking among the ten most water deficit countries.

He also stated that one of the objectives of the special programme is to improve the food security of rural families in Jordan. It is to be accomplished through achieving sustainable increase in productivity, reduction in year-to-year variability in production on the basis of stability of economic and environmental conditions and the incentives emerging as a result of the increase in production, within the national and local economic framework.

Chairperson thanked the speaker and added that Jordan is short of water and land but still manages to export small quantities of agricultural products.
In response to the query of Dr. Anwar distinguished participant from Egypt, the speaker informed that government of Jordan provides subsidized flour with added vitamin A to all Jordanian people.

Malawi

Ms. Sphiwe Mauwa from Malawi in her presentation said that Malawi is a land locked country that lies in central east of Africa bordered by Tanzania to the north, Mozambique to the south east and Zambia to the west. Malawi like many other developing countries has faced food security for a long time, until the last five years, when Malawi managed to win the battle against food insecurity. Malawi has been a hunger country so that it used to rely on food aid from donors and beg from neighbouring countries. Since 2004, Malawi has been food secured and now manages to donate food including maize and rice to the neighbouring countries. This has been the case due to new policies and strategies that the current government has embarking on. In recent years Malawi has been a shining example in Africa as it has shifted from a hunger nation to a self sustaining country.

She mentioned the priority areas in the Malawi growth and development strategy are: agriculture and food security as the first priority; the green belt irrigation and water development; education science and technology; transport infrastructure; climate change natural resources and environment management; integrated rural development; public health sanitation and HIV/AIDS management; youth development and empowerment and energy, mining and industrial development. Agriculture is still the back bone of the economy of Malawi as it contributes over 80 percent of foreign exchange earnings and employs about 80 percent of the work force. The main food crops grown are; maize, cassava, rice, beans, soya beans, peas, sweet potatoes, Irish potatoes and sorghum. The main cash crops are; tobacco, tea, cotton and sugarcane. Livestock also contribute to household food security in terms of provision of protein.

Ms. Mauwa further stated about strategies that Malawi government has embarked on for improving food security are: (i) the input subsidy programme by which the government realized that most of the poor population can not afford to buy the fertilisers and farm inputs like chemicals, pesticides or seeds; (ii) diversification of agriculture helped the people of Malawi by which they should not only rely on maize but other food crops; (iii) improving food storage facilities provided by the government helped those crops which are lost through post harvest; (iv) agro processing ensures food security throughout the year as food crops will not be damaged or destroyed; (v) the green belt irrigation and water development has been relying on rain fed agriculture; and (vi) promoting use of manure is good for soil fertilisation. In the last she said that Malawi has achieved food security due to access to good markets and some value addition skills.

Complimenting the speaker on Malawi becoming the food exporter country from food deficit country, chairperson invited the questions. Answering to the question of Dr. Chang, distinguished resource person from Taiwan, regarding existence of agriculture cooperatives and local farmer’s organizations in Malawi, she informed that the cooperatives and rural farmer’s organization are not common in Malawi. The only exception is tobacco farmers which have strong organizations. In response to the question of Dr Anwar distinguished participant from Egypt, regarding construction of many silos in Malawi and their use, she replied that these silos are build by the government and small farmers can use them for storage of their products for certain period of time.

While replying to the question of Mr. Khushnood Ali from AARDO regarding success rate of one village one product approach and establishment of backward and forward linkages, she informed that people of the village have been organized in
groups and they have provided training to take income generating activities which are based on locally available resources. With regard to the success rate, she mentioned that programme is quite successful. She added that this programme was introduced with the cooperation of JICA.

Mr. Nazrul Islam distinguished participant from Bangladesh enquired that what will be happened if tobacco production is banned which is the main source of Malawi’s foreign exchange earnings? Addressing to his question, she mentioned that the country will face problem. But to mitigate such situation, Malawi government had already taken crop diversification programme. Mr. A.W. Anwer from AARDO added that it is good to know that Malawi is shining in agriculture production and is now helping its neighbouring countries and enquired about future policies on subsidies provided to farmers as Malawi already joined WTO. She replied that government will work out some plan in consultation with other international organizations.

Nigeria

In his presentation Mr. Olanipekun Olurotimi Oshadiya from Nigeria explained about the Federal Government of Nigeria through the Federal Ministry of Agriculture and Rural Development, as part of its quest to achieving food security, has developed a National Food Security Programme. The vision of the programme is to ensure sustainable Access, Availability and Affordability of quality food to all Nigerians and for Nigeria to become a significant net provider of food to the global community. Short term goals are to significantly improve Nigeria’s agricultural productivity, medium term – expand and improve large-scale production, improve storage/processing capacity as well as required infrastructure to achieve food stability and in the long term – derive over 50% of the nation’s foreign exchange through agricultural exports.

He said that despite Nigeria’s rich agricultural resource endowment, the agricultural sector has been growing at a relatively low rate. The agriculture sector is faced with a myriad of challenges, with average yields of major staple crops far below that of other developing countries. The result being that Nigeria spends over 2.8 billion US Dollars annually to import food for local consumption. Over the years, the previous administrations have tried through various programmes, initiatives and policies to address these challenges and develop agriculture in Nigeria with out much success. Private sector participation in agriculture and the agri-business sector appears to be the global direction for sustainable agricultural development. An analysis of previous failures of private sector participation in Nigeria showed that the major issues responsible were economic stability and security. The key features of the programme include providing a conducive environment for private sector involvement, encouraging large scale commercial farming with strategic linkages to small holder farmers, and significantly reducing post-harvest losses through adequate storage, processing and appropriate market outlets. Also funding mechanisms have been designed to ensure that adequate resources are mobilized from both public and private sources.

Mr. Oshadiya also mentioned about the proposal for making Nigeria food secure on sustainable basis with the development opportunities through crops, livestock and fish. He stated that policy orientation for agriculture in Nigeria include: farmland; fertiliser; mechanisation; fadama development; processing; storage; market; micro credit; extension and training; and food import. It is believed that the country will achieve national self sufficiency in the nearest feature, if the programme is properly articulated and well sustained.

Responding to the question of Dr. Ching Cheng Chang distinguished resource person from Taiwan regarding the funds for policy proposals for food security enhancement, he replied that after the
learning the lesson from the past, the Nigerian government adopted a different strategy with the help of FAO and other foreign agencies fund the development projects by ensuring that Funds for Agricultural Development is not solely with Government but also Public Private Sector involvement.

Mr Khurshid Ahmad Sanai distinguished participant from India enquired about the Fadama development in Nigeria. While replying to his query, the presenter mentioned that Fadama development is helping agriculture sector by opening up wasted logged low land areas for rice cultivation. This is supported by Japan International Cooperation Agency.

As there were no more questions from the participants, chairperson thanked Mr Oshadiya for his wonderful presentation.

Pakistan

Mr Sheikh Ghazanfar Hussain, the presenter from Pakistan, started his presentation by quoting the definition of food security given by the United Nations. Food security is "physical, social and economic access of all people at all times to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". Effective biological absorption of food in the body is also important for food security as it ensures nutritional security in the face of availability. He mentioned that the Millennium Development Goals further highlight the importance of confronting the scourge of poverty and the despair of food insecurity. Under a very complex food commodities supply and demand situation, food security is becoming a formidable challenge, especially, when the main grain growing countries are resorting to bio-fuel production creating a divide between countries striving for food security and countries ensuring energy security through bio-fuel production. Resultantly, the food grain and livestock products prices have experienced unprecedented increments, placing food importing countries at disadvantageous position. This situation has further been aggravated by continuing rising trend in the fuel prices.

He further stated that rising food prices are provoking social unrest across the developing world, resulting in a number of short term policy responses from government in both exporting and importing countries, which risk exacerbating instability in world markets. In the short run, net food buyers in urban and rural areas would be pushed deeper into poverty. It is the agriculture sector where the battles for long term economic development will be won or lost. Thus the main burden of development and employment creation will have to be borne by the agriculture sector and it would be harbinger of change and improvement in the living standard of teeming millions.

He mentioned that Food Security Analysis during 2003-04, food availability, the 1st pillar of food security which was assessed on the basis of food production and consumption. FSA also indicates that mega cities pitted against mounting population pressure are also being adversely affected and the net crop based food availability, compared to net cereals or wheat/rice availability was better. Availability of livestock products, contributing 7 to 16 percent in daily diet of rural people, presents altogether different picture compared to crop based food and also the food security was assessed on the basis of parameters including access to safe drinking water, immunization cover and infant mortality, access to medics and paramedics and rural health infrastructure. Mr. Hussain said that recently Government of Pakistan has initiated many food security and poverty alleviation programmes to provide relief to the poor masses to ensure food security and they are: (i) procurement and storage of food grains; (ii) Benazir income support programme; and (iii) sasti (cheap) roti in the Punjab province.
He stated that meeting food security obligations will require various improvements worldwide. Food security is a special concern and in rural areas may require physical infrastructure such as road and power infrastructures, property security and access to systems of market-based exchange, in addition to public investment in research and extension and related communication systems. In some cases it may require the removal of certain constraints, as emphasized by the FAO Special Programme Food Security (FAO 1997, 2000), including improvements in governance and markets, increases in productivity at the farm level, farmer and community group formation and micro enterprise development. Concerted efforts are therefore, needed to ensure food security at national, regional and international levels.

After thanking the presenter, the Chairperson invited the question from the participants. Mr Nazrul Islam, from Bangladesh asked two questions i.e. (i) why number of districts has been used for analyzing the food security situation (indicator of poverty) in Pakistan instead of population, (ii) What is the rate of growth of population in Pakistan? Replying to the first question, the presenter mentioned that the analysis of the study has been followed by the expert in that way, therefore, he used same method of analysis in his paper. With regard to the second question, he informed that the rate of growth of population in Pakistan is 2.1 percent.

Session was closed with a vote of thanks by A.W. Anwer, AARDO to the chairperson for wonderful session and useful deliberations.

1.4.5 Technical Session V : Presentation of Country Reports

Chairperson: Prof. (Dr.) Babo Fadalla, Sudan

Fifth technical session was held in the afternoon of 15th July. Two country papers namely, Oman and Sudan and one expert paper by Dr. Abe, IDACA were presented. Paper presentation was followed by discussion. Summary of the papers and discussion is given below.

Oman

Mr. Khatir Mohd. Al-Alawi, in his presentation, said that modern Oman has a rich cultural and social history under the dynamic and prudent leadership of H.M. Sultan Qaboos bin Said. Oman has established a modern economy with world class infrastructure, peace, economic and political stability as some of the important assets of Oman. The diversification strategy as enshrined provided greater emphasis to the private sector, non-oil exports, development of agriculture resources and value addition by promotion of industrial processing units. By the year 2020, it is expected that the economy will no longer rely on oil, but will be diversified with higher levels of savings and investment and that other sources of national income from the non-oil sector will assume the primary role. In economic sector Oman remains heavily dependent on oil revenue, which account for 80% of the country export earning and 40% of GDP. Oman has accorded top priority to privatisation and diversification of its economy.

He said that Oman food security is a great concern of the government as it heavily depends on imports and this is being studied to develop the suitable strategy in the coming years. The major focus in tune with the food security has following factors: enhancing local production and productivity in agriculture and improve quality of food and yield; investment outside the country in agriculture activities in suitable countries; rationalization of water use in agriculture sector and ranking it as a basic element and important measure for assessing the economic efficiency of the agricultural projects; value addition by promoting processing units in live stock and agriculture; green house cultivation and introducing high-tech agriculture; protection of human and
livestock health from diseases and safeguarding food security and; improvement of natural range lands productivity and creation of alternative food resources.

Mr. Khatir Mohd. further stated about the land and water scarcity seriously limiting agricultural production in Oman and increasing agricultural production through expansion may not be feasible. All this need suitable policy framework and budget. Over the successive five-year plans, the Oman adopted many policies and programmes that have contributed in achieving a degree of self-sufficiency in some commodities, more appropriate measures and policies need to be developed to achieve food security such as focusing on further research on the preservation of water resources, conduct more tests on crops resistant to salinity and aridness, increasing green houses cultivation and increasing modern irrigation with high yielding varieties of seed. Finally, since the sustainable marginal increase in output might be achievable through improvements in land and water productivity even though it may not be enough to achieve self sufficiency.

Chairperson thanked Mr. Khatir for presentation and opened the floor for discussion. Dr. Anwar, distinguished participant from Egypt said that Oman wanted to increase earning from gas upto 10%. In this regard he enquired whether some studies had been taken. He informed that some international organizations conducted the studies on the availability of gas in Oman and our target is based on these reports. Dr. Abe added that Oman also supplies gas to Japan.

Mrs. Sphiwe distinguished participant from Malawi enquired about the non-oil products that the Oman would like to develop in 2020 While answering to her question, presenter informed that Oman is planning to promote industrialization by producing petro products.

In response to the question of Prof. Sharma regarding Omanisation of work force, he replied that it means nationalization of the work force.

Sudan

Last country paper was presented by Eng. Isameldin Abdalla. He started with the background information about Sudan, and stated that Sudan is one of the biggest African countries, with huge natural & agricultural resources. This was including the population structure, the agriculture potential & policies, major farming systems and practices, and its impact in food security. He said that there are four major farming systems i.e. irrigated agriculture; mechanized rain fed; traditional rain fed; and extensive livestock production. The majority of livestock production is in the traditional sector and largely under nomadic and agro-pastoralists system. Despite of the huge and diverse agricultural resources potential in Sudan, successive plans and strategies to develop agriculture have been implemented but they have a limited success in achieving their objectives. This approach explores the current situation of agricultural sector by strength.

Eng. Abdalla stated that the global factors which affecting food security in Sudan are international population growth, climate change, global financial crisis and rising of oil and substitutes (bio-fuel) and the main causes of food insecurity are natural hazard like drought, flood and other climatic factors; conflict and civil strife; low productivity; poor rural infrastructures and instability of policies.

On the other hand, he mentioned that if we want to achieve the solution for attaining food security, the government should take into consideration—to give attention to food insecurity issues; to enhance scientific understanding of poverty and its impact on food security; making linkage between environment and poverty and food insecurity; better coordination and sharing...
On the conclusion of the presentation of country report, Mr. A.W. Anwer, AARDO thanked the chairperson for conducting the session and making the session interactive.

Presentation on Japan’s Agriculture and Agricultural Cooperatives by Dr. Y. Abe, IDACA

After the completion of the country reports presentation, Dr. Abe made a presentation on Japanese agriculture, society, culture and various stages of economic development in Japan. Dr. Abe explained the agricultural situation in Japan in 1950 and the contribution made by agricultural cooperatives. He also elaborated the multipurpose cooperatives, their function, activities, such as guidance, marketing, credit and mutual insurance, real estate, hospital and clinic, day care, restaurant, direct sale, kindergarten, funeral services, travel etc. He also explained the structure of cooperatives, their numbers at different level and membership etc. He also explained Japan self sufficiency level in food production and changing food habits of Japanese people.

A video film on Japanese agriculture showing the agriculture in 1950’s and its transition into modern agriculture, farm practices and function of cooperatives was shown for the better understanding of the participants. During the presentation the participants had very interactive session.

1.5 Valedictory Session

The valedictory session of the seminar was held on 16 July 2010 in the afternoon. The Session was attended by Mr. Miyazaki Kenjiro, Managing Director, IDACA, Dr. Y. Abe, Seminar Coordinator, IDACA officials and Mr. A.W. Anwer, Executive Secretary, AARDO.

On behalf of the Secretary General, AARDO, Mr. A.W. Anwer, Executive Secretary delivered the
valedictory address. On behalf of AARDO and on behalf of the Secretary General, Mr. Anwer extended his sincere thanks to Mr. Miyazaki Kenjiro, Managing Director, IDACA and his able colleagues for the successful conduct of the seminar. He mentioned that the arrangements made by the IDACA for the smooth conduct of the seminar and especially in extending all help to the participant from Iraq are highly appreciated. He also thanked to the JA-Zenchu for their continuous kind support in organizing the seminar. The food provided by the new team of the chefs was very delicious and enjoyed by all of us and thanked them. He further stated that during the last 4 days we had a number of presentations. These presentations were comprehensive covering various aspects of food security in different regions. He wished that the presentations and valuable interventions made by the resource persons will enhance our existing knowledge. He placed on record his deep appreciation and thanked for their efforts and contribution. The presentation of country reports enlightened our knowledge by way of exchanging the views on many common issues. He thanked to all the participants for their contribution and cooperation in ensuring the success of the seminar. He also expressed his gratitude to his two colleagues from AARDO for their contribution. In the last but not the least he conveyed his heartfelt thanks to Mr. Miyano from IDACA for helping all participants in all matters during their stay at IDACA.

He wished that field visits arranged by IDACA to Hyogo prefecture will provide an excellent opportunity to learn about Japanese agriculture and people. While concluding his address, Mr. Anwer, once again, thanked all for their cooperation and support.

Mr. Miyazaki Kenjiro, Managing Director, IDACA in his valedictory address while congratulating the participants thanked them for their enthusiastic attendance in the lecture and discussion. He mentioned that over the week there has been various sessions such as country reports presentations and deliberations by resource persons on the food security which possessed a global challenge. In the wrapping session, participants presented the group reports and came out with recommendations. He hoped that all the participants had spent a meaningful time at IDACA. He said that next week, the participants will travel to Hyogo prefecture, located in the southern part of Japan and visit various agricultural related institutions such as Hyogo prefectural government, JA Hyogo Minami to study the fostering of leading farmers who are expected to shoulder the future agriculture in Japan.

He mentioned that the issue of leading farmer is closely related to the food security from the viewpoint of securing food supply in Japan. Amid Japan’s food self sufficiency being only 40%, and the extent to which it can feed its people with locally produce farm products, Japan is now seriously confronted with such problems as the decline and aging of farmers. Under such background, concerns have been voiced that securing food by domestic agriculture might further become vulnerable. Keeping in view, government has been taking necessary measures to help foster and secure leading farmers.

He also stated that at this point of time, JA Zenchu held its 25th National Congress with the participation of JA group members across the country last year and adopted the resolution to help, foster and support the leading farmers such as family farming management, hamlet farm management association, agricultural production incorporation according to regions and commodities keeping step with the government policy. To put such activities into concrete practice, JA plan to tackle accumulation of farmland use and also agricultural management supports such as provision of technical guidance and management guidance from the view point of expanding management scale of leading farmers.
Mr. Miyazaki also mentioned that apart from one week’s class room discussion, Kyoto sight-seeing tour is also planned in the coming week. Nowadays, Tokyo is the capital of Japan but Kyoto was once the old capital of Japan from 794 until 1869. Thus, many shrines, temples and castles are located in Kyoto. Some of them are registered as the world heritage, or cultural property of old city of Kyoto, attracting a lot of tourists from all over the world. He hoped that all of you will have an opportunity to enjoy the visit, familiarizing with the history and culture of Japan. From Kyoto, participants will return to their respective countries. He wished all safe journey and success in future endeavor in their countries. Mr. Miyazaki and Mr. A.W. Anwer awarded the certificate to the participants.

On behalf of participants, Mr Sheikh Ghazanfar Hussain, distinguished participant from Pakistan presented a Vote of Thanks. Addressing to Mr. Miyazaki Kenjiro, Managing Director IDACA; Dr. Abe, Seminar Coordinator, IDACA and IDACA Officials, Mr. A.W. Anwar, Mr. Khushnood Ali and Mrs. Suman Dhingra of AARDO; Hon’ble Resource Persons and fellow participants, he mentioned that it is a matter of great honour and privilege to thank IDACA and AARDO on behalf of his fellow participants. He said that when I set foot at Narita airport, it was with great trepidation and hesitation chiefly because I was told that Japan being a non-English speaking country, communication would be difficult. But to the utter surprise and delight of all of us this visit has been as facile and smooth as a fairy tale. Things have been easy and systematic as clockwork with no complaints whatsoever. He cited a few examples.

He mentioned that on the night of his arrival, there was difficulty in reaching IDACA until the driver of the car approached a group of young people happily chatting away on the road side. When the driver explain to our difficulty, they huddled together, figured out the way to IDACA and one of the boys got on his scooter and led us to IDACA premises. The second example is when a Policeman called on phone a taxi for us when we were not able to do so while going to Takao. These are significant steps of help when it is considered that there was no verbal communication because of the language barrier.

He also mentioned that at IDACA, the staff is small in number but large at heart. Right from the bird like ladies of the kitchen and office to the quite Mr. Miano and of course not forgetting Dr. Abe, everybody at all times has been only too eager to help.

He said that Mr Miyazaki and Dr Abe as a nation you are great but with your humility and kindness you have made us feel special. So much so that there was no shadow of home sickness behind us. It is this warmth of feeling which makes this visit to Japan so memorable. Participants would always look back on it with fond memories. We not only admire you but love you as well. He added that he would be failing in his duty if he do not profoundly thank staff of AARDO who went all out to facilitate journey and made participants stay at IDACA so comfortable.

He further added that he is sure that his fellow participants join him with immense pleasure and gratitude in saying “thank you IDACA, thank you AARDO” and of course the resource persons for their wonderful guidance. He also thanked personally to all the participants and extended his appreciation on behalf of one another for the excellent relationship that was struck during the course of this seminar and the congenial atmosphere that prevailed throughout the proceedings. He ended with a good luck and praying for God blessing for all of us.

In the last, Dr. Abe and Mr. A.W. Anwer thanked all the participants and declared the closing of the valedictory session.
In order to arrive at appropriate recommendations/ action plan, two groups were formed. Each group selected a Chairperson and a Secretary. Further, each group discussed the assigned topic and suggested some suitable recommendations/ action plan which were presented in the afternoon session on 16th July. Prof. R. K Sharma chaired the session. Group composition and assigned topics and reports are as under:

**Group “A”**

**Topic :** “Role of (Public and Private) Investment in Ensuring Food Security”

**Facilitator :** Prof. Dr. Babo Fadlalla Mohamed

**Members :**

- i) Mr Mohammad Nazrul Islam, Bangladesh
- ii) Mrs. Soaud Ibrahim Mohammed, Egypt
- iii) Mr. Emmanuel Kwesi Hedzro-Garti, Ghana
- iv) Mr. Khurshid Ahmad Sanai, India
- v) Ms. Chou Miao-Fang, R.O. China
- vi) Mr. Sheikh Ghazanfar Hussain, Pakistan
- vii) Eng. Isameldin Abdalla, Sudan
- viii) Mr. Abdul Waheed Anwar, AARDO

1 **Why do we need private investments?**

From the papers presentation, it is clear that governments have made huge investment in agriculture but these are not sufficient to meet the development needs. Government must mobile additional resources from other sources, may be private sector or private-public partnership to develop the infrastructure, to increase the productivity, storage capacity, better research & development for improved agricultural inputs etc.

2 **What should be the exact Role of Government?**

Governments have to play a vital role in all area relating to Agriculture. Some of the notable areas are:

- Frame policies concerning to all including taxes, corporate rebates (fiscal incentives), land, human resource development, storage, marketing, introduction of Agrarian reform, creating infrastructure to maintain buffer stock, introduction of contract farming etc.
- Provide enabling environment to attract private investment like long term agreement with clear guidelines, responsibilities etc.
- Provide regulatory mechanism to supervise the activities of private stake holders
- Promote local level organization such as cooperatives, farmer association, self help groups etc. Reinforcing existing cooperatives/ farmers organizations.
- Provide the necessary capital infrastructure investments in roads, railway networks, irrigation facilities etc.
What role Private Sector can play towards food security?

Role of Private sector in following areas may be considered:

• Help improve production and promoting contract farming.
• Distribution, extensive penetration of input dealers for fertilizers.
• Help improve Storage facilities.
• Research and development.
• HRD in agriculture.
• Development of innovative insurance and financial products for the farmers.
• Innovative dissemination and extension services.
• Road construction in outreach areas.
• Help establish irrigation systems.
• Invest in land reclamation.
• Soil conservation measures for sustainable environment.

Recommendations

• Governments should invest in the development of strategies for drought preparedness, with special reference to livestock.
• Increased investment in agro-processing and preservation of perishable crops
• Bilateral or regional cooperation for exchange of agricultural production technology, etc.
• Close government collaboration with International stakeholders working in Agricultural related matters.
• Monitoring and facilitation of the funds invested by private sector.
• To provide enabling environment to attract private investment.
• Greater interaction between government, private sector and other stake holders.
• Greater transparency in policy, procedure and its implementation.
• Exchange of experiences among countries which have good experiences in attracting private investment.
• Coordination between different Ministries/ Departments for faster clearance of projects.

Group “B”

Topic: “Changing Global Scenario and Its Implications on the Food Security of Poor People”

Facilitator: Dr Ching-Cheng Chang

Members:

i) Dr. Malek Y. H. Mahadin, Jordan
ii) Dr. Anwar Mahmoud Abd El-aal Shehata, Egypt
1 Introduction

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet the dietary needs for an active and healthy life. Therefore, food security will include aspects of availability, economical access, utilisation and stability of supply of adequate food at all times.

Given that world population is projected to grow from 6.5 billion in 2005 to nearly 9.2 billion by 2050, the global food production needs to nearly double if there is to be enough to feed this increased population. The following changes in the global scenario need to be given urgent consideration in order to meet the projected food demand.

2 Changing Global Scenario

- Financial crisis and world economic recession since 2008

The slowdown in economic activities has affected the investment in public and private sector and led to reduction in national budgets and decrease in multilateral assistance. This has adversely affected many nations, primarily the livelihood of the poor, who are most often the worst affected by economic crises.

- Increasing food prices across the world.

Food prices have substantially increased since 2007 and 2008. There are various reasons for this, which include:

- Increasing demand for food due to increase in population, economic growth of emerging economies.

- Increasing production cost in agriculture.

- Decrease in food grain stock.

- Stagnation of agriculture in developing countries, due to lack of public and private investment in agriculture, declining share of ODA to agriculture has resulted in shortage of research and development, which has an adverse impact on yields of food production.

- Natural calamities like drought, floods etc.

- Export restrictions by several countries to protect the domestic consumers and meet the domestic demand for food which has adversely affected food importing countries, specifically the poor.

- WTO is likely to curtail agricultural subsidies adding to food prices across the world; this would further lead to food insecurity of the poor.

  - Increasing world oil prices.

The increasing oil price has increased the cost of transportation, distribution and marketing of farm produce, which has added further to food price increase.

Several net food importing countries will be short of foreign exchange to meet food import requirements, since the foreign reserve will be used to meet the increased oil prices.

  - Political instability/ civil wars in several countries.

Government of countries that are at war will divert resources to arms instead of investing in food production. Agricultural activities, food supply and distribution will be disrupted.
• Climate change and environmental degradation.

Climate changes would lead to changes in the normal patterns of temperature and precipitation. This is likely to lead to a higher occurrence of extreme climate events and cause decline in agricultural yields over time.

Moreover, environmental degradation due to overuse of chemicals and exploitation of land nutrients will lead to stressed natural resources like soil and water salinity, ground water scarcity, land degradation, diseases in plants and livestock, that would in the long run affect production.

Implications for food security for poor.

• Lower availability of food in the world would lead to increase in hunger and food insecurity for the poor.

• Decline in nutrition levels of poor leading to malnutrition and poor health, that will affect the productivity of the poor and their income as well; as a result the poverty levels will deteriorate.

• There will be decline in food and financial aid to developing countries, which would also lead governments to cut down their social sector spending and investment like food subsidies, health, education, rural development, etc. Such trends are more likely to affect the populations which live on the fringes of the poverty line in various countries.

• Climate changes and environmental degradation are likely to put stress on the natural resources such as land and water, which would affect the food production and invariably the livelihood of the poor and vulnerable classes.

Recommendations

• Improve/ secure safety nets for the targeted group/population (poor, mothers and children) to optimise limited/declining aid.

• Investment in agriculture and food production, so as to increase overall food availability

• Promote social and physical infrastructure for agriculture and rural development.

• Improve agro processing, storage and marketing of agricultural products to reduce wastes, and increase rural and farm incomes.

• Make available productive resources such as micro-finance, farm inputs at reasonable prices, agricultural insurance for small farmers through agricultural cooperative societies and association.

• Land reclamation efforts need to be undertaken by countries in order to put more land into productive use.

• Water conservation and water management programmes in flood and drought prone areas should be embarked upon.

• Promote consumption of local produce/substitutes to reduce dependence on imports.

• Efforts to promote sustainable agriculture by encouraging use of balanced fertilisers, crop rotation and improved farming practices.

• Diversification of agricultural activities and promoting of off farm activities like livestock, poultry, and high value crops.

• Establish regional buffer stocks to meet crises.
3. A NOTE ON THE FIELD VISITS

The participants had the opportunity to visit Hyogo Prefecture to study and observe the agricultural practices, extension services, functioning of cooperatives, etc. The field visit was undertaken during 20-23 July 2010. A brief about the visit to different organisations is as under:

1. Agriculture in Hyogo Prefecture

Hyogo Prefecture, often known as the miniature of Japan, extends from the Japan Sea in the north to the Seto Inland Sea in the south. The Chugoku mountain ranges lie in the central part of the prefecture with a rich topographical condition and a variety of natural conditions such as severe winter, heavy snowfall, dryness and mild climate. As such it has diverse natural conditions, unprecedented in other prefectures.

It is composed of five regions, namely, Settu (Kobe & Hanshin), Harima, Tajima, Tanba and Awaji. Agriculture is rooted deeply in the weather and climate in every region is actively carried on. Land area of the prefecture is 840,000 ha, of which 560,000 ha (67%) is forest and farmland 80,000 ha (10%). It is ranked 12th in term of the areas in Japan. Population is 5,590,000, ranked 7th in Japan in 2009, out of which Kobe, the capital city has the population of about 1,530,000.

2. Outline of Agriculture

Diverse agriculture is carried on in different regions rooted in each regional climate as explained above.

a) Settu region being adjacent to a big consuming Kei-Hanshin area: pliable vegetables.

b) Higashi Harima region: Rice wine and grapes.

c) Tajima region rich in nature: cattle and highland vegetables.

d) Tanba region surrounded by mountains: Black beans and yam.

e) Awaji region characterized by mild climate: onions and dairy farming.

Above all, rice wine, black beans, yam and Tajima cattle (feeder cattle of superior beef well-known as Kobe beef in the world) and broilers are also renowned as the brand farm products in Japan. Moreover, the outputs of food manufacturing industry rank five in Japan. Thus Hyogo prefecture is one of the nation’s leading food producing centres.

2.1 Agricultural Production

Agricultural production in FY 2007 was 143 billion yen, accounting for 32% of outputs of the Kinki region which covers 6 prefectures. However, since 1990, the agricultural production has been on the downward trends, even if it still holds an important position as the core food production station in the Kei-Hanshin region.

2.2 Number of Farm Households

The number of farm households stood at 104,990 in 2005, showing a decrease of 16% compared to 10 years ago. Farm household population under commercial farm households was 275,744 or 71%, accounting for 5% of the total population in the prefecture. Of them, the full-time farm households
stood at only 5,750 households, while most of farm households were part-time farm households.

### 2.3 Agricultural Management

Cultivated area per farm household is 0.74 ha, which is smaller than the national average (1.6 ha). As a whole, farm management scale is small, while farmland tends to be concentrated in the hands of big farm households.

Considering the number of those holding more than 2 ha, there were 1,528 households in FY 1990. It was increased to 2,210 by 2005. As for farmland fluidity (buying & leasing of farmland) ratio, it was 14% higher than national average which was 12.4%. It clearly shows that expansion of farm management scale is making its headway. Moreover, rice production costs in 2007 became 149,119 yen per 0.1 ha, which was lower relative to the previous year, but higher than the national average which was 143,538 yen. Above all, labour cost tends to increase.

Of the farm that households income in FY 2007 which stood at 3,589,000 yen (3,880,000 yen in FY 2005), agricultural income was only 487,000 yen, accounting for a mere 14%. Thus, Hyogo farmers depend largely on the non-agricultural income.

### 2.4 Securing Good Farmland

Of about 80,000 ha of farmland, paddy field occupies 92% against national average of 54%. Thus Hyogo agricultural structure is characterized by high dependence on paddy farming. The land consolidation ratio remains 75%, almost the same as the national average but there exists the gap between each region. This is especially in Awaji region where land utilization ratio is relatively high with a double cropping system adopting mixed farming consisting of paddy crops and vegetables. However, in terms of land consolidation ratio, it is rather small with 38%.

### 2.5 Agricultural Cooperatives (JAs)

The agricultural cooperative has been established to uplift the socio-economic position of members in accordance with the Agricultural Cooperative Laws. Agricultural cooperatives in Japan undertake the following activities:

- Guidance on agricultural production, sales of farm products and supply of production materials and daily necessities.
- Credit business regarding savings and loans.
- Mutual insurance and housing insurance.
- Welfare services.

In recent years, efforts have been made to promote wide-area amalgamation (target: 7JAs) with the view to strengthening of farm guidance with allocation of farm adviser on a full-time basis. 127 agricultural cooperatives which had existed in FY 1980 were reduced to 14 JAs (740 in whole Japan) as of April 2009.

Recently, in response to meeting the consumers' needs for ensuring safe and reliable farm products, JAs are now vigorously grappling with direct sales known as Farmers Market as part of promoting marketing business.

### 3 Direction for the Development of Measures and Policies, Policy System and Budget in FY 2009

In developing agriculture, forestry and fisheries policies in FY 2009, the agriculture, forestry and fisheries vision 2015 is in conformity with the central government guidelines. The vision will be steadily implemented with a view to respond to changes in situations stemming from the ongoing drastic administrative reform and also severer economic and employment situations prevalent
in Japan with a view to realizing a society to capitalize on diverse agriculture by taking advantage of the characteristics that Hyogo is a big consuming area as well as a big producing area.

Such being the situation, measures and policies for vitalization of regional areas as well as for promotion of safety and assurance would be developed by promoting them in a comprehensive and systematic manner. In concrete terms, the followings will be implemented:

• Fostering of future agriculture leaders including increase of new entrants into farming;

• Establishment of branding strategy of local products, measures for ensuring safe and assured food through streamlining of production, distribution and consumption; and

• Preservation of agriculture, forestry and fisheries villages which perform multiple functions with the promotion of greater involvement and collaboration of labour.

4 Outline of the Hyogo Life Center

The Hyogo Rakuno Seikatu Centre (Hyogo Life Center) was established by Hyogo Government-run corporation in 2007. Rakuno means enjoyment of farming, while Seikatu means life or living. That is how the name of this Centre was derived from.

The concept of enjoying farming life is a new life style being put forward by the Hyogo Prefectural Government to enable its people to lead a more human life by promoting farming work experiences and exchange of farming, mountainous and fishing villages. The Hyogo Life Centre provides various facilities and useful programmes in which everybody can gain farming experiences with a joy and also learn the importance of better farming.

4.1 Goals

i) To improve quality of life of prefectural people through interaction with or exposure to farming.

ii) To support development of new agriculture.

iii) To promote development of regional community in which relevant organs such as enterprise, NPO, regional community, local administration are involved in an integrated manner.

4.2 Outline of Facilities

i) Exchange hall: processing of jam, bread, soy-beans etc., restaurant business.

ii) Farm products direct sales shop: direct sales shop.

iii) Mushroom hall: cultivation of different mushroom with air-conditioning system.

iv) Farming implement exhibition hall: display of old and new farming implements.

v) Green house

vi) Farm: training for new entrants to farming, hobby farming, farming experiences for parents and children, paddy farming experiences for disable people.

vii) Orchard: to gain experiences of cultivating grape, chestnuts and plum.

viii) Other facilities: training on agri. business course, training for those desiring to take up farming in retirement life, holding of class on demand, implementation of volunteer activities support for revitalization of farming village or those aged people lacking farm successor.
Outline of JA Hyogo Minami (South)

In the northern part are generally found large-sized farm households, while the operational area in the southern part was developed as the bedroom community of the Kei-Hanshin region (Osaka, Kobe and Kyoto) which has an easy and convenient traffic access for leisure, shopping, etc.

Blessed with a warm climate with mountains and the sea, it is suitable for the production of a wide variety of agricultural commodities without influence of natural disaster. In the area where the production areas are huddled together with the consuming areas, JA Hyogo Minami is positively tackling the nation-wide “Chisan Chisho campaign” (promotion of local consumption from what is grown locally) by setting it as our great mission to get local people to consume what is grown locally with the installation of 7 direct sales shop called “Farming shop”.

The Cooperative was established on 1st April 2001 by merging 7 primary agricultural cooperatives in the nearby area. The total number of members is 40,694, of which regular members account for 36.7% and association members 63.3%.

5.1 Vision of the JA

The cooperative will aim at creating a regional community where it could build up an affluent society together with its members, develop JA in every one can share the safe, assured and stable life, thereby enabling men, agriculture and nature to live in harmony.

a) Activities for the promotion of the Chisan Chisho Campaign (Local consumption from local production)

By setting up 7 direct sale shops in the operational area, the cooperative supplies locally produced safe and fresh farm products to local consumers. Sales of processed items by six processing groups increased with the improvement of assortment.

Aiming at establishment of stores appreciated by consumers, it strived to increase volume of products through such measures as expansion of stores, improvement of display of stores, fostering new farmers and installation of 14 units of rental houses utilizing the prefectural subsidy products. Moreover, the cooperative tried to enlarge supply of farm products for school lunch.

b) Fostering of hamlet farm management groups and supports for them

In response to the paddy management income stability measures being pushed by the government, the cooperative strived to secure core farmers by setting up farming associations which undertake the production of rice, wheat and soybeans.

It is also trying to expand farmland scale, widen coverage areas, adopt incorporation system of farming associations which are considered the future challenges to be tackled. In fact, as part of promoting the hamlet farm management system to help make up for shortage of core farmer as well as to streamline farming, 14 farming associations were amalgamated to establish a large-sized farming association with guidance of the local extension centre in March 2009, whereby better farming would continue to be maintained in the future through such an endeavour.

c) Activities for ensuring safe and assured production of farm products

In a bid to supply safe and assured farm products to consumers, the cooperative tried to reinforce various measures to make shippers delivering commodities to the direct sales shops realize the importance of proper labeling of production area and correct use of pesticide, to get marketing experts (planner) examine how commodities are
actually treated in the field and to inspect traceability of products.

d) Activities to familiarize consumers with agriculture

As part of promoting the prevalent food education across the country, the cooperative tried to implement heart to heart activities with consumers by holding various events such as agricultural festival, paddy transplantation festival, harvesting festival, harvesting experiences gaining event, Gourmet tours combined with farming gaining experiences in close tie-up with the Kakogawa Tourism Association, thereby increasing better appreciation of consumers towards agriculture.

e) Activities to resolve the problem of abandoned farmland and also to foster farm successor

The Farming Support East Harima, agricultural incorporation, holds the food and agriculture school commissioned by the Kakogawa city office as part of the project for fostering new farming entrants. Four of them graduated from schooling at the end of September 2009 which was the second year of its course.

Promoting commissioning of farm works and managing abandoned farmland in an attempt to resolve the problem of abandoned land was also tried.

f) Counter measures against rising prices of agricultural inputs

Agricultural production costs rose sharply in 2008. In a bid to help assist farmers to alleviate financial burden, the cooperative tried to give local farmers some subsidy amounting to 30 million yen (US $310,000) for the purchase of fertilizers, oils for green house and carton boxes for shipment. Moreover, it also tried to enlighten farmers about the programme to cope with the urgent rise of oil prices for fertilizers that the government came out with and also filed the application for it on behalf of farmers.

In addition to this, dissemination of information on proper fertilizing technique by making soil analysis and cultivation test of high nitrogen type fertilizer was also tried.

g) Activities to promote exchange between crop farmer and livestock farmer

The cooperative promoted paddy cultivation for use of feedstuff and use of paddy straw by establishing closer linkage between dairy association and farm management association in the area. Farmers were advised farmers about the necessity of improving soil fertility by using manure.

The cooperative tackled a study of flexible container bag-type manure to be ready for the installation of fertilizer centre in the near future.

h) Training for fostering new farmers

An elementary class for fostering 22 new shippers who ship commodities to farming shops was opened. Another class for 23 shippers engaged in fruits production was held. Both of these groups learned cultivation techniques and skills.

i) Making of speciality products

The cooperative conducted experimental cultivation of raw wood made Hiratake mushroom and pickling melon in tie up with the local private company and tried to grasp the points to keep in mind regarding cultivation and study marketing method.

In order to disseminate the concept of Chisan-Chisho (local consumption from local production), the cooperative endeavoured to develop new speciality products such as various types of noodles, Japanese pizza, flour for tempura, etc.)
and six row barely used barley for pet bottle use by utilizing locally produced rice.

j) Information on the contribution to the regional community

The JA is evolving various activities to help contribute to the development of regional society by protecting farming and better living of members which constitute the original point of the cooperative movement, thereby promoting regional agriculture.

k) Social action activities

- Implementation of Cool Biz and Warm Biz as measures for coping with environmental problems. (Cool Biz and Warm Biz is the name of an energy-saving campaign the government started in recent years).
- Installation of AED and blood pressure meter.
- Campaign for the collection of eco-cap to save the children in the world for the purchase of polio vaccine.
- Campaign for the collection of Bell-mark for the improvement of teaching equipments in schools.
- Activities to cleaning the regional community by employees and local volunteers.
- Blood donation activities.
EVALUATION REPORT

The participants were given an evaluation form to give their feedback on the overall organization including the logistics of the seminar. The main objective of getting the feedback from the participants was to improve the standard of the seminar wherever needed. The evaluation contained queries to be answered by the participants regarding the relevance of the theme and the objectives of the seminar, effectiveness of the contents, papers presented by the resource persons and the participants, duration of the seminar and the logistics provided, etc. At the end of the seminar, all seventeen (17) participants from AARDO member countries submitted their duly filled questionnaires to the AARDO officials. The comments and recommendations of the participants are as follow:

1. Comments by the Participants

1.1 Relevance of Theme of the Seminar

On the relevance of the theme and objectives of the seminar, the participants opined differently as 47 percent agreed that the objectives of the programme were "highly relevant" to their professional requirement, 41 percent considered "very much relevant" while 12 percent said "relevant" (Figure-1).

1.2 Fulfilling the Objectives of the Seminar

With regard to the extent of success of the programme in fulfilling its objectives, 41 percent of the participants found it exceptionally successful, 35 percent rated it as highly successful whereas the 24 percent opined it successful (Figure-2).

1.3 Effectiveness of the Contents

On the effectiveness of the contents in relation to the objectives was considered exceptionally successful by 58 percent, highly successful by 24 percent, successful by 12 percent and moderately successful by 6 percent participants. Effectiveness of the contents with regard to the practical utility in home situation was considered highly successful by 47 percent, exceptionally successful by 24 percent, successful by 18 percent and moderately successful by 12 of the participants. As regard to the change in knowledge/orientation to the subject, the opinion of the participants on the effectiveness of the contents was 41 percent for exceptionally successful, 29 percent for highly successful, 24 percent for successful and 6 percent for moderately successful. 47 percent of the participants felt the effectiveness of the contents highly successful in increasing their capability, 29 percent gave their opinion for exceptionally successful, 18 percent rated it as successful while 6 percent felt the seminar as moderately successful respectively (Figure-3).

1.4 Presentation of Expert and Country Papers

With regard to the effectiveness of the programme in addressing different issues through the presentation of expert and country papers and group discussion during the course of the seminar, 47 percent of the participants were of the opinion that the presentation of the expert papers was highly effective, 41 percent felt that it was very effective and 12 percent rated it as effective. On the presentation of country papers, 64 percent rated as it was very effective, 18 percent opined that it was highly effective and 18 percent felt that
it was effective. With regard to the group discussion, participants gave different opinion as 47 percent highly effective, 35 percent very effective and 18 percent effective (Figure-4).

1.5 Field Visits

About the field visit, 58 percent of the participants felt that it was highly effective, 24 percent found it very effective while 12 percent felt it was effective. 6 percent did not respond because one participant could not attend field visits programmes (Figure-5).

1.6 Duration of the Seminar

On the duration of the seminar, 94 percent of the participants considered that it was adequate whereas 6 percent felt that it was not adequate. Those have opted inadequate option, they felt the need to increase the period of the field visits to get exposure to more projects relevant to the theme of the programme (Figure-6).

1.7 Overall Management and Logistic

The majority of the participants felt the overall coordination, hospitality, accommodation, local travel, seminar room facilities, air travel, internet and computer facilities were highly satisfactory while two participants felt that it was moderately satisfactory and only one participant felt that the accommodation was not so satisfactory (Figure-7). However, participant did not mention suggestion/reason of quoting the accommodation as ‘not so satisfactory’.

2 Suggestions/Recommendations by the Participants

• Frequency of such programmes may be increased.
• AARDO should ask for the country papers in advance and should provide basic framework for the country papers.
• Time for country paper presentation and discussion (question/answer) should be increased.
• AARDO could send a yearly calendar of all its training programmes/seminars in advance to the member countries so that nominations could be processed well in advance.
• There should be greater coordination between AARDO and national level institutions located in AARDO member countries.
• There is need to provide more opportunities to see agricultural development projects (small agro-industries) of relevance to third world countries.
Fig. 1: Relevance of Theme of the Seminar

Fig. 2: Fulfilling the Objectives of the Seminar
Fig. 3: Effectiveness of the Contents

- Exceptionally Successful
  - Relevance to the Objective: 58
  - Practical Utility in Your Home Situation: 24
  - Changing your Knowledge: 29
  - Increase in Capability: 24

- Highly Successful
  - Relevance to the Objective: 47
  - Practical Utility in Your Home Situation: 24
  - Changing your Knowledge: 29
  - Increase in Capability: 24

- Successful
  - Relevance to the Objective: 47
  - Practical Utility in Your Home Situation: 12
  - Changing your Knowledge: 18
  - Increase in Capability: 18

- Moderately Successful
  - Relevance to the Objective: 6
  - Practical Utility in Your Home Situation: 6
  - Changing your Knowledge: 6
  - Increase in Capability: 6

Fig. 4: Presentation of Expert and Country Papers

- Highly Effective
  - Presentation of Expert Papers: 47
  - Presentation of Country Papers: 47

- Very Effective
  - Presentation of Expert Papers: 41
  - Presentation of Country Papers: 35

- Effective
  - Presentation of Expert Papers: 12
  - Presentation of Country Papers: 18
  - Group Discussion: 18
Fig. 5: Field Visits

Fig. 6: Duration of the Seminar
Fig. 7: Overall Management and Logistics
5. ANNEXURES
5.1 INAUGURAL ADDRESS
INAUGURAL ADDRESS OF
H. E. DR. ABDALLA YAHIA ADAM
SECRETARY GENERAL, AARDO

(Delivered by Mr. Abdul Waheed Anwar, Executive Secretary, AARDO)

Mr. Miyazaki Kenjiro
Managing Director, IDACA

Mr. Akihiro Fujii, Manager, International Cooperation Office, JA-Zenchu

Dr Yukio Abe, Seminar Coordinator and IDACA officials

Distinguished Resource Persons and participants

Ladies and Gentlemen,

On behalf of Afro-Asian Rural Development Organization (AARDO) and on behalf of the Secretary General, AARDO, it gives me great pleasure to welcome you all to the 32nd RECA Seminar on “Food Security – Global Trends and Perspective”, being organised at the Institute for the Development of Agricultural Cooperation in Asia (IDACA). I am grateful to all of you for sparing invaluable time and for enduring the long-distance travelling. This seminar is being jointly organised by Afro-Asian Rural Development Organization (AARDO), Central Union of Agricultural Cooperatives (JA-Zenchu), Tokyo and IDACA. AARDO is indeed grateful to the JA-Zenchu and IDACA for their appreciated efforts in organising this Seminar.

Ladies and Gentlemen,

I wish to take this opportunity to give a brief introduction of the Afro-Asian Rural Development Organization (AARDO), which is one of the earliest examples of the South-South cooperation and Afro-Asian solidarity. Established in 1962 with its headquarters located in New Delhi, India, AARDO is an international inter-governmental organisation mandated towards agricultural and rural development. The Organization has five regional offices located in Seoul, Republic of Korea; Amman, Jordan; Accra, Ghana; Cairo, Egypt; and Lusaka, Zambia.

Japan is one of the five founder members of the Organization, the others being Egypt, India, Libya and Malaysia. The membership of the Organization stands as 30 member countries, 15 from Africa and 14 from Asia as full members and one associate member from Africa. AARDO enjoys observer status with various UN and other international and regional organisations like FAO, IFAD, UNCTAD, UNESCO, CIRDAP, etc.

AARDO acts as a catalyst and provides a forum for the member countries in the continents of Africa and Asia to jointly discuss their problems, exchange views, ideas, experiences and information in the field of rural and agricultural development, pool their resources, and to make concerted efforts, wherever possible, to improve the quality of life of their rural people. AARDO’s strategies for rural development are focussed on three broad areas i.e. human resource development, financing of development pilot projects and dissemination of information.

Since its establishment, IDACA has been playing a pioneering role in the field of training,
dissemination of knowledge and information on various aspects of agricultural cooperatives with special reference to the Japanese experience. Since 1967, RECA (Research and Education Centre of AARDO) Seminars on different themes of agricultural development have become a regular feature and international seminars are being organised under the auspices of RECA in collaboration with JA Zenchu and IDACA, at this Institute. So far, 31 RECA Seminars have been successfully organised in Japan.

Ladies and Gentlemen,

The concept of food security emerged in the 1970s following the rapid increase in food prices that led to the global food crisis. Since then food security is closely linked with human security and hence, it has been the focal point of the policies of all the countries facing the problem of hunger, malnutrition or dependence on imported food. The problem of food (in)security in the developing countries was brought in on the forefront at the FAO World Food Summit, 1996. The issues afflicting food security mainly population, environment, agriculture, gender, etc., were highlighted in the Summit in order to sensitize the international community about its obligations to eradicate hunger and malnutrition. The FAO World Food Summit, 1996 defined the food security as

“It exists when all people at all times, have physical, social and economic excess to sufficient, safe and nutrition food”.

The Summit has placed the emphasis on - equitable access to land tenure; resource rights and; responsibilities; improved market access; regional trade, market infrastructure and economic integration; and livestock development. Food security focuses attention on income, market and natural resources.

Therefore, the attention has been focused on food availability, food quality, food accessibility and use and, most recently, the human right to adequate food as advocated by the World Development Report, 2008. The world is generally said to be ‘food secure’, as it is producing enough food to meet the dietary needs of total global population. Yet, 850 million people are still food insecure as they do not have sufficient income to buy food.

For our survival and the food security, land remains the prime factor. The earth with 25% of the land surface has been providing succour to all since ages. But earth’s bearing capacity has long reached its maximum due to the population pressure on one hand and uncontrolled exploitation of the national resources on the other. It cannot be loaded any further without disastrous consequences. In this situation, sustainable food security could be achieved by overcoming the problems of population growth, unemployment, debt, energy consumption, environmental and political security etc.

Population growth is one of the important issues that demands increase in food production. According to the latest UN population statistics, the world population is projected to grow by 34 percent from 6.8 billion today to 9.1 billion in 2050. Nearly all of this increase will occur in the developing countries. About 70 percent of the world’s population will be urban as compared to 49 percent today. Income levels will be multiples of what they are now. (FAO Report on World Summit on Food Security, Rome 2009). Thus, the increase in both population and income will require additional food production and also a shift in the types of food to be produced.

It is worth to mention that three out of every four poor people in developing countries live in rural areas. Of them, 2.1 billion people are living on less than $2 a day and 880 million on less than $1 a day—almost all of them depend on agriculture for their livelihoods. Hence the population growth will affect the demand for food.
Ladies and Gentlemen,

Apart from the demographic factors, climate change and especially global warming threatens some of the world’s crop land in river deltas and coastal areas. According to Tim Dyson (1995), significant part of Bangladesh, Egypt, Thailand, China and Indonesia will be affected. High temperatures are more likely to lead to decrease in soil moisture and soil fertility increasing the risk of soil erosion. Global warming could also affect the average annual rain fall. The affect of global warming on world agriculture is uncertain and immensely complicated issue, but it is likely to be gradual and the consequences of food production can be felt by poor farmers especially in developing countries. The increased risk of drought and floods are indeed serious challenges arising from global climate change.

The irrigated agriculture supplies 40% of world food and thus scarcity of water resources for any reason will significantly impacts the global food production. In the wake of global use of water resources exceeding the renewable supply rates, new technologies and practices need to be developed in order to increase food output per unit of water “kg”.

The prevailing situation demands improvement in the agricultural scenario both in production as well as distribution. This can be achieved through adoption of modern technologies and practices for optimizing food production. Transformation of farmers’ communities through institutional development has also become imperative to handle the situation. The issues of rural – urban migration and less engagement of people in agriculture, ageing of farming communities and lack of succession and small scale family farming which threaten optimization of food production need to be addressed. Besides, development of rural infrastructure (roads, electrification and irrigation) to boost food production and provide access to food need to be given priority.

Distribution related issues such as storage, processing, post harvest losses and increase in the purchasing power of poor people are to be addressed.

The issues related to agriculture and food security cannot be discussed without touching upon WTO and Agreement on Agriculture which places a new challenge of producing agricultural commodities by each country and region in a cost-effective and competitive manner. It increasingly emphasizes on the need of developing competitive technology through research and development. But the capacity of the developing countries in supporting their agriculture is limited as compared to the high level support worth 350 billion dollars in the developed countries for improving their agriculture and trade competitiveness.

The issue of food security has been debated over the years and has assumed critical importance because of widespread hunger and malnutrition. Therefore, the above mentioned factors that condition the world food prospects need to be addressed in interrelated manner in order to secure global food security. There is a need to devise sound strategies and policies to optimize food production and secure food supply.

Against this backdrop, Afro-Asian Rural Development Organization (AARDO) is organizing the 32nd RECA Seminar on “Food Security – Global Trends and Perspective” with following objectives:

• To provide a forum to review and deliberate on global situation of food security - trends and perspective;

• To share information on the best practices and technologies being applied to achieve the food security in the member countries; and

• To formulate policies and an action plan to overcome the current and potential challenges to ensure food security.
I am sure that this Seminar will provide an opportunity to discuss varied experience on the subject. The presentations by the experts and country reports and deliberations will enrich the existing knowledge on important issue of food security.

Before concluding, I would like to again express our sincere thanks to JA-Zenchu and IDACA for their continuous support in successfully organising the RECA Seminars. I would like to thank the member countries for sparing the services of their senior officers to attend this Seminar. I am sure that the Seminar, followed by field visit, will give a deep insight not only into the Japanese culture, but also into the Japanese experiences on agricultural development. I wish a pleasant and comfortable stay to all of you.

Thank you for your kind attention.
5.2 EXPERT PAPERS
1 Introduction

Aggregate food security in the world has been improving markedly over the past half a century due to increasing food availability per capita and declining real food prices. However, at individual level hunger, malnutrition and food insecurity remain widespread. Around one billion people are suffering undernourishment today and at least one third of the world population bears nutritional risks. Ample food availability has failed to provide for sufficient nutrient intake for everyone in the world. Hence the sufferings for a substantial section of the population have continued. This may be because of the failure of the distributive mechanism. Many countries of the world has implemented food assistant programmes of some sort, however, many of these have proved to be expensive and ineffective or both. Therefore, food security continues to be a prominent concern for economists as well as policy makers.

The recently erupted food crisis coupled with the financial crisis has brought back the debate on food security on the world agenda once again. The current spurt in prices has been interpreted by scholars and policy makers as a global food crisis. The major factors for the current global food crisis are the rise in costs of food production, high oil prices, production of bio-fuels, poor harvests in certain major agricultural regions and consistent under investment in agriculture. Gravity of the situation can be understood as the G-8 summit held in Japan in July 2008, the leaders of world’s most industrialized nations voiced their deep concern “that the steep rise in global food prices, coupled with availability problems in a number of developing countries, is threatening global food security”. To make the things worse rising food prices are also followed by a severe global financial crisis which is termed as the deepest economic recession in the last 70 years. This crisis has hit hard large parts of the globe simultaneously pushing many people into hunger and undernourishment. However, to the comfort of every one the crisis started easing towards late 2008. Food commodity prices in world markets have declined in the wake of the financial crisis, however, food prices in the domestic markets are sticky downward and often come down very slowly if at all, we in India are still struggling with the high food inflation. The severity, depth and breadth of the crisis had made swift recovery impossible. As international indicator prices have fallen, commodity prices, particularly retail food prices in many countries have been slow in coming down. Impact of these unusually high food prices coupled with fuel prices have severely affected the vulnerable sections of population in the world to the extent that even the coping mechanisms have gone to the extent that people have been forced to draw down their assets (financial, physical and human) to avoid large declines in consumption. Many Asian countries have also been affected by the negative consequences of the surge in food prices. Thus, the extent of hunger and food insecurity has worsened in the region as a result of the crisis.

2 Concept of Food Security

Food security is inherently an observable concept that has largely eluded a precise and operational
definition. Thinking has advanced from first generation focus on aggregate food availability-the supply side to second generation emphasizing individual- and household access to food-the demand side- towards nascent third generation conceptualization that places food security in a broader framework of individual behaviour in the face of uncertainty, irreversibilities and binding constraints of choice. The commonly accepted definition of food security is when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences to maintain active and healthy life. The three pillars of Food security are:

i) **Increasing food availability** : Food availability is achieved when sufficient quantities of food are available within country, through all forms of domestic production, commercial imports, National stocks and food aid.

ii) **Improving access to food** : Food access is ensured when households are able to acquire adequate amounts of food. Access depends on their own production, on income available to the households, on the distribution of income within the households and on the price of food.

iii) **Enhancing nutritional adequacy of food intake** : Food utilization refers to households’ use of food, requiring a balance diet and Intra-household distribution together with individuals’ ability to absorb and metabolize nutrients.

If food security involves access at all times to enough an appropriate food, then food insecurity reflects uncertain access to enough and appropriate food. Food insecurity is generally classified in three type's namely chronic food insecurity, seasonal food insecurity and transitory food insecurity. The chronically food insecure are those who never have enough to eat. The seasonally food insecure are those who fall below adequate consumption levels in lean season. Whereas transitory food insecure fall below the food consumption threshold as a result of an economic or natural shocks such as drought, sometimes with long lasting consequences.

Food security is inherently an ex-ante status with respect to nutrition and health. There are a number of closely related ex-post concepts. “Hunger” is physiological sensation associated with insufficient food intake closely related to the concept of “food insufficiency” meaning that an individual or household sometimes or often goes without food. While hunger and food insufficiency imply food insecurity, the converse does not hold. Whereas Malnutrition or under nutrition is significant shortfalls in consumption of macro-nutrients and is an outcome with a complex relationship to hunger, because it is influenced by many other variables like health status, energy expenditure in work, care giver education levels, community infrastructure, micronutrient intakes (Strauss and Thomas 1995, 1998). Malnutrition is another potential but not necessarily a consequence of food insecurity. Food security is sufficient but not necessary for freedom from hunger but neither necessary nor sufficient for adequate nutrition. Malnutrition can reflect insufficient intake and absorption of micro-nutrients (vitamin and minerals), even if protein and energy intake are satisfactory. Micronutrient deficiencies are also recognized as serious and widespread food security issues. The concept of food security thus concerns the risk of macronutrient or micronutrient deficiency which may threaten one’s well being. The concept of food insecurity is most precise at the individual level because its foundation is the individual-specific nutrient requirements for maintaining active and healthy life.

The world is generally food secure producing enough food to meet the dietary needs of to-days global population. Yet 915 million people are undernourished in 2008 (FAO 2009), the highest number over the last 3-4 decades. This sharp increase has come on top of an already worrisome upward trend observed over the past decade.
Moreover, the recent crisis has led to an increase for the first time in both the absolute number and in the proportion of undernourished people in the world. This is in the face of first Millennium Development Goal which includes the target of halving hunger as tracked by undernourishment (FAO). The highest incidence of undernourishment is in Sub-Saharan-Africa, where one in every three persons suffers from chronic hunger. Asia particularly South Asia is characterized by some of the highest levels of under nutrition in the world. The magnitude of the under nutrition in Asia are a staggering 92.7 million stunted children in South-Central Asia. India currently has the highest population of malnourished children in the world followed by Bangladesh, Ethiopia, and Nepal. The highest number is in South Asia (299 million), closely followed by East Asia (225 million). The continuing, large scale problem of food insecurity is primarily a distributional issue, a matter of getting available food to people who need it, when they need it and of ensuring their regular, appropriate, affordable access to food. At the time of the World Food Conference of 1974, food insecurity was widely viewed as a problem of insufficient and unstable production. As has already pointed out food availability is a necessary but not a sufficient condition for food security. Although the food is in plenty at global level, but food availability is insufficient in many poor countries (Table 1).

Food security depends on adequate and stable food, availability although it is a necessary but not a sufficient condition. The data fully supports that per capita production has been rising due to rising productivities at the global level and the commodity prices has been declining up to 2000 and the started rising but rose steeply in the period 2006-08, then creating a panic situation. But adequate global supplies do not ensure that all the countries or households have enough food. In fact purchasing power matters more than availability of food (Fig.1).

Food security is linked to consumption, production and marketing of food, the functioning of the factor markets-especially for labour-social safety nets, governmental and non-governmental interventions, initial assets and income distribution and so on. Aim of the present paper is to introduce the broad aspects of food security rather than to attempt in depth analysis (Fig.2).

Food security has been viewed as a problem of insufficient and unstable production. Variability in domestic food production significantly increases cereal consumption instability at the national level. Food availability alone may not ensure food security, however it is a necessary condition. There must be enough food for all but distributional problems generally lead to food insecurity. This is true at the national level as well as at individual level. Food is in plenty at global level, but food availability is insufficient in some underdeveloped countries of the world, especially without significant external assistance. So food availability is an issue at the national level especially in LIFD (Low Income Food Deficit Countries) and perhaps it can be enhanced by food deliveries or balance of payments assistance to support the import of food (Fig.3).

3 Indicators and Global Food Production

The available indicators may be far from perfect, but they are operationally useful. The first generational view equating food security with food availability which is a function of food production per capita is a key indicator for the food security of an area. At the global level one finds that the production of basic staple crops like rice has slightly increased at aggregated level from 94 kgs per capita to 96 kgs per capita and for wheat there is a decline in per capita production from 103 kgs to 94 kgs. Total cereals which include rice and wheat as well have declined from 364 kgs per capita in 1980-1985 to 2001-08 periods to 345 kgs per capita. On the contrary in South Asia and India per capita availability of rice, wheat and cereals has increased during 1980-85 to 2001-08. However, it is lower than the period 1996-2000. Therefore, it is clear that at the global level as well as Asia,
South Asia and India experienced decline during the period 2001-08 when compared to 1996-2000, which otherwise has increased compared to early 80s. So it brings us to the basic argument that the issues related to food security are better addressed at the national level and more precisely at the individual level rather than at the global or more aggregate level.

One may add that food availability is a necessary but not a sufficient condition for food security. There may be enough food for all, but distributional problems commonly lead to food insecurity. Although the food is in plenty at the global level, but food availability is insufficient in LIFD countries, especially without significant assistance. Therefore, food availability become an important issue at the national level in countries which either does not produce enough food to be self sufficient or does not have enough foreign exchange reserves to buy food from the international market.

Food production is determined by the use of technology and is constrained by the area. Following Table 2.1 presents annual growth rate of production of staple food crops namely rice, wheat and cereals along with population at global level, Asia, South Asia & India. It’s very clear that growth rate of rice production has been positive at the global level. Table shows that production of rice has increased at an annual growth rate of 1.67 percent during the period 1980 to 2008, which has been higher than the population growth rate of 1.52 percent per annum showing that per capita availability of rice has increased over the years. However, across the decades one finds a slowing in the rate of growth which was 2.53 percent per annum during 1980-90 and stumbled to 1.84 percent per annum during 1991-2000 and picked up significantly to 2.39 percent during 2001-2008. Showing that availability of rice never declined at the global level even in the period of crisis. These rates of growth have been possible due to the technological innovations resulting in increase in yield rates of paddy (rice) over the years. One does not see any deceleration or stagnation in the production of rice at the aggregate level which has led to increase in per capita availability.

Table 2.1 also shows that the major contribution to production growth has been due to application of modern technology which has resulted in increase in yield rates which have grown at a rate of 1.34 percent per annum during the period 1980-2008. Growth rates of yield levels follow the same pattern as that of rice production i.e. it was the highest during 1980-90 i.e. 2.27 percent per annum and declined to 1.13 per cent during 1990’s and rose to 1.49 percent in the recent period 2001-2008. Incidentally, the highest growth rates in yield are experienced in South Asia which is most thickly populated region although the pattern is the same for Asia and South Asia as that of the world. Interestingly one finds that the major contribution in production has been made by technology by increasing the yield growth rate rather than growth rate of area which has increased at 0.33 percent per annum only. In fact, it is important to note that area growth rates under rice remained positive at all levels and was less than 1 per cent per annum.

Although it is very clear from the above analysis that growth rate of production of rice has considerably increased during the period 1980-2008 due to role of technology which resulted in growth of yield rates which were mainly responsible for the increase in production at the global level as well as in Asia, South Asia and India. Area as expected has been growing at a slower rate and thus contributing relatively less to the growth of production. This also highlights the point that the countries having basic staple food need not worry much. Nevertheless area growth may not be a feasible proposition in the long run. Table 2.2 present the annual growth rates of production, area and yield of wheat. Wheat production the highest growth rate has been achieved by India which is 2.81 percent per annum followed by 2.78 percent per annum by South Asia during 1980-2008, whereas at the global level
wheat production has risen at a rate of only 1.12 percent per annum. These positive growth rates are also mainly due to yield growth rates as the area growth rates under wheat were considerably higher for Asia, South Asia and India compared to rice, however they were negative at the global level. It may be mentioned that wheat is also the major staple food of Asia particularly India. However there are wide variations across regions and across various decades in the production growth rates. In the decade of 80’s growth rates of production were quite impressive ranging between 4.24 percent per annum in India followed by 4.07 percent in Asia, 3.44 for South Asia. Whereas at the global level it was 2.25 percent which are basically due to higher yield growth rates. In the following decade of nineties growth rate of yield declined at the global level from 2.90 in eighties to 1.31 percent in the nineties. Nonetheless growth rate of yield was the highest for India followed by Asia and South Asia during the decade of 80s. The growth rate of wheat production considerably declined during the decade of 90’s due to decline in growth rates in the yield rates. However, the production of wheat was maintained by increasing area under wheat. It is notable that area under wheat has grown at an impressive rate of 1.72 percent per annum in case of India and 0.84 per cent for South Asia. In the new millennium 2001-2008 one finds the growth of yield picking up in Asia whereas South Asia experienced further decline and India almost came down to naught. However, the growth of population is consistently declining at the global level as well as in Asia, South Asia and India thus imposing no immediate threat to food insecurity at the aggregate level.

Table 2.3 presents annual growth rate of cereals, which will bring out the scenario of overall availability of foods for human consumption. It may be made clear that cereals include rice and wheat two major staple crops besides other cereal crops. Table shows that production of cereals has grown at an average annual growth rate of 1.32 percent per annum at the global level which is lower than the growth rate of population showing declining per capita availability of cereals precisely other cereals as rice and wheat has already taken into account. Nonetheless the vulnerable regions of Asia, South Asia and India have growth rate of production much higher than the population growth meaning thereby that availability in Asia has increased during 1980-2008, therefore, there is no cause of concern. However in the recent years also 2001 to 2008 the period in which prices has risen considerably growth of production has been considerably higher than the respective population growth rates showing improvement in per capita availability of cereals thus causing no immediate threat to food security. It may be mentioned that the major constraint in food supply will come in future only if technology is not able to over compensate the area declines. It means that yield growth rates of food crops are lower than the decline in the area growth rates for which there is not much possibility in the near future and more so when growth of population has been falling at the global level as well as for all the regions. Table 2.4 and Figs. 2.4.1, 2.4.2, and 2.4.3 present average yield rates of rice, wheat and cereals.

Before discussing availability of arable area which will be a major constraint on production, let’s be clear that the area figures discussed in relation to rice, wheat and cereals are the area harvested, meaning area allocated to individual crops i.e. rice and wheat and area allocated to cereals as a group which can increase even when arable area is not increasing or declining at the cost of other crops. Following table presents the Arable Land, Land under pastures and forests.

Table 3, Land use statistics suggest that the arable area at the global level has increased over the years from 1281 million hectares in 1961 to 1403 million hectares in 1991 and 1411 million hectares in 2007. However, the declining additions do suggest that in the near future expansion of arable area is not a possibility which may start shrinking due to increasing population pressure and demand on
land for non agricultural purposes as has happened in case of developed countries of the world where arable area has already declined from 633 mn hect to 576 mn hect. On the contrary, one finds that arable area has increased in developing countries from 647 million hectares to 834 million hectares. Expansion in arable area in the developing countries under the pressure of population have taken place at the cost of area under forests which have declined from 2253 mn ha to 2108 mn ha and will have serious environmental implications and this should not be allowed any more. Therefore, arable area expansion is a major constraint and calls for higher investment in R&D in agricultural sector to increase yield rates to ensure food security at the global level. However area under specifies high yielding crops can increase in spite of arable area not increasing and substitution of rice and wheat for other cereal crops.

Table 4 and Figs. 4.1, 4.2 and 4.3 present the average harvested area per thousand of population for rice, wheat and cereals. Table clearly brings out that there is a continuous decline in per capita harvested area at the global level as well as for Asia, South Asia and India. As has been mentioned the food security in future at global or regional level will solely depends on the capability of technology to overcome the area declines.

4 Supply and Demand Position of Food at Global Level

The Appendix A1 presents the world’s rice, wheat and coarse Grains: Supply and demand in mn.mts. and area harvested in mn ha. As already explained area harvested has declined from 227.9 mn ha in 1986-87 to 218.2 in 2007-08 then it picks up to 224.0 in 2008-09. Nevertheless yield rates have continuously increased from 2.3 tonnes per hectare in 1986-87 to 3.0 tonnes per hectare thus increasing the wheat production from 524.1 mn. mts in the year 1986-87 to a record figure of 682.9 mn. mt. in the year 2008-09. It justifies our contention that it’s the appropriate technology which has helped in increasing the yield rates and thus production of wheat, which resulted in increasing the per capita availability of wheat in spite of increasing population as already pointed out. The domestic consumption of Wheat has increased from 511.3 mn mts to 653.9 mn mts.

Accompanying Figure 5.1 shows the fluctuation in production and ending stocks which are moving in quite unison with each other. One finds that when the global production declines the ending stocks also decline as these were used to maintain the domestic consumption and whenever production levels are higher than the stocks get replenished. Therefore, the stocks of wheat have been fluctuating between a high of 207.5 mn. mts. in 1999-2000 to 119.4 mn. mts in 2007-08.

Besides wheat, rice is another major staple consumed by majority of the population especially in Asia, South Asia and India. The appendix A1 (Figs. 5.2 and 5.3) presents the area harvested under rice in mn. ha, yield rates in mts per hectare, production domestic consumption and ending stocks in mn. mts. It is clear from the table that production of rice has grown at an average annual rate of 1.66 percent per annum which is predominantly due to impressive rate of growth of yield at an average annual growth rate of 1.40 percent per annum. As already pointed out that yield has grown due to use of appropriate technology coupled with application of inputs like fertilizers, irrigation and pesticides. As a consequence domestic consumption has also risen faster to prove that there were sufficient production of rice since 1980’s for the feeding of the world population and the domestic consumption was never constrained due to non availability of food as there were sufficient stocks available during the period of shortfalls to maintain the stability of domestic consumption. Stocks of rice were as high as 127.7 mn. mts in the year 1998 constituting around 33 percent of the total rice production. The stocks of rice were the lowest in 1982 i.e. around 12% of the total production. This only shows food
availability at the world level has never been a problem and is not going to be a problem at least in the near future. Accompanied graph makes it amply clear. Nevertheless countries especially LIFD countries may experience the shortfall and are not in a position to maintain per capita availability of food and thus may suffer from food insecurity.

Another way to enhance food availability in the food deficit countries is to import food to ensure food security. As it has already pointed out that imports are feasible only if there are requisite foreign exchange reserves with the importing country that is those countries which are exporting countries with favourable balance of trade. Things may be difficult for those countries which are food deficit and do not have enough foreign exchange reserves. Sudden spurt in prices in the early seventies which resulted in a serious food crisis was exacerbated due to the low availability of foreign exchange reserves, limiting food imports by many food deficit countries. This has forced many countries to look for option of food self sufficiency by improving domestic production. Nonetheless, it may be pointed out that in the present context that with growing integration of the international markets, lower real prices and more countries with convertible exchange rates, trade (imports) will help in enhancing food availability in food deficit countries of the world. These countries were also advised to diversify their export base in general and agriculture in particular, thus increasing their capacity to import.

However, food availability is still a concern and that too in the predominantly agrarian economies in Africa. Many of these countries have declining domestic production per capita of food staples. Most of these are in Africa with food production based largely on rain fed area and experiencing large fluctuations caused by climatic disturbances. So the question is can this shortfall be filled up with imports? For many of these countries the answer is yes and there are others who cannot do it as the main staples they consume have a low degree of tradability at the international level. Besides tradability, inadequate infrastructure and low foreign exchange availability limits their capacity to import. Almost all the agriculture based countries are net importers of food staples, importing on an average 14 percent of their total consumption over the past 10 years. The accompanying table 5 presents the import of rice, wheat and cereals by world and Asia regions (Table 5 and Figs. 5.4, 5.5 and 5.6).

Table 5 presents the pattern of imports of rice, wheat and cereals during the period 1980 to 2008. Total cereal imports in the world has increased from 225 mn tonnes in 1980-85 to around 281 mn tonnes in the period 2001-07, the period of rising prices, imports has consistently risen when compared to the earlier periods. Wheat imports has also consistently risen over the period from 96 mn tonnes in the period 1980-85 to around 118 mn tonnes. Whereas rice imports have more than doubled during the same period. Situation is almost similar in case of Asia as a region. However, imports in South Asia & India has not kept pace with Asia or world but have almost stagnated in case of wheat and rice where during the period it has only risen from 5.8 mn tonnes to 6.8 mn tonnes and rice from 1.2 mn tonnes to 2.2 mn tonnes. Total cereals imports in South Asia have risen from 8.5 to 13.0 mn tonnes. Thus, showing increase in imports of coarse cereals. Significantly in case of India the imports of wheat has been around 1 mn mts and for rice they were never more than 0.3 mn mts and have come down over the years. Therefore, the import of total cereals also shows a declining pattern. This was made possible as India after being humiliated in the late fifties went with a vengeance for food self sufficiency to the extent that most of the academicians and policy makers continue to define food security in the country as food self sufficiency only. As already emphasized that food availability is not a problem to ensure food security, the question of food security in fact is that of economic access to food.
Economic Access to Food

Mere increase in food availability does not ensure access to food at the individual level as well as at the national level. For most of the malnourished lack of economic access to food is a greater problem than food availability. A Nation must have enough income (foreign exchange) and people must have sufficient income so as able to buy food i.e. to have an economic access to food. That is nation has enough to export to generate enough foreign exchange and at the micro level people must have access to income generating opportunities which can allow them to secure adequate food to sustain their household. Sources of income are an important indicator of food security because reliable sustainable and suitable employment and income levels enable access to food. Remittances are peculiar source of income and represent person to person flows well targeted to the needs of the recipients fundamentally and also personal flows from migrants to their families mostly. Remittances are the transfer of money by a worker in a foreign country or in another area of the same country to his or her home place. Internal remittances in developing countries are generally rural/urban. Both internal and international remittances are particularly important as a source of income for food security because they play an important role in reducing poverty and promoting growth and development.

However the present global economic crisis resulted in leading to loss of employment and income and drying up the remittances. This loss of income is compounded by food prices that are still relatively high in the local markets of the poor countries. There are evidences suggesting that households have reduced the quality and quantity of food consumed in the face of higher food prices. The most vulnerable households are those spending a large share of their income on food. Poor households have additionally cut back on their health and education expenses and sold their assets to avoid starvation. “Starvation is a matter of some people not having enough food to eat and not there being not enough food to eat” (Amartya Sen). Most of the food insecure live in rural area as poverty constrain their access to food. According to the UN Hunger Taskforce about half of the hungry are small holders, a fifth are landless labourers and a tenth are agro-pastoralist, fisher folk and forest user; the remaining fifth live in urban areas.

India has moved from food deficit to a food surplus country, reducing poverty significantly and reaching a per capita income higher than that in most parts of Sub-Saharan Africa. Yet it remains home to 21 million undernourished people and thirty nine percent of the world underweight children (WB). As already pointed out that food security per se does not ensure nutrition security. Nonetheless, it is food consumption which is a necessary condition for achieving nutrition insecurity. Food must be of right quality and diversity in terms of energy and micronutrients and in tune with body’s ability to absorb it and convert it into adequate nutrition. Malnutrition has significant economic consequences leading to loss of productivity.

Another important aspect of food security (availability) is prices of the staple commodities. Sudden fluctuations or increases in the prices put additional strains on the import capability of the poor importing countries thus affecting the domestic food availability. Even otherwise also variability in the world prices are quite high and affects the domestic food availability of the poor food importing countries. The recent food crisis was the product of the unusual increase in prices of food which affected the domestic prices as well. This has resulted in to the declining economic access to food especially by the vulnerable sections of the society.

Table 6 and Fig. 6.1 present the growth rate of prices of Rice (Thai), Wheat (US gulf) and Maize (US). Average annual increase of prices of rice, wheat and maize were negative during the period...
1980-2000 which had resulted in increasing access to food by the food deficit countries. However, the prices grew at an average annual growth rate of more than 18 percent for rice, around 13 percent for wheat and 12 percent for maize during the period 2001-08 thus resulting in a serious global food crisis. This rise in prices has been interpreted by scholars to be caused by various factors like supply and demand imbalances, increase in crude oil prices and use of cereals for producing bio-fuel and other factors like professional speculators and hedge funds being active in the commodity futures. Accompanied Figs. 6.2 & 6.3 presents the movement of producer prices of rice from Thailand and India and wheat from Australia and India which clearly brings out the point that variability in the world prices are quite high as compared to the India’s producer prices and they have been consistently rising since 2001.

Figure 6.4 shows the movement of international prices of rice (Thai), wheat (US gulf) and maize (US). Which clearly show that prices have been consistently rising since 2001, however rise was quite steep in between 2007 and 2008, thus sending the alarming signals. Increase in food prices hurt more to the developing countries especially the low income food deficit countries (LIFDC’s) at the macro as well as micro level. As increase in prices affect the real income of these countries and they have to spend more to maintain their consumption levels. Prices provide a great insight into access to food and availability. Prices are a measure of availability when they tend to affect macro level food supply (import prices). Food prices are also a measure of food access when they affect household’s purchasing power. Consumer prices of food determine how much food a household can buy given its level of income. The conclusions relating to the overall purchasing power of food access of households depend to a certain extent on the level of representativeness of the food chosen to household consumption. The actual impact on households would among other factors, depend on the possibilities of substitution and coping strategies applied which in rural setting may include a wider range of options (outmigration, higher reliance on self consumption, etc) then would be available to urban households. The terms of trade does not take into account the fact that households will often substitute their preferred food, where possible by non-preferred foods, in the face of rising food prices. It may be emphasized that terms of trade is a proxy indicator of food access and purchasing power.

At the micro-level, prices reduce the per capita real income of the people who have to spend more on food thus affecting their food security. However, given the skewed distribution of income in the developing economies the vulnerable sections i.e. those who are on the lower rung are hit very hard thus increasing the incidence of poverty and hunger. Therefore, governments of these countries have to play a significant role in providing livelihood to these people.

6 Conclusion

To sum up, world population is projected to grow from 6.5 billion in 2005 to nearby 9.2 billion by 2050. To feed a population of more than 9 billion free from hunger, global food production must nearly double by 2050. It is pertinent to note that the entire population growth will take place in developing countries and that too in the urban areas. This means that a shrinking workforce in rural areas will have to be much more productive. Higher productivity requires more investment in agriculture, more machinery, more implements and so on as well as more skilled and better trained workforce and better functioning markets or supply chains. To achieve this, the world agriculture has to expand its land base and use some of the nearly 4.2 billion hectares potentially available for rain-fed crop production (only 1.5 billion ha are currently in use). But it would not be possible without further environmental degradation. Another avenue would be to tap yield-enhancing technologies which could double productivity for many crops. However, this
can only be achieved by increasing the access of farmers to sufficient inputs so as to apply better fertilizers in abundance, make use of better seeds, improve their farming and management skills and expansion of irrigation.

Another serious problem to overcome in the future is to ensure food security will be that of climate change. According to IPCC if temperature increases by more than 2°C, global food production potential is expected to contract severely and yield of major crops will suffer. Another major challenge to food security is that of rapidly rising energy prices. Rising fossil energy prices mean that agriculture will become increasingly important as an energy supplier to the market.

The impact of the financial crisis which occurred along the phenomenon of rising food prices will also have serious implications for international agriculture and food security. The channels through which agricultural markets will be affected are both on demand and supply side. However, the role of China, India and other rapidly developing countries may help in containing the negative impact of falling world income growth on agricultural commodity markets. Overall the result of falling demand is likely to have further downward pressure on agricultural prices. Nevertheless drop in food prices may not benefit consumers as the decline may not be enough in the wake of declining household incomes due to worldwide recession as economic activity slows down, employment also falls and so do the remittances from abroad dry up.

On the supply side reduction of price incentives may result in some cut back in agricultural production. There is every possibility of the financial crisis depressing the input prices, especially if energy prices continue to weaken, as this could also trigger a reduction in fertilizer and energy related costs from production to processing transportation, freight rates have also halved in the past few weeks. Another important aspect of the financial crisis will be the availability of credit which plays very important role in agricultural development in the developing countries. So the combination of falling agricultural prices and reduced excess to credit will affect the agricultural production and seriously impact the global food security.

Reference


Fig. 1: Production Per Capita of Rice (Kgs).

Fig. 2: Production Per Capita of Wheat (Kgs).
Fig. 2.4.1: Production Per Hectare of Harvested Area - Wheat

Fig. 3: Production Per Capita of Cereals (Kgs)
Fig. 2.4.2: Production per hectare of Harvested Area - Rice

Fig. 2.4.3: Production Per Hectare of Harvested Area - Cereals
Fig. 4.1: Harvested Area of Rice (Ha) Per Thousand Population

Fig. 4.2: Harvested Area of Wheat (Ha) Per Thousand Population
**Fig. 4.3:** Harvested Area of Cereals (Ha) Per Thousand Population

**Fig. 5.1:** Supply and Demand position of Food at Global Level
Fig. 5.2: Area harvested, Production, Domestic Consumption, etc., of Wheat

Fig. 5.3: Area harvested, Production, Domestic Consumption, etc., of Coarse Grains
Fig. 5.4: Import Quantity – Rice (million tonnes)

Fig. 5.5: Import Quantity – Wheat (million tonnes)
Fig. 5.6: Import Quantity—Cereals (million tonnes)

Fig. 6.1: Growth Rate of Prices of Rice, Wheat and Maize
**Fig. 6.2**: Movement of Producer Prices of Rice (US$/ton) (Thailand and India)

**Fig. 6.3**: Movement of Producer Prices of Wheat (Australia and India)

*Source*: FAO, 2010
Fig. 6.4: Movement of International Prices of Rice, Wheat and Maize (US$ per metric tonne)
### Table 1: Production Per Capita for Rice, Wheat and Cereals (kgs)

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<tr>
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<th>India</th>
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Source: FAO, 2010

### Table 2.1: Annual Growth Rate of Area, Production and Yield - Rice

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Source: FAO, 2010
# Table 2.2: Annual Growth Rate of Area, Production and Yield - Wheat

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Source: FAO, 2010
**Table 2.3**: Annual Growth Rate of Area, Production and Yield - Cereals

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**Source**: FAO, 2010

**Table 2.4**: Production per Hectare of Harvested Area of Rice, Wheat and Cereals (Mts)

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**Source**: FAO, 2010
| Region/Country Grouping | Arable Land | | | Pasture | | | | Forest | | |
|-------------------------|------------|------------|------------------------------------------------|
|                         | Area (million ha) | Share of total land (Per cent) | Area (million ha) | Share of total land (Per cent) | Area (million ha) | Share of total land (Per cent) |
| Baltic states and CIS2  | 235 | 224 | 199 | 9 | 302 | 327 | 362 | 17 | 849 | 850 | 40 |
| Eastern Europe          | 49 | 45 | 40 | 35 | 20 | 20 | 17 | 15 | 35 | 36 | 32 |
| Western Europe          | 89 | 79 | 73 | 20 | 70 | 61 | 59 | 17 | 123 | 133 | 37 |
| Developing Asia         | 404 | 453 | 466 | 18 | 623 | 805 | 833 | 32 | 533 | 533 | 20 |
| North Africa            | 20 | 23 | 23 | 4 | 73 | 74 | 77 | 13 | 8 | 9 | 2 |
| Sub-Saharan Africa      | 134 | 141 | 196 | 8 | 812 | 824 | 834 | 35 | 687 | 618 | 26 |
| Latin America and the Caribbean | 89 | 134 | 149 | 7 | 458 | 539 | 550 | 27 | 988 | 915 | 45 |
| North America           | 222 | 231 | 216 | 12 | 282 | 255 | 254 | 14 | 609 | 614 | 33 |
| Oceania                 | 33 | 49 | 46 | 5 | 445 | 431 | 393 | 46 | 212 | 206 | 24 |
| Developed Countries     | 634 | 632 | 576 | 11 | 1119 | 1094 | 1083 | 21 | 1816 | 1829 | 35 |
| Developing Countries    | 648 | 771 | 835 | 11 | 1968 | 2243 | 2295 | 30 | 2253 | 2108 | 27 |
| World                   | 1281 | 1403 | 1411 | 11 | 3087 | 3337 | 3378 | 26 | 4068 | 3937 | 30 |

**Source:** FAO, 2009

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**Source:** FAO, 2010
Table 5: Import Quantity of Rice, Wheat and Cereals (million tonnes)

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Wheat

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Cereals

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Source: FAO, 2010

Table 6: Growth Rate of Prices of Rice (Thai-Bangkok), Wheat (US Gulf) and Maize (US)

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Source: IMF Statistics, 2010
### Appendix A1: World Wheat, Coarse Grains and Rice: Supply and Demand

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Source: USDA, USA
1 Introduction

Food insecurity concerns are repeatedly raised in summit meetings of world leaders; by participants in workshops, seminars and symposia organized by food aid and relief organizations as well as by specialists in academic institutions worldwide. FAO (2009a) provided an analysis of trends in global undernourishment by region. That analysis showed figures for undernourished people as 15 million for developed market economies, 42 million for the Near East and North Africa, 53 million for Latin America, 265 million for Sub-Saharan Africa and 642 million for Asia and the Pacific. The proportion of undernourished people in the developing countries declined from over 30 per cent in the period 1969-1971 to around 15 per cent in 2004-2006 and then went up again and approached 20 per cent in 2008-2009.

Food security is a situation where people have access to adequate levels of safe nutritious food for an active and healthy life. It comprises availability, access, stability and utilization of food (FAO, 2009b). Food insecurity is a function of both quantity and quality of food. Livestock are important in terms of both availability and quality of food. This is particularly so for smallholders in rural areas who rely on livestock for food, income and services. For urban people livestock provide cheap high quality food. The cheapness and availability of livestock products stems to a large extent from utilization of marginal lands not suitable for arable cropping and also from backyard production in urban areas. Intensive systems are also a vital source of affordable food as they benefit from economies of scale and technology.

In Africa livestock have a special place as they provide high quality food and other benefits. They are a source of income and prestige, a source of wealth and insurance in bad crop years, a source of energy in farms and for transport, a source of manure for crops and contribute to export earnings to mention a few.

2 Livestock population

Africa has a significant share of the world’s livestock population as can be seen from Table 1. It hosts about 20.0 per cent of the world cattle, 26.7 per cent of the sheep, 33.8 per cent of the goats, 2.8 per cent of the buffaloes, 85.0 per cent of the camels, 2.8 per cent of the pigs, and 7.4 per cent of the poultry (Chickens, ducks, geese and guinea fowls). Camels, goats, sheep and cattle are particularly important with the continent’s share ranging from 20 per cent of the world population of cattle up to 85 per cent of the camels. Poultry and pigs are relatively few (7.4 and 2.8 per cent respectively).

3 Africa Livestock Production Systems

The numbers of livestock reported above are sustained and managed through diverse livestock production systems (Table 2). These systems have been thoroughly described by Steinfeldet al. (2006), Seré and Steinfeld (1996) and Perry et al. (2002). Based on reports by these authors nine livestock production systems prevail in Africa (Table 2). Three of these are pastoral, five agro-pastoral and one peri-urban landless. The pastoral systems include livestock only, rangeland-based in arid/semi-arid
zones; livestock only, rangeland-based in humid/sub-humid zones; and livestock only, rangeland-based in temperate/tropical highlands. The agro-pastoral systems comprise agro-pastoral mixed rainfed in arid/semi-arid zones; agro-pastoral mixed rainfed in humid/sub-humid zones; agro-pastoral mixed irrigated in arid/semi-arid zones; and agro-pastoral mixed irrigated in humid/sub-humid zones.

4 Livestock Production and Productivity

Despite the large share of Africa in the total world livestock population its contribution to world production of meat, milk and eggs is modest and does not reflect the large numbers of animals found in the continent. Tables 3 and 4 presented data on the world and regional production of meat for the years 1980, 1995 and 2007. From the data it is clear that Africa produced 9.4 and 12.9 million tonnes out of the 206.9 and 285.7 million tonnes of world production in 1995 and 2007 respectively. This amounts to only 4.5 per cent and 4.4 per cent of world meat production in the two years under consideration. In fact Africa meat production as percentage of world production has declined in 2007 despite the small increase of 3.1 million tonnes in 2007 over 1995.

Data for milk production are shown in Tables 5 and 6. As in the case of meat the contribution of Africa to world milk production does not reflect the number of animals prevailing in the continent. World production of milk has increased from 465.5 million tonnes in 1980 to 671.3 million tonnes in 2007. While milk production in Africa increased from 23.2 million tonnes in 1995 to 33.3 million tonnes in 2007. These figures amount to 4.3 per cent and 5.0 per cent of world production in the two years respectively. Again this poorly compares with the share of Africa in world population of cattle, sheep, goats and camels of 20.0 per cent, 26.7 per cent, 33.8 per cent and 85.0 per cent respectively. The increase in world milk production between 1980 and 1995 was 51.4 per cent while that for the period 1995-2007 was 38.1 per cent. For the whole period 1980-2007 the increase was 109.9 per cent. That for Africa rose from 23.2 tonnes in 1995 to 33.3 tonnes in 2007, an increase of 43.5 per cent. The small relative increase as percentage of world milk production between 1995 and 2007 in Africa may be attributed to introduction of dairy breeds in many parts of the continent especially after the improvements witnessed in disease control. The increased demand for milk and milk products following the increase in population and urbanization is also a contributing factor. Nonetheless, Africa’s contribution to world milk production is only 4.3 per cent in 1995 and 5.0 per cent in 2007. Again this is a very poor production and does not reflect the magnitude of the huge livestock herd of the continent.

In case of production of eggs the situation is not better from that for meat and milk production. Tables 7 and 8 show world’s and Africa’s production of eggs, respectively. Africa poultry flock amounts to 7.4 per cent of world poultry population in 2008 but it contributed only 3.2 per cent of world production of eggs in 2007 falling down from 3.6 per cent in 1995. World eggs production increased from 24.7 million tonnes in 1980 to 46.9 million tonnes in 1995 and to 67.8 million tonnes in 2007. In percentage this amounts to an increase of 89.9 per cent during the period 1980-1995; and 44.6 per cent during the period 1995-2007. World eggs production has increased by 147.5 per cent for the whole period between 1980-2007. In contrast Africa eggs production increased only by 29.4 per cent between 1995 and 2007 going up from 1.7 million tonnes in 1995 to 2.2 million tonnes in 2007. Africa eggs production is thus really meagre both in total tonnage and as percentage of world production.

5 Per capita Consumption of Livestock Products

Per capita consumption of livestock products in kg/person/year is shown in Tables 9, 10 and 11.
World per capita consumption of meat was 35.7 kg/person/year in 1995 and increased to 41.2 kg/person/year in 2005 with an annual growth rate of 1.5 per cent. The developed countries showed per capita consumption of meat of 77.3 kg/person/year in 1995 which rose to 82.1 kg/person/year in 2005 with an annual growth rate of 0.6 per cent. Per capita meat consumption in North Africa was 22.5 kg/person/year in 1995 and went up to 23.3 kg/person/year in 2005 with an annual growth rate of 1.2 per cent. That for Sub-Saharan Africa was 12.4 kg/person/year in 1995 and increased to 13.3 kg/person/year in 2005 showing an annual growth rate of 0.7 per cent. In 2005 per capita consumption of meat for North Africa was 56.6 per cent of world average; that for Sub-Saharan Africa was 32.3 per cent of world average. In that year Sub-Saharan Africa per capita meat consumption was only 16.2 per cent of that for developed countries. Annual growth of per capita consumption for Sub-Saharan Africa was 46.7 per cent of world average and that for North Africa was 80 per cent of world average. These figures indicate that Africa has alarmingly lower per capita meat consumption compared with the rest of the world. In fact that is just about 1/3rd of world average.

World and regional per capita milk consumption in kg/person/year is shown in Table 10. The world average was 75.6 kg/person/year in 1995 which increased to 81.2 kg/person/year by 2005 showing an annual growth of 0.8 per cent. The equivalent figures for the developed countries were 198.3 kg/person/year in 1995 that went up to 207.7 kg/person/year giving an annual growth of 0.5 per cent. North Africa per capita milk consumption was 62.8 kg/person/year in 1995 and that has increased to 83.4 kg/person/year by 2005 with an annual growth of 2.0 per cent. Sub-Saharan Africa per capita consumption of milk was 27.9 kg/person/year in 1995 and rose only to 30.1 kg/person/year by 2005 meaning an annual growth rate of 0.7 per cent. Considering the 2005 figures Sub-Saharan Africa per capita consumption of milk represents 37.1 per cent of world average and 14.5 per cent of that for the developed countries. Annual growth in per capita milk consumption for Sub-Saharan Africa was 87.5 per cent of world average and 140.0 per cent of that for developed countries. These figures imply that despite the fact that Africa has a much lower per capita consumption of milk compared with world average yet the growth in per capita milk consumption is also less than world average. Of course the developed countries, contrary to Africa, have reached satiety and do not need to increase per capita milk consumption.

Per capita world and regional egg consumption for the years 1995 and 2005 is shown in Table 11. World per capita eggs consumption was 7.3 kg/person/year in 1995 and 9.0 kg/person/year in 2005 while the annual growth during that period was 2.1 per cent. The figures for developed countries for the same period were 12.3 kg/person/year, 13.0 kg/person/year and 0.6 per cent respectively. Figures for North Africa for the same period were 5.1 and 5.8 kg/person/year and 1.2 per cent respectively. Those for Sub-Saharan Africa were 1.6 and 1.6 kg/person/year and 0.3 per cent respectively. Sub-Saharan Africa per capita consumption of eggs was 21.9 per cent and 17.8 per cent of the world average for 1995 and 2005 respectively. Compared with that for developed countries per capita consumption for Sub-Saharan Africa was 13.0 per cent and 12.3 per cent during 1995 and 2005 respectively. The growth rate in per capita eggs consumption was 14.3 per cent of world average during the period under consideration. The point to stress is that Africa per capita consumption is alarmingly low and is growing at a slower rate compared with the rest of the world. This has serious implications from a nutritional perspective.

6 Drivers of Production and Consumption Growth of Livestock Products

Worldwide livestock production has responded to factors such as cheap inputs, technological change and efficiency due to economies of scale.

Drivers of Production and Consumption Growth of Livestock Products

Worldwide livestock production has responded to factors such as cheap inputs, technological change and efficiency due to economies of scale.
The long term declining trend in feed grain and fuel prices had resulted in an increase in use of grains as feed for livestock and the decline in transportation costs has eased the movement of livestock products and feeds. As a consequence availability and access to livestock products has improved. However, this improvement is threatened and may halt or even be reversed by the recent rise in grain and energy prices. Consumption growth on the other hand was driven by economic growth, rising per capita income, urbanization and demographic factors. These production and consumption drivers had marked consequences in increasing production and consumption of livestock products in most regions of the world and especially so in Asia and particularly in China. Africa on the other hand did not respond adequately to these drivers since production and consumption remained low.

A host of factors contributed to the low African production and consumption levels. These include:

i) Prevalence of traditional livestock production systems. Most African livestock are raised under traditional production systems that depend on seasonal migration to capture grazing and water or on subsistence village based rainfed systems. Although migratory systems allow the utilization of lands that would otherwise be largely unexploited yet the long distance movement has high energy costs. For example sheep walking for 20 km a day between grazing and water during the dry season in Sudan were found to spend about 29 per cent of the energy they harvest during grazing as cost of walking (Fadlalla, 1987). The movements are also a recipe for disease transmission especially for trans-boundary diseases. Moreover these traditional systems are associated with poor husbandry practices. The free grazing encouraged keeping of large poorly managed, low producing herds. In these herds, in some cases, breeding through selection favoured hardy breeds that can tolerate the harsh environments and poor management practices prevailing.

ii) Absence of or inadequate land tenure arrangements especially in countries with largest livestock populations raised under pastoral mode of production. The lack of tenure discouraged investment in the land. Fencing and water installations cannot be developed in common land except for common use which is difficult to regulate. Efforts of reseeding of degraded lands often failed because of inability to protect common land even for a short period of deferment to allow establishment of the reseeded plants.

iii) Climate change, recurrent droughts and hostile environment. In the absence of drought preparedness strategies by many African countries frequent droughts impoverished numerous households and even whole communities. The affected households usually drop out of the livestock sector and join the poor cultivating village communities or migrate to urban centres. Strategies to restock are needed.

iv) Livestock diseases and epidemics. Livestock diseases were and are still a major hindrance to livestock production in Africa. However, with the advances in the industry of veterinary drugs and improvements in drugs and vaccines availability many diseases are under control. This allowed the introduction of high yielding dairy breeds from Europe and other parts of the world. Nonetheless this is to a large extent restricted to large farms in urban centres which can provide the inputs needed for high yielding animals such as good husbandry, adequate and appropriate feeding and veterinary care.

v) Lack or inadequate use of production enhancing technology such as improved water management systems for irrigation, improved breeds of animals, improved forage varieties and a flourishing feed industry. Also improved handling, storage and processing are essential for efficient marketing.

vi) The recent trend towards increased use of biofuel where grains and sugar industry by-
products such as molasses are increasingly removed from the feed industry for use as biofuel further worsens an already ailing situation.

vii) Low incomes and poverty are contributing factors to the low production and consumption. The ability of low income households to buy livestock products is restricted by their purchasing power. Moreover poverty curtails the capacity of the poor to access production increasing inputs.

viii) Conflict and civil wars in many parts of Africa have either led to the displacement of a large part of the productive force to urban areas or have made large areas of productive land inaccessible because of insecurity and/or land mines. Conflict also destroyed infrastructure and led to a hostile rural environment thus forcing communities to migrate and live in the suburbs of cities.

ix) Poor capacities are a major constraint to production and development in Africa. Education institutions are run down as a result of economic difficulties faced by many African countries or due to some irrational education policies. Personnel with experience and who had a chance to study in prestigious international education institutions have chosen to seek lucrative jobs out of the continent in Europe, the United States of America or the oil rich countries. Research remained to a large extent serving the market oriented relatively small modern sector for decades following the independence of many African countries. The consequences are that when governments premeditated policies to develop rural areas in Africa they were confronted with the reality that there is lack or absence of needed appropriate technology. The lack of technology is aggravated by a reduced ability to transfer the little available technologies. The technology transfer institutions are weak and lack the required numbers of well trained personnel. This left rural farmers dependent on traditional practices which are no longer able to withstand the challenges of land exhaustion, climate change and other vulnerabilities.

7 Strategies to Enhance Production and Consumption of Livestock Products

If the state of food security with respect to livestock products in Africa is to be upgraded, strategies, plans and programmes addressing the constraints to livestock-based food production and consumption discussed above must be developed and implemented. At the present time Africa is sitting at the bottom of the world with millions of its people suffering from hunger and malnutrition despite the huge land, water and livestock resources. Proposed strategies, plans and programmes should aim at alleviating the constraints that crippled the continent and prevented it from achieving food security. Some of the interventions suggested are:

Transformation of the traditional subsistence production systems those are dependent upon communal minimum input production strategies. The transformation will capitalize on the developments in technology. The poultry production revolution in China and other Asian countries is an example to learn from. The use of improved high producing genetic stock of poultry put China in the fore-front of countries with fast growth of livestock products.

The dairy industry can benefit from introduction of improved genetic stock especially in the highlands where climate is favourable. In other parts of Africa there is need for a painstaking long term breeding programme that depends on tropical cattle reputed for their high milk production such as the Kenana and the Butana type of Sudan. These are cattle well known for milk production and at the same time tolerant to the climatic conditions of the tropics. There is high variance within the breed that can be captured to bring about quick improvements. The developments in biotechnology will reduce the time required to reach encouraging results.

Nutrition is a major factor contributing to the level and cost of production. In the rangeland- based
livestock systems there is need to encourage possession of land title. This will encourage titleholders to invest in the land in the form of fencing; water structures for livestock watering and for irrigation and reseeding with improved varieties of forage and fodder plants. Distances travelled by livestock in search of forage and water should be kept to the minimum possible as this is a drain on the meagre amount of energy obtained by the animal from a sparse poor quality grazing. Sound feeding practices should be conveyed to producers through viable and efficient technology transfer institutions. The use of grains and molasses as biofuel is a development that will negatively impact on food security in Africa especially livestock products. The continent is already in acute food deficit. The conversion of more grains and molasses to biofuel will exacerbate an already unfortunate situation. It will also further curb the emerging feed industries in the continent that are relying on grains and sugar industry by-products.

Drought occurrence is a frequent phenomenon in Africa. It has catastrophic impact on communities. Preparedness strategies need to be in place in anticipation for the worse. Programmes that allow slaughter and chilling or processing of meat for export will assist in restocking by producers who lost their animals. This requires the establishment of large abattoirs with all the necessary lines. Exporting processed meat instead of live animals reduces the risk of disease transmission thus opening new markets that were previously inaccessible; and will avail funds for restocking when the drought recedes.

Capacities in livestock production research and extension need to be enhanced. Being a long term research programme animal breeding attracted a limited number of scientists in the past, thus progress was slow. However, with the advances in biotechnology there is a large opportunity for quick results. African governments must provide the needed infrastructure and training in this field so that quick and effective improvements can be achieved. Capacities in rural areas are always weak. This is because these areas are hostile in terms of services such as clean water, education and health. As a result high rated experienced scientists prefer to work in urban areas. Incentives should be provided to attract more qualified personnel.

References


Table 1: Africa Livestock Numbers in Relation to World Population

(Thousand heads)

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<th>Livestock species</th>
<th>World</th>
<th>Africa</th>
<th>Africa/World</th>
</tr>
</thead>
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<td>Cattle</td>
<td>1,347,473</td>
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<td>Sheep</td>
<td>1,078,179</td>
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<tr>
<td>Goats</td>
<td>861,902</td>
<td>291,102</td>
<td>33.8%</td>
</tr>
<tr>
<td>Buffaloes</td>
<td>180,703</td>
<td>5,023</td>
<td>2.8%</td>
</tr>
<tr>
<td>Camels</td>
<td>24,732</td>
<td>21,025</td>
<td>85.0%</td>
</tr>
<tr>
<td>Pigs</td>
<td>941,282</td>
<td>26,466</td>
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<td>Chickens</td>
<td>18,394,836</td>
<td>1,430,536</td>
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<td>Geese and Guinea fowls</td>
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<td>Poultry total</td>
<td>19,854,563</td>
<td>1,459,931</td>
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Table 2: Major Animal Production Systems in African Agro-ecological Zones

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</tr>
<tr>
<td>Pastoral, livestock only, rangeland-based</td>
<td>humid/subhumid</td>
</tr>
<tr>
<td>Pastoral, livestock only, rangeland-based</td>
<td>temperate/tropical highland</td>
</tr>
<tr>
<td>Agro-pastoral, mixed rainfed</td>
<td>arid/semi-arid</td>
</tr>
<tr>
<td>Agro-pastoral, mixed rainfed</td>
<td>humid/subhumid</td>
</tr>
<tr>
<td>Agro-pastoral, mixed irrigated</td>
<td>temperate/tropical highland</td>
</tr>
<tr>
<td>Agro-pastoral, mixed irrigated</td>
<td>arid/semi-arid</td>
</tr>
<tr>
<td>Peri-urban, landless</td>
<td>humid/subhumid</td>
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</table>

Source: Perry et al. (2002).

Table 3: World Production of Meat 1980, 1995 and 2007

(Million tonnes)

<table>
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<tr>
<th>Region/Country Group</th>
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<td>East &amp; South East Asia</td>
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<td>Latin America &amp; the Caribbean</td>
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<tr>
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<tr>
<td>Near East &amp; North Africa</td>
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<td>Sub-Saharan Africa</td>
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</table>

Source: FAO (2009b)
Table 4: Africa Production of meat in 1980, 1995 and 2007

<table>
<thead>
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<th>Region/ Country group</th>
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<th>1995</th>
<th>2007 (%)</th>
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<tr>
<td>Sub-Saharan Africa</td>
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<td>7.1</td>
<td>9.3</td>
</tr>
<tr>
<td>Total Africa</td>
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<tr>
<td>Africa/World (%)</td>
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<td>4.4</td>
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</table>

Source: FAO (2009b)

Table 5: World Production of Milk in 1980, 1995 and 2007

<table>
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<td>Latin America &amp; the Caribbean</td>
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<tr>
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Source: FAO (2009b)

Table 6: Africa Production of milk in 1980, 1995 and 2007

<table>
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<tr>
<th>Region/Country Group</th>
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<tr>
<td>North Africa</td>
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</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>12.9</td>
</tr>
<tr>
<td>Total Africa</td>
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<td>Africa/World (%)</td>
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Source: FAO (2009b)
**Table 7**: World Production of Eggs in 1980, 1995 and 2007

(Million tonnes)

<table>
<thead>
<tr>
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<td>20.1</td>
<td>34.6</td>
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<td>Latin America &amp; the Caribbean</td>
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<td>Sub-Saharan Africa</td>
<td>0.7</td>
<td>1.1</td>
<td>1.5</td>
</tr>
<tr>
<td>World</td>
<td>27.4</td>
<td>46.9</td>
<td>67.8</td>
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</table>

**Source**: FAO (2009b)

**Table 8**: Africa Production of Eggs in 1980, 1995 and 2007

(Million tonnes)

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<tr>
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<td>Total Africa</td>
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<tr>
<td>Africa/World (%)</td>
<td>-</td>
<td>3.6</td>
<td>3.2</td>
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**Source**: FAO (2009b)
Table 9: Per capita Consumption of Meat in 1995 and 2005  

(Kg/person/year)

<table>
<thead>
<tr>
<th>Region/country</th>
<th>Year</th>
<th>Annual growth 1995-2005%</th>
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<tr>
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<td>1995</td>
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<tr>
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<td>35.7</td>
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<td>Developed countries</td>
<td>77.3</td>
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<tr>
<td>Developing countries</td>
<td>24.0</td>
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</tr>
<tr>
<td>East &amp; South East Asia</td>
<td>32.3</td>
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<tr>
<td>Latin America &amp; Caribbean</td>
<td>54.8</td>
<td>61.9</td>
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<td>South Asia</td>
<td>5.6</td>
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<td>North Africa</td>
<td>22.6</td>
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<tr>
<td>Sub-Saharan Africa</td>
<td>12.4</td>
<td>13.3</td>
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Source: FAO (2009b)

Table 10: Per Capita Consumption of Milk in 1995 and 2005  

(Kg/person/year)

<table>
<thead>
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<th>Region/country</th>
<th>Year</th>
<th>Annual growth (%) 1995-2005</th>
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</thead>
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<td>2005</td>
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<tr>
<td>Developed countries</td>
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<td>Developing countries</td>
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<td>Latin America &amp; Caribbean</td>
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<td>Sub-Saharan Africa</td>
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</table>

Source: FAO (2009b)
Table 11: Per Capita Consumption of Eggs in 1995 & 2005 (Kg/person/year)

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<th>Region/country</th>
<th>Year</th>
<th>Annual growth (%)</th>
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<td>East &amp; South East Asia</td>
<td>10.2</td>
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<td>Latin America &amp; Caribbean</td>
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<td>South Asia</td>
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<td>1.7</td>
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<td>Near East &amp; North Africa</td>
<td>5.4</td>
<td>6.3</td>
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<tr>
<td>North Africa</td>
<td>5.1</td>
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</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>1.6</td>
<td>1.6</td>
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</table>

Source: FAO (2009b)
1 Introduction

The sharp increase in global food prices during 2007-2008 has triggered the awareness of food insecurity problem and its impact on the living standards of many, particularly the poor. The definition of food security which has evolved over time. Initially in the 1974 World Food Summit introduced the concept of food security as “availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices.” Basically, the essence was to respond transitory food insecurity such as milk supply-demand gaps during the lean season, and temporary food insecurity such as production shortfall due to natural disasters (Kuntjoro and Jamil, 2008).

Besides the demand and supply side, more concerns gave rise to the distribution of food and access to food. Therefore, the World Food Summit in 1996 offered a holistic perspective of food security: “The food security exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life.” This definition implies that the food security should include four dimensions: availability, stability, access, and utilization of food. In recent years, the rising energy costs, the falling dollar, and increasing demand of grains for bio-fuel not only induce a sharp increase in grain prices (Mitchell, 2008) but also exacerbate the deficiency in food and undernourishment of the poorer households with a larger share of food in their total expenditures (Brahmbhatt and Christiaensen, 2008).

2 The Global Trends of Food Security

Recently, the food price change has reflected precarious food insecurity for many low income countries. By March 2008, the basic food grain prices were more than two and a half times higher than in early 2002. Almost three quarters of this increase occurred since the start of 2007, and about half since the beginning of 2008. According to the forecasts of major international organizations e.g., FAO, UNDP, and OECD, the prediction of high food grain prices in the medium term is expected to continue as policies aiming at achieving energy security and carbon dioxide emission reductions present a strong trade-offs with food security goals (Brahmbhatt and Christiaensen, 2008).

Figure 1 shows that the food prices continued their rise in the early part of 2008, which became a concern for policy makers, but then fell in the later part of the year. Particularly, from July to December 2008, international prices for food and fuel declined sharply. Oil prices were cut by nearly 70% and food prices by 33%. However, as of February 2010, prices of food and fuel still remain much higher than they were for much of this decade. The increase in food prices would be a negative development for low income, food-deficit countries, many of which are becoming more dependent on imported foods and food ingredients.

Fig. 2 exhibits most net exporters are located in North America and Australia. However, the critical problem of inadequate food occurs in Asia. For most African countries, the stability of food supply
system is also impeded. Referring to the prevalence of undernourishment population in Figure 3, most net exporters relatively have less undernourished population. Actually, FAO reports that even before the consecutive food and economic crises, the number of undernourished people in the world had been increasing slowly but steadily for a decade.

Figure 4 shows that the number of undernourished people increased between 1995-97 and 2004-06 in all regions except America. In late 2008, as global food and oil prices continued to fall, the global financial crisis was another blow to the food-insecure and vulnerable people. Particularly for developing countries, FAO states that the current economic turmoil is different in three important aspects. First, the crisis is affecting large parts of the world simultaneously, and thus traditional coping mechanisms used to focus on several countries in particular regions are likely to be less effective than they were in the past.

Second, the current economic crisis emerged immediately following the food and fuel crisis of 2006 to 2008. While food commodity prices in the world market declined, they remained high by recent historical standards. Also, food prices in domestic markets came down more slowly, partly because the weakened US dollars, in which most imports are priced. At the end of 2008, domestic prices for staple foods remained an average of 17% higher in real terms than two years earlier.

Finally, developing countries have become more integrated, both financially and commercially, into the world economy than they were 20 years ago. As a consequence, they are more exposed to changes in international markets. The rising income and urbanization are also changing the nature of their diet. It is very important to be cognizant of all the components of food security so that progress towards reducing malnutrition and improving living standards can be maintained.

3 Food Security with Respect to East Asia

3.1 Difference between East Asia and Global Situation

In Asia, the increase in the number of food-insecure people of 4 percent from 2007 to 2008 was more a reflection of population growth than deepening food insecurity. The region’s food security is largely driven by domestic production performance, and despite the doubling of import volume during the last decade, Asia remains the least dependent of all regions on food imports. While Asia accounted for an estimated 46 percent of the food-insecure people of the 70 countries in 2008, the region accounted for nearly two-thirds of the total population of these 70 countries. In other words, its food-security situation was good in relative terms. Less than 20 percent of the region’s population was estimated to consume below the nutritional target in 2008.

Table 1 shows the share in dietary energy consumption and the average nutrient including carbohydrates, proteins, and fats. The carbohydrates are measured as kcal per person per day. Compare the composition and consumption level of the nutrients, the percentage of carbohydrates in East Asia is slightly lower than other regions and world average. Proteins and fats account for 12% and 27%, respectively, which are higher than that of other regions.

Table 2 listed the food balance sheet of Southeast and Northeast Asia. Because of China, the population of Northeast Asia is much higher than that of Southeast Asia. Northeast Asia export more rice while the domestic supply is less than the Southeast Asia. Basically, the demand of rice and protein are higher for people in Northeast Asia.

3.2 Regional Reviews

Based on FAO report, recent cyclones, floods
and droughts in addition to the continuing conflicts and civil strife affected most regions in East Asia. The food aid situation of East Asia is listed in Table 3. From 2000 to 2006, based on FOA statistics, only Cambodia, Indonesia, North Korea, Laos, and Philippines received continuous food aid. Thailand received the food aid only in 2002. North Korea and Cambodia had a sharp decline on its volume of assistance.

The FAO report classified several East Asia regions which are requiring external assistance and is exhibited in Table 4. Different from other regions, the reason of requiring food support for North Korea is because its economic constraints and political problems. Next, the food security situation for primary regions in East Asia is stated according to FAO reports.

In China, the harvest of the 2009 secondary spring wheat crop was completed in August and output is estimated at record 6 million tons. The 2009 aggregate wheat output is now estimated at a record 114.9 million tons, some 2.2% above the previous high set last year reflecting Government support and favourable weather. Harvesting of the 2009 maize crop is just completed and the annual output is estimated at 158 million tons, lower than the record level of last year but above the five-year average. Harvesting of the 2009 early rice crop, a small crop accounting for less than 20 percent of total annual paddy output, was completed in July. The output is estimated at some 38 million tons, about 3.3 percent above the crop of last year, reflecting increased area and yields.

In Japan, agriculture is in a freefall decline. In the years between 1960 and 2005, the share of agricultural output in GDP dropped from 9% to 1%, the food self-sufficiency ratio from 79% to 41%, and agricultural land, indispensable for food security, from 6.09 million hectares to 4.63 million hectares. Meanwhile, the ratio of part-time farm households, which derive more than half their income from non-farm employment, increased from 32.1% to 61.7%. The percentage of farmers over 65 years old also jumped from 10% to 60%. Gross agricultural output in 2006 was 8.5 trillion yen, less than the sales volume of Panasonic, which stood at 9.1 trillion yen in the same year.

In Myanmar, the Government and partners recently appealed for USD 103 million to help meet critical recovery needs for last year's cyclone affected areas. Furthermore, the food supply and market access exist difficulties. In Myanmar, agricultural and food assistance continues to be needed for the summer season and the current monsoon season to help small farmers recover their production and livelihoods in the areas affected by cyclone in 2008.

In North Korea, the food security remains precarious because of political problems. Because of a series of natural disasters and the dissolution of the Soviet Bloc, the number of food insecure people more than doubled between 1995-96 and 2007-08. North Korea is facing persistent food shortages. In 2008, according to the UN World Food Programme, 40% of the country's population people were in need of emergency food aid. From 2000-2006, within the recipient countries in East Asia, North Korea receives most types of food. The main assisted food can be seen in table 4. As Table 5 shows, the sharp decline of foreign assistance is due to the decline of rice and coarse grains.

In the Philippines, nearly 2 million people were affected by the tropical storm which hit the northern island of Luzon in September 2009 and caused heavy flooding in this main rice producing area. The Government declared "a state of calamity" for 25 provinces of the island and appealed for international assistance. A joint Government/UN appeal has been launched for 25,800 tons of food for 1 million most affected people.

In Taiwan, the food self-sufficiency ratio is only 30.6% weighted by energy in 2007. Total
agriculture imports and cereals have increased significantly due to the expansion of livestock and fishery industries and improve living standard. The agriculture sector of Taiwan is facing many challenges, such as: low level of food self-sufficiency, aging farmers, large acreage of set-aside farmlands, small scale farming, soaring price of fertilizers, natural disasters accelerated by climate change, and rapid changes in the world food economy. To cope with these challenges, the present agricultural policy is based on three guidelines: “Healthfulness, Efficiency, and Sustainability.” A programme entitled “Turning Small Landlords into Large Tenants” was launched to make effective use of idle lands. Facing globalization and the food crisis, Taiwan will secure stable food supply through revitalization of its set-aside farmlands and international markets, and provide technical assistance to developing countries, in particular for staple food crops (Huang et al., 2009).

In Thailand, the world’s largest rice exporter, 2009 paddy production is preliminarily forecast at 31.8 million tons, higher than 2008 and the average of the last five years but slightly below the record harvest in 2007. Rice exportable surplus for 2010 is estimated at about 8.6 million tons, similar to that of 2009 but down from the near record level of about 10 million tons in 2008.

4 Climate Chang and Rice in Asia- A Quantitative Assessment

Evidence has shown that agricultural production is rather vulnerable to climate change, in particular, temperature and precipitation changes. As Matthews et al. (1995) indicates, the impact of climate change on rice production in Asia is of particular policy interest considering that rice is the most important component in millions of Asians’ diet. Seventeen south, south-east, and east Asian countries produce 92% of the world total rice supply, among which 90% is consumed in these regions as well (Matthews et al., 1995). Rice-growing countries in Asia locate in different latitudes and the terrain conditions of the rice-growing areas vary as well. As such, climate-change impact on rice production of the Asian countries is quite diversified and warrants a detailed assessment at regional level.

A recent study by Lee and Chang (2010) regarding the impact of climate change on Asia’s rice sector, employs a multi-region, multi-sector computable general equilibrium (CGE) model—which also considers crop suitability and agro-ecological characteristics—to analyze the climate-change impact on global rice market (supply-side shock through crop yield change), with the consideration of changes in food demand due to population and economic growth. In contrast to Mathews et al. (1995), the study places more emphasis on the economic side of food security issue regarding rice such as the effect on prices of rice and other competing food crops that is brought about by varied changes in rice yield across countries.

The study take into account changes in both the supply and demand sides to examine the impact of climate change by 2020 on the global rice market and food security for Asian countries should the world is developing as plotted in the IPCC SRES scenario A2. Among all these concerns, food price is the key. Thus, in addition to the physical impact of climate change, price-induced adjustments in food production, which would affect significantly the reallocation of agricultural land among uses, are also taken into account. By identifying crop suitability and agro-ecological features of land, the economic model used here can model more realistically the production responses of rice-growing countries to climate change, especially when diversity are found for the rice-growing countries in their vulnerability to climate change. Food security of countries located in tropical and sub-tropical zones may be adversely affected by climate change and the fluctuations in global food prices thus induced.
On the demand side, this study considers the fact of fast growing Asian economies, such as China and India, in population and per capita income, which are the key drivers for food demand increase. On the trade front, the study also simulates for the production and demand shocks being received by all food exporting and importing countries. Importing countries are more concerned about food security, while exporting countries are concerned about the change in farm income.

The simulation design follows that of Lee (2009) and is illustrated in Fig. 4. In the first step of the simulation, we produce line A1B, which graphs the growth path of some variable, e.g., supply of a crop, in the GTAP land use model from 2001 to 2020 under the SRES scenario A2. In producing this baseline A1B, we brought in region-specific GDP and population growth forecasts by IIASA (2007a) and IIASA (2007b) to the GTAP land use model and gradually updated the benchmark database of 2001 to 2020, i.e., point B. Population and GDP growth forecasts of 19 world regions/countries used in this study draw on those as compiled by Lee, Cheng, and Chang (2010).

In the 2nd step, the updated database then serves as the benchmark equilibrium for the simulation—that is, to bring in climate-induced crop yield changes (the supply-side shocks). The climate-induced yield changes of three staple crops—i.e., rice, wheat, and coarse grains—by 2020 as estimated by Rosenzweig and Iglesias (2001) are used based on the climate forecasts as projected by the HadCM3 model (Gordon et al. 2000; Pope et al. 2000) under the IPCC emissions scenario IS92a. Japan, Centralized Planning Economies in Asia, Indonesia, and other regions in the Pacific Asia gain 6%, 3%, 1%, and 1.58%, respectively, in rice yield. On the other hand, China, India, other South Asian countries receives negative impact of 1%, 8%, and 0.74% on their rice yield.

The results suggest that among Asian countries, India gets the hardest hit of climate change in its rice production, and a huge increase in the unit cost of rice production. Thus India has to rely heavily on imports from the world market to meet its domestic rice demand. To fill the gap being caused by climate change, China also has to increase rice imports, with a relatively bigger magnitude than the other Asian countries. India and China have been the world’s top rice-growing countries, and most of their rice production is consumed domestically. Should negative effects of rice yield occur in these two major rice-consuming countries, their raised demand for rice imports may push up global price of rice, and in turn affect regions that are very much reliant on foreign supply.

The major finding of the study is that as agricultural trade intensifies, impact of climate change, be it positive or negative, occurring in one region will spill over into other regions, through the channels of trade. As such, policy measures aimed to effectively alleviate food security problem should also take into account the geographically diverse impact of climate change on crop yield along with the agricultural trade development related policies.

5 Response of East Asia Regions and Concluding Remark

It is a big challenge for East Asian countries to deal with rising food prices. There may be some speculative procurement in the food sectors around the region. According to Brahmabhatt and Christiaensen (2008), it is emergent for setting greater international engagement and collaboration to address the competing demands of energy and food security. Demeke et al. (2009) suggest that the policies include releasing food stock to the market, reducing tariffs, price control, and export restriction. In recent years, the bio-fuel mandates, trade tariffs and subsidies in the advanced countries have distorted world food markets and have played an important role in rising world food prices. More analysis and international dialogue is needed to decide whether the benefits from the
current mix of policies really justifies the costs, or whether a new global deal can be struck covering both clean energy and food.

For example, China eliminated export taxes on some grains, including wheat (3%), rice (3%), and soybeans (5%). The Thailand government set the farmers guaranteed price for second-crop paddy at THB 11,800 (USD 332) per ton under a new intervention scheme starting on March 16 and running through July. Japan cut the price at which it sells imported wheat to domestic flour millers by an average 23% to 49,820 yen (USD 549) per ton. Indonesia is planning to release 2,250 tons of rice through a market operation to avoid price spikes before the harvest of the second season. In the Philippines, the National Food Authority announced that it will allow private-sector traders to import up to 563,000 tons of rice annually. The measure aims at enhancing market participation ahead of liberalization of the sector, including the removal of quantitative restrictions on imports. The Viet Nam Food Association (VFA) confirmed the purchase of 400,000 tons of husked rice for state reserves under the first phase of the procurement plan announced by the Government in mid-June. Under the plan, the VFA is instructed to buy two million tons of summer-autumn rice to prevent a fall in domestic prices at the peak of the harvest, when export demand is low.

Table 6 illustrate the major policy measures taken by the East Asian countries. It is quite obvious that most of the government interventions focus on short-term measures such as reducing domestic food prices through changes in trade policies or changes in domestic taxes or subsidies. Price control is also implemented in some cases. Despite these efforts, the severity of the food insecurity renders national action inadequate and requires multilateral cooperation. The establishment of a regional food reserve (e.g., ASEAN Emergency Rice Reserve or East Asia Emergency Rice Reserve) as a long-term measure would serve to stabilize extreme price fluctuations in the international market.

Footnotes

1. Food Security Assessment, 2008-09/GFA-20, Economic Research Service/USDA.
2. According to FAO, the undernourishment exists when caloric intake is below the minimum dietary energy requirement (MDER). The MDER is the amount of energy needed for light activity and a minimum acceptable weight for attained height, and it varies by country and from year to year depending on the gender and age structure of the population.
5. Food and Agricultural Organization (FAO), November 2009, Crop Prospects and Food situation, No.4.
7. Food and Agricultural Organization (FAO), November 2009, Crop Prospects and Food situation, No.3.
9. In order to simulate for more Asian countries, we tried to use the yield change estimates of as disaggregated regions as possible. Rosenzweig & Iglesias (2001) has, so far, the most disaggregated regions of estimates that fit with the need of our study purposes.
10. Viet Nam is included in CPA; Thailand and the Philippines are in PAS.
Reference


2. Dimaranan, B. V. (eds.), 2004. Global Trade, Assistance, and Production: the GTAP 6 Data Base. Center for Global Trade Analysis, Purdue University, West Lafayette, IN 47907, U.S.A.


4. Food and Agricultural Organization (FAO), November 2009, Crop Prospects and Food Situation, No.3.

5. Food and Agricultural Organization (FAO), November 2009, Crop Prospects and Food Situation, No.4.


Fig. 1: Grand prices from January 1990 to March 2010


Fig. 2: Global Net Trade Position in Food

**Fig. 3** : Prevalence of Undernourishment in Total Population (per cent)


**Fig. 4** : Undernourishment on the rise: number of undernourished in selected regions from 1990-92 to 2004-06.

Table 1: Share in Total Dietary Energy Consumption and Average Nutrients

<table>
<thead>
<tr>
<th>Country Groups</th>
<th>Macronutrients</th>
<th>g/person/day*</th>
<th>percent</th>
</tr>
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<tbody>
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<td>World Total</td>
<td>Carbohydrates</td>
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<tr>
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<td>Proteins</td>
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<td>11</td>
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<tr>
<td></td>
<td>Fats</td>
<td>71</td>
<td>25</td>
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<td>Asia and the Pacific</td>
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<tr>
<td></td>
<td>Proteins</td>
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<td>Proteins</td>
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Table 2: Food balance sheet of Southeast and Northeast Asia

<table>
<thead>
<tr>
<th>Items</th>
<th>Population</th>
<th>Total Production</th>
<th>Import Quantity</th>
<th>Stock Variation</th>
<th>Export Quantity</th>
<th>Domestic Supply Quantity</th>
<th>Feed Supply Quantity</th>
<th>Seed Supply Quantity</th>
<th>Food Supply Quantity</th>
<th>Protein Supply Quantity</th>
<th>Fat Supply Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1000)</td>
<td>(1000 tons)</td>
<td>(1000 tons)</td>
<td>(1000 tons)</td>
<td>(1000 tons)</td>
<td>(1000 tons)</td>
<td>(1000 tons)</td>
<td>(1000 tons)</td>
<td>(1000 tons)</td>
<td>(1000 tons)</td>
<td>(g/capita/day)</td>
</tr>
<tr>
<td><strong>Southeast Asia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Population</td>
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<td></td>
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</tr>
<tr>
<td>Wheat</td>
<td>110,520</td>
<td>11,543</td>
<td>-1,202</td>
<td>4,199</td>
<td>116,662</td>
<td>8,046</td>
<td>4,155</td>
<td>98,993</td>
<td>64.4</td>
<td>563</td>
<td>18</td>
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<tr>
<td>Rice</td>
<td>137,534</td>
<td>2,698</td>
<td>9</td>
<td>1,333</td>
<td>138,908</td>
<td>10,366</td>
<td>4,500</td>
<td>115,363</td>
<td>75</td>
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<tr>
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<td>-211</td>
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<td>6,436</td>
<td>1,311</td>
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<tr>
<td>Maize</td>
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<td>30,078</td>
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<td>118,913</td>
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<td>7.9</td>
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<tr>
<td>Millet</td>
<td>1,571</td>
<td>48</td>
<td>0</td>
<td>25</td>
<td>1,594</td>
<td>832</td>
<td>30</td>
<td>661</td>
<td>0.4</td>
<td>3</td>
<td>0.1</td>
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<tr>
<td>Sorghum</td>
<td>2,468</td>
<td>1,307</td>
<td>99</td>
<td>238</td>
<td>3,636</td>
<td>2,648</td>
<td>21</td>
<td>844</td>
<td>0.5</td>
<td>4</td>
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<tr>
<td>Cereals, Other</td>
<td>567</td>
<td>155</td>
<td>100</td>
<td>182</td>
<td>641</td>
<td>206</td>
<td>104</td>
<td>304</td>
<td>0.2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Northeast Asia</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>159</td>
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<td>698</td>
<td>12,252</td>
<td>959</td>
<td>6</td>
<td>10,873</td>
<td>19.3</td>
<td>140</td>
<td>3.8</td>
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<tr>
<td>Rice</td>
<td>123,237</td>
<td>4,633</td>
<td>-8,440</td>
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<td>105,113</td>
<td>8,832</td>
<td>2,550</td>
<td>73,863</td>
<td>131</td>
<td>1270</td>
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<tr>
<td>Barley</td>
<td>18</td>
<td>1,129</td>
<td>-78</td>
<td>26</td>
<td>1,043</td>
<td>2</td>
<td>0</td>
<td>35</td>
<td>0.1</td>
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</tr>
<tr>
<td>Maize</td>
<td>30,401</td>
<td>4,516</td>
<td>-1,230</td>
<td>778</td>
<td>32,909</td>
<td>18,409</td>
<td>276</td>
<td>9,162</td>
<td>16.2</td>
<td>116</td>
<td>2.9</td>
</tr>
<tr>
<td>Millet</td>
<td>168</td>
<td>18</td>
<td>1</td>
<td>6</td>
<td>181</td>
<td>22</td>
<td>5</td>
<td>144</td>
<td>0.3</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>Sorghum</td>
<td>57</td>
<td>19</td>
<td>0</td>
<td>3</td>
<td>73</td>
<td>70</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cereals, Other</td>
<td>140</td>
<td>234</td>
<td>100</td>
<td>219</td>
<td>254</td>
<td>23</td>
<td>4</td>
<td>304</td>
<td>0.5</td>
<td>3</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Table 3: Food aid shipments of East Asia regions for cereal (tons)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>18,917</td>
<td>55,302</td>
<td>24,932</td>
<td>33,670</td>
<td>13,622</td>
<td>12,568</td>
<td>6,326</td>
</tr>
<tr>
<td>China</td>
<td>40,300</td>
<td>80,680</td>
<td>106,847</td>
<td>8,808</td>
<td>66,787</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Indonesia</td>
<td>241,949</td>
<td>219,966</td>
<td>205,657</td>
<td>177,013</td>
<td>76,147</td>
<td>37,247</td>
<td>21,338</td>
</tr>
<tr>
<td>North Korea</td>
<td>1542,440</td>
<td>1,069,860</td>
<td>973,064</td>
<td>843,965</td>
<td>995,907</td>
<td>878,968</td>
<td>133,783</td>
</tr>
<tr>
<td>Laos</td>
<td>16,331</td>
<td>22,648</td>
<td>21,037</td>
<td>19,379</td>
<td>14,340</td>
<td>11,032</td>
<td>13,384</td>
</tr>
<tr>
<td>Mongolia</td>
<td>64,866</td>
<td>59,539</td>
<td>-</td>
<td>48,691</td>
<td>34,194</td>
<td>29,730</td>
<td>34,271</td>
</tr>
<tr>
<td>Myanmar</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>249</td>
<td>10,111</td>
</tr>
<tr>
<td>Philippines</td>
<td>108,808</td>
<td>244,928</td>
<td>68,150</td>
<td>106,100</td>
<td>48,200</td>
<td>70,969</td>
<td>82,957</td>
</tr>
<tr>
<td>Thailand</td>
<td>-</td>
<td>-</td>
<td>1,223</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>2,030</td>
<td>800</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>108,255</td>
<td>27,000</td>
<td>60,000</td>
<td>24,027</td>
<td>31,600</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>


Table 4: Countries in crisis requiring external assistance

<table>
<thead>
<tr>
<th>Nature of Food Insecurity</th>
<th>Main Reasons</th>
<th>Changes from last report (July 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widespread lack of access</td>
<td>Economic constraints</td>
<td>-</td>
</tr>
<tr>
<td>Severe localized food insecurity</td>
<td>Past cyclone</td>
<td>↑</td>
</tr>
<tr>
<td>Myanmar</td>
<td>Past cyclone</td>
<td>↑</td>
</tr>
<tr>
<td>Philippines</td>
<td>Tropical storm</td>
<td>+</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>IDPs</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: “-”=No change; ↑= Improving; ↓= Deteriorating; + = New entry.

Source: Food and Agricultural Organization (FAO), November 2009, Crop Prospects and Food situation, No.4.

Table 5: North Korea- Food aid shipments (tones)

<table>
<thead>
<tr>
<th>Type</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>575,959</td>
<td>296,084</td>
<td>626,572</td>
<td>493,003</td>
<td>490,400</td>
<td>431,414</td>
<td>102,811</td>
</tr>
<tr>
<td>Coarse Grains</td>
<td>725,850</td>
<td>420,667</td>
<td>52,425</td>
<td>163,218</td>
<td>278,320</td>
<td>88,593</td>
<td>5,424</td>
</tr>
<tr>
<td>Other Non-Cereals</td>
<td>31,322</td>
<td>8,400</td>
<td>6,452</td>
<td>3,831</td>
<td>6,326</td>
<td>2,796</td>
<td>2,500</td>
</tr>
<tr>
<td>Wheat</td>
<td>239,384</td>
<td>325,990</td>
<td>277,121</td>
<td>180,923</td>
<td>224,722</td>
<td>358,960</td>
<td>25,548</td>
</tr>
</tbody>
</table>

Table 6: Policy measures taken by governments to moderate food insecurity

<table>
<thead>
<tr>
<th></th>
<th>Consumer oriented</th>
<th>Producer oriented</th>
<th>Trade oriented</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tax</td>
<td>Social</td>
<td>Market</td>
</tr>
<tr>
<td></td>
<td>Taxes / customs</td>
<td>Food Assistance</td>
<td>Food Subsidies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>China</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Indonesia</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Japan</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Malaysia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mongolia</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Philippines</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Thailand</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Vietnam</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: Food and Agricultural Organisation (FAO), July 2008, Crop Prospects and Food Situation, No. 3
### Appendix: Countries in Each Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia and the Pacific</td>
<td>East Asia, Oceania, Southeast Asia, South Asia, Central Asia, Western Asia.</td>
</tr>
<tr>
<td>Northeast Asia</td>
<td>China, Korea Dem People's Rep., Republic of Korea, Mongolia.</td>
</tr>
<tr>
<td>Oceania</td>
<td>Papua New Guinea.</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Viet Nam.</td>
</tr>
<tr>
<td>South Asia</td>
<td>Bangladesh, India, Nepal, Pakistan, Sri Lanka.</td>
</tr>
<tr>
<td>Central Asia</td>
<td>Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.</td>
</tr>
<tr>
<td>Western Asia</td>
<td>Armenia, Azerbaijan, Georgia</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>North and Central America, The Caribbean, South America.</td>
</tr>
<tr>
<td>North and Central America</td>
<td>Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama</td>
</tr>
<tr>
<td>The Caribbean</td>
<td>Cuba, Dominican Republic, Haiti, Jamaica, Trinidad and Tobago</td>
</tr>
<tr>
<td>South America</td>
<td>Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.</td>
</tr>
<tr>
<td>Near East</td>
<td>Afghanistan, Islamic Rep. of Iran, Iraq, Jordan, Kuwait, Lebanon, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, Yemen</td>
</tr>
<tr>
<td>North Africa</td>
<td>Algeria, Egypt, Libyan Arab Jamahiriya, Morocco, Tunisia.</td>
</tr>
<tr>
<td>East Africa</td>
<td>Burundi, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania, Uganda.</td>
</tr>
<tr>
<td>Southern Africa</td>
<td>Angola, Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Swaziland, Zambia, Zimbabwe.</td>
</tr>
<tr>
<td>West Africa</td>
<td>Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.</td>
</tr>
</tbody>
</table>

1. **Food Crisis**
   - Soaring food prices in 2007 and 2008
   - World economic recession since late 2008
   - The number of undernourished people surpassed one billion
   - Long-term challenge: how to feed the increasing population under environmental and resource constraints

2. **Reaction of International Community**
   - June 2008: High level meeting on climate change and bio-energy (FAO)
   - July 2008: G8 Summit in Japan
   - January 2009: Follow-up meeting on soaring food prices
   - July 2009: G8 Summit in Italy
   - November 2009: World Summit on Food Security

3. **World Summit on Food Security**
   (16-18 November 2009)

   In preparation for the summit, expert meetings were held to discuss the following issues relevant to world food security; supply/demand trend; climate change and bio-energy; foreign direct investment; farm support; Sub-Saharan Africa; technology; food security and financial crisis; global governance

4. **Food Security**
   Food security exists when all people, at all times have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. (World Food Summit Plan of Action, 13 November 1996; Every Human Being; Every time; Can Produce or Procure; Safe, Sufficient, Nutritious Food; Culturally Acceptable; For Active & Healthy Life

5. **Dimensions of Food Security**
   - Availability
   - Access
   - Utilization
   - Stability

6. **Right to Food**
   A human right is not something that somebody gives you; it is something that nobody can take away (by Eleanor Roosevelt). All human beings are born free and equal in dignity and rights (by Universal Declaration of Human Rights)

7. **History of Right to Food**
   - 1941: “Four freedoms” speech by President Roosevelt
• 1948: Universal Declaration of Human Rights
• 1966: Adoption of the International Covenant on Economic, Social and Cultural Rights
• 1976: Implementation of the Covenant
• 2004: Adoption of the Right to Food Guidelines by the FAO Council

8 International Covenant on Economic and Social Rights, Article 2

Each state party to the present covenant undertakes to take steps, individually and through international assistance and co-operation, especially economic and technical, to the maximum of its available resources, with a view to achieving progressively the full realization of the rights recognized in the present Covenant by all appropriate means, including particularly the adoption of legislative measures.

Right to Food Guidelines:

i) Democracy, Good Governance, Human Rights and the Rule of Law
ii) Economic Development Policies
iii) Strategies
iv) Market Systems
v) Institutions
vi) Stakeholders
vii) Legal Framework
viii) Access to Resources and Assets
ix) Food Safety and Consumer Protection
x) Nutrition
xi) Education and Awareness Raising
xii) National Financial Resources
xiii) Support for Vulnerable Groups
xiv) Safety Nets
xv) International Food Aid
xvi) Natural and Human made Disasters
xvii) Monitoring, Indicators and Benchmarks
xviii) National Human Rights Institutions
xix) International Dimension

9 Goal of International Community

- World Food Summit in 1996: halve the number of undernourished people by 2015
- Millennium development goals: halve the percentage of undernourished people by 2015
- G8 Summit Joint Statement (July 2009)

The combined effect of longstanding underinvestment in agriculture and food security, price trends and the economic crisis have led to increased hunger and poverty in developing countries, plunging more than a further 100 million people into extreme poverty and jeopardising the progress achieved so far in meeting the Millennium Development Goals.

10 Factors of Soaring Food Prices

- Bio-fuel, production cost increase due to rising oil prices, economic growth of emerging economies, population growth
• Low cereal stocks
• Inflow of speculative money, export restriction
• Stagnation of agriculture in poor countries
• Lack of investment, declining share of ODA going to agriculture, shortage of R&D fund, stagnant yield growth

11 Impact on Resource Use

Share of cropland to biofuels:

<table>
<thead>
<tr>
<th>Country</th>
<th>Share of Crop to Bio-fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>5% (10% in 2030?)</td>
</tr>
<tr>
<td>USA</td>
<td>2% (5-10% in 2030?)</td>
</tr>
<tr>
<td>EU</td>
<td>1% (12-16% in 2030?)</td>
</tr>
<tr>
<td>World</td>
<td>1% (3-4% in 2030?)</td>
</tr>
</tbody>
</table>

12 Impacts on Agriculture & Food Security

<table>
<thead>
<tr>
<th>Country</th>
<th>Share of Crop to Bio-fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>50% of sugarcane</td>
</tr>
<tr>
<td>USA</td>
<td>30% of maize</td>
</tr>
<tr>
<td>EU</td>
<td>60% of rapeseed</td>
</tr>
<tr>
<td>World</td>
<td>5% of cereals, 9% of vegetable oils, but over half of the increase since 2005</td>
</tr>
</tbody>
</table>

13 Small Scale Bio-energy Projects

<table>
<thead>
<tr>
<th>Country</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mali</td>
<td>Jatropha</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Sisal</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Ethanol</td>
</tr>
</tbody>
</table>

14 Foreign Direct Investment

• Win-win or land grab
• Substantial international concern
• Lack of investment – underlying cause of food crisis
• Need to fill the investment gap

15 Recent Trends

• Inward FDI stock: USD 32 billion in 2007
• Inflow of FDI: USD 3 billion in 2007
• Form: purchase or long-term lease
• Investors: Gulf States, China, South Korea
• Host countries: government involvement
• Pattern: resource seeking, basic food, repatriation

16 Motivation

• Food security concerns; constraints of natural resources; global strategy
• Land acquisition and other forms
• Land acquisition does not provide immunity to sovereign risk
• Contract farming can offer security of supply
• Appropriate business model depends on specific circumstances

17 Host Country Benefits

• Technology transfer; employment creation, income generation, infrastructure development

18 Code of Conduct

• Respect for land, water and resource rights
• Food security and rural development
• Transparency, good governance and enabling environment Consultation and participation
• Economic viability and responsible agro-enterprise investing
• Social sustainability
• Environmental sustainability
• Climate Change Adaptation
• Essential for food security, poverty reduction, sustainable management of natural resources; Many countries are dealing with climate change impacts
• Emergence of pests, diseases; Adaptation must be tailored to local context; Local people, policies, research efforts

19 Climate Change Mitigation
• Responsible for one third of GHG emissions
• Forest and blue forest; Conservation agriculture; Pastures
• Need to create financial mechanism to mitigation efforts in developing countries

20 Appropriate Policy Environment
• Short term - safety nets, social protection
• Longer term - responsible and effective investment
• Collaboration between Government and civil society

21 Five Rome Principles for Sustainable Global Food Security
• Principle 1: Invest in country-owned plans, aimed at channeling resources to well designed and results-based programmes and partnerships.
• Principle 2: Foster strategic coordination at national, regional and global level to improve governance, promote better allocation of resources, avoid duplication of efforts and identify response-gaps.
• Principle 3: Strive for a comprehensive twin-track approach to food security that consists of: 1) direct action to immediately tackle hunger for the most vulnerable and 2) medium and long-term sustainable agricultural, food security, nutrition and rural development programmes to eliminate the root causes of hunger and poverty, including through the progressive realization of the right to adequate food.
• Principle 4: Ensure a strong role for the multilateral system by sustained improvements in efficiency, responsiveness, coordination and effectiveness of multilateral institutions.
• Principle 5: Ensure sustained and substantial commitment by all partners to investment in agriculture and food security and nutrition, with provision of necessary resources in a timely and reliable fashion, aimed at multi-year plans and programmes.
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Fig. 3: Long-term Trend of Food Prices

Fig. 4: Long-term Trend of Food Consumption
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Fig. 6: Number of Undernourished People
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Fig. 8: Food Prices by Commodity
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Source: OECD and FAO Secretariats.

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Fig. 32: Share of ODA going to Agriculture
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5.3 COUNTRY PAPERS
1 Introduction

Bangladesh economy is predominantly agrarian which provides for more than 60% of the rural employments and most of the diets to the country’s ever increasing population. Over the past two-and-a half decades food production in Bangladesh has more than doubled, kept meaningful pace with the population growth and placed the country’s present food (mostly cereal) situation within ‘self-reliant to surplus’, which most of the governments tend to avow due, mostly, to political reasons. This, however, has not been easily achieved. Food production activities in Bangladesh are mostly based on small farm but tremendous population pressure on land (920 people per sq. km), thus ever shrinking land-man ratio (every day cultivable land is lost @320 hectares due to urbanization, infrastructural expansion, housing, land erosion, increasing brick-field development etc), declining soil fertility due to high cropping intensity and imbalanced fertilization practice, high input-low output farming and low market price of farm produce.

Paper focused on the current trends in food production, availability, access and consumption situation at the national level of Bangladesh. It looks also at the country’s future food demand and supply perspectives. The information reported here are drawn partly from the findings of several donor sponsored research studies conducted in Bangladesh on the food security issues and partly from the panel data of the Bangladesh Bureau of Statistics and Bangladesh Economic Review journal periodically published by the Bangladesh Ministry of Finance.

The Government of Bangladesh has declared Food Security as a vitally important feature of its national policy contributing to its socio-economic stabilization and development. As defined by the World Food Summit (1996): Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. To discuss food security, three important aspects must be considered: availability of adequate food, stability in food supplies, access to and nutrition security of food. Bangladesh has made a steady progress in the expansion of food production. But because of the increasing population pressure there has been an extensive and intensive use of land to meet the growing demand for food. Despite the growth in food production and its availability, food insecurity is still a major problem mainly because of the lack of purchasing power thereby causing inability to access to food, especially for the ultra poor. A major portion of the rural population is landless, and as day labourers they depend on casual earning for their livelihood. Due to the seasonal variation in agricultural employment and limited employment opportunities in non-farm sector, millions of people suffer from chronic and transitory food insecurity. The average Bangladesh diet is deficit in energy by about 15 percent. It is seriously unbalanced with an inadequate intake of fat, oil, fish/animal protein, fruits and vegetables.

2 Different Kinds and Dimensions of Food Security

A very important factor in determining food security is to identify the nature of food security
problem and it is common to draw a distinction between the chronic and transitory food insecurity.

- When individuals or groups of people suffer from food insecurity all the time, then they can be said to suffer from chronic food insecurity. In other words, chronic food insecurity is a continuous inadequacy of diet caused by the consumer's inability to acquire food. It affects households that persistently lack the ability either to buy or produce enough food. Hence poverty is considered the root cause of chronic food insecurity.

- Transitory food insecurity occurs when households face a temporary decline in access to enough food. Transitory food insecurity can be further divided into temporary food insecurity and cyclical or seasonal food insecurity. Temporary food insecurity occurs when sudden and unpredictable shocks, such as drought or flood, affect a household's entitlements. Famine is the worst form of transitory food insecurity, which can result from one or more causes like flood, drought, crop failure, market failure, loss of real purchasing power by group of households etc. For urban households, sudden unemployment may also be a cause of transitory food insecurity. Seasonal food insecurity occurs when there is a regular pattern of inadequate access to food.

- Transitory food insecurity may lead to chronic food insecurity depending on how severe it is and how frequently it occurs. If a household suffers two drought years in a row, and is forced to sell some of its assets to survive, then it may move from a situation of transitory food insecurity to one of chronic food insecurity.

- All of these types of disruption to food supplies can trigger crises by threatening a population's access to food. They are the immediate causes of famine but these precipitating triggers lead to famine only where particular groups of people are already exposed to it.

3 Measuring Food Security

- In order to understand better the nature and extent of the food security situation and the possible ways to improving it, it is important to distinguish between food security at the national, local, household and intra-household level. The ultimate goal is to meet the food requirements of the people at all levels.

- Food security at the national level is determined by the availability of enough resources for the whole population. The most widely used indicators are quantities of available food compared with needs, as well as import requirements compared with the country's capacity to import.

- At the sub-regional level, food security can be measured by comparing regional nutritional requirements with availability of dietary calories per head. Furthermore, the problem is increasingly being used in terms of seasonal or local level.

- At the household level, food security is dependent on a household's access to enough food. Thus it is closely linked with the issue of poverty, access, sufficiency, vulnerability and sustainability. At the household level, food security is measured by actual dietary intake of all household members.

- A food sufficiency indicator shows the number of individuals living in a household whose access to food is sufficient to provide a dietary intake adequate for growth, activity and good health. Individual food security implies an intake of food and absorption of nutrients sufficient to meet an individual's needs for activity, health, growth and development. The individual's age, gender, body size, health status and level of physical activity determine the level of need.

4 Current Trends in Production and Availability of Food

Data regarding production of major foodstuffs of plant and animal origins are reported in the Tables-
1-3. Data indicate, except in wheat, a steady rise occurred in production volumes of all food commodities including rice, maize, meat, milk, eggs and fish across years until 2008-09. The drop in production volume of wheat is attributed to the decline in its area which is largely responsible for change in the climatic pattern. Onset of monsoon has now moved erratically backward, at the time of harvest of this crop. This has led to farmer reluctance to grow this crop. Other causes include severe weed infestation and lack of suitable varieties to shift the start of cultivation to the end of rainy season - early Rabi period. This has triggered adoption and expansion of maize, which is cultivable year-round, though it has not become popular yet as human food and still can not substitute wheat. Maize, in Bangladesh, is used largely as animal and poultry feed and in bakery industries.

According to latest Household Income and Expenditure Survey (HIES, 2000) of Bangladesh Bureau of Statistics (BBS), the malnutrition problem is desperately serious for the poorest 14% of the rural population consuming fewer than 1600 calories per capita per day, level barely adequate for survival. Another 10% consume between 1600 and 1800 calories per day, while roughly 23% consume more than 1800 calories but less than the minimum calorie requirement set in Bangladesh at 2122 per day. These groupings are termed respectively as "ultra food deficit", "hard-core food deficit," and "moderately food deficit," using locally familiar nomenclature.

In all, about 45% of the country's rural households are considered food insecure living below poverty line although these percentages are considerably less severe than those which existed two decades ago. The percentage of the rural population consuming less than required calories in 1981 was 73%.

It has been extrapolated that increased domestic production, supplemented by imports and overall public food management contributed to relatively adequate availability of food at national level over the recent past years. However, as has been mentioned, the fundamental spirit of food security is to ensure availability and consumption of food at individual level. Even when aggregate food supplies are adequate, a number of factors may prevent households or individuals from acquiring enough food. The overall productivity of the poor producers may be low or their income levels may be insufficient to enable them to purchase the necessary foods from the market at the prevailing prices. Food security at household level is closely linked with the poverty scenario.

- Bangladesh has so far been able to raise domestic production and maintain availability of food grain up to the level of aggregate requirement, as defined by certain stipulated per capita requirement. However, distribution of availability or intake shows substantial deficit for a large segment of the population. For non-grain crops and non-crop food items, the deficits are even larger, both at aggregate and disaggregate levels.

- Regarding intake of nutrients, per capita calorie and protein intake for the average rural and urban population appear to be sufficient in relation to per capita requirement. However, distribution of consumption according to classes of people point to serious deficiency for a large proportion of the population. The most vulnerable groups are women and children. The deficiency in the intake of micronutrients including iron and vitamin is more acute, particularly among women and children.

- An important dimension of food security is to address the issues of availability, access and utilization of food across location, group of people and over future periods. Bangladesh is characterized by frequent occurrences of natural disasters like flood, drought, cyclones etc. Emergency preparedness to mitigate the transitory food insecurity caused by natural disasters, diversification of production, proper targeting for
distribution and public stock management are ensured by the government in order to cope with uncertainties and mitigation of the effects of disasters.

5 Adequacy of Food In-take for Different Income Groups

Consumption of different types of food by the poor (the bottom 50 per cent in the per capita income scale), middle (35 per cent), and the upper (15 per cent) income groups for 1985/86, estimated by the BBS Household Expenditure Survey, was related to the normative requirement specified by the Food and Agriculture Organization (FAO) for the Bangladesh population for balanced nutrition. It was found that the poor have a just adequate intake of grains and their consumption of vegetables was only about 15 per cent lower than the requirement (Table 4). But, for the types of food which are rich in protein or provide balanced nutrition, the intake of the poor is less than 50 per cent of the minimum requirement. Also, the differences in food intake between the poor and the rich are not very large for grains and vegetables, but are substantial for other types of food. For example, for meat and eggs, the bottom 50 per cent of the population in 1985/86 satisfied only about one-third of the requirement, while the top 15 per cent of the households managed to get about five times more; their consumption was about two-thirds higher than the minimum consumption norm.

6 Long Term Outlook of Food Supply and Demand

6.1 Although Bangladesh has achieved considerable success in augmenting domestic production and thereby ensuring stable supply of food over the past years, sustainability of production and hence availability of food is a big issue which is being raised very strongly. The overall production, availability, requirement and food security situation can be analyzed by taking into account population growth, income growth and the consequent food demand patterns. Bangladesh has achieved moderate success in checking population growth. The annual growth of population declined from around 3% in the 1960s to 1.5% in the year 2001 (BBS 2001) and to 1.4% onward (BBS, 2007). An important aspect of population growth which will have important implications for the pattern of food demand is the rate of growth of urban population.

6.2 With national income growing at a rate of 4 percent per annum, per capita income is expected to grow at about 1.9 percent per annum under the medium population growth scenario. Under the optimistic population growth scenario, however, per capita income will grow by 2.4 percent per annum. If national income grows at a rate of 5 percent per annum, per capita income would increase at a rate of 2.9 percent per annum under the medium population growth scenario and 3.4 percent per annum under the low population growth scenario (Hossain 1989).

6.3 A drastic change in the pattern of food demand would occur if per capita income growth could be accelerated to between 3.0 and 3.5 percent per annum. The demand for cereals, vegetables would increase at a much slower rate, while the demand for livestock products would increase at a higher rate than the growth of national income. With higher increase in urban population, the demand for cereals will proportionately decline while the demand for fishery and livestock products will continue to rise.

6.4 The projection of annual increase in the demand for various types of food under alternative growth scenarios for the 1985-2010 period is presented in Table-5. Demand would grow at an annual rate of less than 3% for foodgrains; 3-4% for vegetables, pulses and edible oils; 4-5% for fish, milk and sugar; and at more than 5% for meat. With population growing at 1.5% per annum, demand for grains would grow only at 2.3% even if the GNP growth accelerates to 5% per annum.
Under this scenario, demand for livestock products would grow at nearly 5.6% and the demand for fish at 4.2% (Hossain 1989).

6.5 A picture of projection of total requirement of major food items under alternative development scenarios by 2010 and 2020 is presented in Table-6. The 'business as usual (BAU)\', scenario assumes a growth of national income at 4.5%, while a growth rate of 6.5 is assumed under the 'accelerated growth' scenario (AGS). The table shows that rice consumption requirement is expected to reach 29.72 million tons in 2010 and 31.1 million tons in 2020 under the accelerated growth scenario. A sharp increase in requirement is observed for non-cereal items such as vegetables, meat and milk.

Thus both under 'BAU' and 'accelerated growth' scenarios, Bangladesh will require about 35 million tons of food grains per annum by the year 2020. If all or most of this quantity is to be produced domestically, this will have to be done under conditions of declining availability of the two crucial resources, land and water.

7 Changes in Relative Prices and Food Intake

In order to keep relative food prices unchanged, the supply of various types of food will have to be grown at the same rate as the increase in demand. In recent years, production has increased at a considerable pace only for grains and vegetables. For all other food items, production growth has been significantly lower than the lowest demand growth scenario (Scenario C).

Thus, if the present structure of growth in food production continues, relative prices will decline for vegetables, remain unchanged for grains and will increase for all other food items.

For pulses, edible oil and sugar the gap between demand and supply may be met through imports, if the Government can afford to allocate foreign exchange for this purpose. But for fish and meat this is unlikely to happen, because of the consumer demand for fresh fish and meat, the high processing and transport cost involved in international trade for these commodities, and the prevailing high level of prices for these food items in the international market.

The increase in relative prices of pulses, fish and meat would hurt the agricultural labourers and the urban poor more than the producers of food in rural areas and the higher income group in urban areas. At current price levels, fish and livestock products are beyond the reach of the bottom 50 per cent of the population; pulses are still the major source of protein for the poor (Table 8).

Therefore, any increase in the relative prices of pulses would further reduce their intake of protein from an already low level. If the prices of protein-rich food items increase relative to grains and vegetables the poor would shift their demand away from fish and pulses to grains and vegetables. The shift in consumption pattern may not reduce the intake of calories, but the quality of their consumption basket will further deteriorate.

Faster development of livestock and fisheries may promote equity and food security by focusing attention on the disadvantaged social groups and regions where the crop production environment is unfavorable. Cattle and poultry population is less unequally distributed than land, and so the growth of livestock income would be more equally distributed than the growth of crop incomes.

8 Impact of Global Warming on Bangladesh Agriculture and Food Security

Total coastal area of Bangladesh is about 47,203 km² (about 32% of the area of the country) covering 19 districts dominantly under Barisal, Khulna and Chittagong divisions where 35 million people (about
24% of country’s total population) live. Climatologically, the entire coastal belt of Bangladesh is more vulnerable than the other parts of the country due to its special geo-morphological characteristics. The Bangladesh coast is located in between the Indian coast and Myanmar’s peninsula that formed on top of a cone/funnel shaped sea-land structure which invites most of the tropical sea-cyclones. An analysis of all of the cyclones that originated from the Bay of Bengal since 1961 indicated that most devastating cyclones formation are occurred from last quarter of April through May and from mid-October to November, just prior to the harvest of Boro and Aman crops, respectively. Therefore, Boro and Aman harvests are mostly unpredictable every year posing great threat to the standing crops and security to the coastal livelihoods. Most of the coastal parts and associated islands of Khulna, Barisal and Chittagong divisions lie within 1m from sea level where intrusion of saline water is common. It is predicted that these areas will be inundated and be unsuitable for crop production due to sea-level rise in the next 50 years. By the middle and end of the current century, global annual mean temperature is predicted to be to the tune of 1.5 and 2.5°C, respectively. These projected warming will lead to about 14, 32 and 88 cm sea-level rise by 2030, 2050 and 2100, respectively which would cause inundation of about 8,10 and 16% of total land mass in Bangladesh. Therefore, agriculture in low-lying areas is likely to become most vulnerable and difficult to sustain. The arable land mass of Bangladesh being already quite limited and its population density one of the highest in the world, continuous land engulfing by rising sea water will only bring devastating consequences forcing an estimated 20 million coastal people to become climatic refugees. Cyclones and tidal surges would enhance this process. These climatic refugees will exert immense pressure on the already existing vulnerable food security of the country.

On the other hand, climate change impact is evident in other parts of the country as well. Frequency of erratic rainfall has increased and rain intensity and distribution pattern has changed not only in the drought-prone northwest and southwest but also in the eastern parts of the country. Regularity in the onset and intensity of monsoon has become now unpredictable. This has led previously fully rain dependant Aman rice crop production risky.

9 Current Crop Production Realities and Imperative Options

The predominant crop in entire coastal belt is Aman rice and especially transplanted Aman with sporadic occurrences of Aus rice. These land, in Boro season, are either loosely occupied by mugbean, khesari (lathyrus), cowpea, groundnut, soyabean, potato, sweet potato, chilli etc or remained fallow until the following monsoon. These areas are criss-crossed by innumerable water canals/channels especially in Barisal and Khulna divisions which can be utilized for Boro cultivation in dry season by irrigation despite some levels of salinity. Cultivation of salt-tolerant varieties could mitigate such hindrances. Introduction of high-yielding Boro rice in coastal cropping patterns and/or advancing the harvesting times by a fortnight in both Aman and Boro seasons to circumvent cyclonic havoc would not only ensure food security but also turn the entire coastal belt into a food surplus region.

10 Current Achievements of Bangladesh Rice Research Institute (BRRI) and Bangladesh Agricultural Research Institute (BARI) to Face Climate Change in Food Production

• Salt tolerant crop varieties of certain cereals (rice, wheat), legumes and sugarcane have already been contrived.

• Flood/submergence tolerant rice and sugarcane varieties have been developed.
• Some drought tolerant lines in rice have been identified.

• In addition to the conventional research tools, biotechnology is going to be increasingly used to ensure food security under changed climate.

• Recuperative technologies are available to combat crisis period.

• In order to shift cropping cycle to hazard free periods short duration varieties have been developed in certain crops including cereals, potatoes, legumes, vegetables, spices, oil crops, fibre crops and sugarcane.

• Some round-the-year cultivable varieties have been released in tomato and onion.

• To mitigate vitamin-A deficiency problem in the poor segment of the population, a variety of rice viz. Golden rice, has been developed which is capable of naturally synthesizing vitamin-A in its grains.

11 Bio-technology

11.1 Bio-technology and Food Security

Recent development in Biotechnology have revolutionized the way to introduce any new crop varieties or domestic animals or birds for higher production and quality by utilizing the technique of genetic engineering for food security. New emerging gene transfer technologies have enormous potential for plant improvement by introducing foreign gene in plant cells or tissues. In Bangladesh, different research institutes and universities have been producing a number of transgenic plants such as rice, potato, maize, etc. Specially, the application of plant tissue culture in potato seed production in both public and private sector have achieved near about self-sufficiency of potato seed. As a matter of fact, the import of potato seed especially from the Netherlands will be declined dramatically, which would save our hard cash foreign currency.

In order to feed the increasing human population and to decrease the pressure on shrinking arable land of our country, the output of other crops has to be multiplied. Feeding the population with scarce resources in an environment, increasingly affected by climate change is one of our most important global challenges. Nevertheless, the current state of global crisis has breathed new life into arguments to support agricultural development. However, the biotechnology has been quickly popularized on this changing scenario and claims that it offers solution to these menacing challenges. The government of Bangladesh recently established National Biotechnological Institute (NBI), Savar, Dhaka for strengthening the development of genetically modified organisms (GMOs).

11.2 Bio-technology Policy in Bangladesh

Goal - Ensure sustainable development of agriculture, food and other crops; nutrition; health; environment and livelihood of people; enhance agricultural competitiveness in relation to global standards.

The other important goals include strengthening of national capabilities in modern biotechnology, bio-safety, and bio-ethics in order to ensure judicious use of this modern tool for socio-economic development of the country.

Policy Statement - To create suitable environment for modern biotechnology research development extension and commercialization, appropriate measure will be taken for infrastructure and human resource development and to create centre(s) of excellence in identified priority areas of biotechnology based on national needs.

Policy Activities - The following are the declared policy of government regarding biotechnology.
11.3 Prospects of Biotechnology in Bangladesh

The following are the areas in Bangladesh where Biotechnology is expected to make a tremendous contribution for ensuring food security.

- Agricultural crop outputs
- Fisheries and livestock
- Forestry and environment
- Health care and nutrition
- Biotech products and processes
- Biodiversity conservation

11.4 Innovation of Genome of Jute

Dr. Md. Maksudul Alam, a renowned Bangladeshi scientist, has been successful in inventing genome of jute recently. This innovation will help to know all the genes and gene sequence that govern traits of jute plants. With the help of biotechnology high fibre quality, disease resistant/ improved jute varieties at low cost can be developed. It is to be noted that jute was once the largest foreign currency earning export item of Bangladesh. But due to the invention of different artificial fibres of lesser cost international marketing facility of jute shrunk drastically resulting in dying out of it. Currently with the invention of genome of jute a new horizon of prospect has been opened to enhance the income of the farmers of Bangladesh, who are mostly poor, and thereby indirectly contributing immensely towards food security by increasing their purchasing power.

References

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7 Krishi Projukti Hatboi (Handbook of Agriculture), Bangladesh Agricultural Research Institute (BARI), Gazipur, 2004.
**Table 1**: Trend in Food Grain Production (million tons)

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**Table 2**: Production Trend of Meat, Milk and Egg, 1994-95 - 2008-09

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</tbody>
</table>

*Source*: BSS, DAR, DoF, Government of Bangladesh.

**Table 3**: Trend in Fish Production (Million Tons)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Open water bodies</td>
<td>4.047</td>
<td>0.709</td>
<td>0.732</td>
<td>0.859</td>
<td>0.957</td>
<td>1.006</td>
<td>1.06</td>
<td>0.908</td>
</tr>
<tr>
<td>Pond culture</td>
<td>0.388</td>
<td>0.857</td>
<td>0.915</td>
<td>0.882</td>
<td>0.892</td>
<td>0.946</td>
<td>1.006</td>
<td>1.182</td>
</tr>
<tr>
<td>Marine</td>
<td>0.48</td>
<td>0.432</td>
<td>0.455</td>
<td>0.475</td>
<td>0.48</td>
<td>0.487</td>
<td>0.497</td>
<td>0.611</td>
</tr>
<tr>
<td>Total</td>
<td>1.998</td>
<td>2.102</td>
<td>2.216</td>
<td>2.329</td>
<td>2.44</td>
<td>2.563</td>
<td>2.79</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Adequacy of Food Intake for Different Income Groups, 1985-86

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Minimum Requirement(^a) (gms/capita/day)</th>
<th>Consumption Estimated by 1985/86 HES(^b) (gms/capita/day)</th>
<th>Consumption as Percentage of Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Poor</td>
<td>Middle</td>
<td>Rich</td>
</tr>
<tr>
<td>Grains</td>
<td>437</td>
<td>439</td>
<td>542</td>
</tr>
<tr>
<td>Pulses</td>
<td>40</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>Fish</td>
<td>48</td>
<td>24</td>
<td>41</td>
</tr>
<tr>
<td>Meat &amp; Eggs</td>
<td>12</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Vegetables</td>
<td>177</td>
<td>151</td>
<td>210</td>
</tr>
<tr>
<td>Milk</td>
<td>58</td>
<td>12</td>
<td>29</td>
</tr>
</tbody>
</table>

\(^a\) The Minimum consumption norm prescribed for the Bangladesh population from nutritional considerations.

\(^b\) HES-Household Expenditure Survey the population has been classified on the basis of per capita income. The poor constitute the bottom 50 per cent and the rich the top 15 per cent of the population.

Source: Hossain, 1989: Estimated from BBS.1988a

Table 5: Average annual Rate of Growth of Expected Demand of Various Types of food 1985-2010.

| Type of food   | Annual average growth rate of demand under |
|               | Scenario A | Scenario B | Scenario C | Scenario D |
| Grains        | 2.76       | 2.89       | 2.33       | 2.33       |
| Vegetables    | 3.30       | 3.75       | 3.02       | 3.45       |
| Pulses        | 3.26       | 3.64       | 3.78       | 3.26       |
| Fish          | 3.67       | 4.40       | 3.57\(^e\) | 4.21       |
| Meat and Eggs | 4.44       | 5.58       | 4.51       | 5.60       |
| Milk          | 4.17       | 5.09       | 4.13       | 4.97       |
| Edible Oil    | 3.45       | 4.03       | 3.25       | 3.78       |
| Sugar/Gur     | 4.22       | 5.20       | 4.23       | 5.17       |

Notes: Scenario A: Business as usual
       Scenario B: Medium population - high income growth
       Scenario C: Low population - low income growth
       Scenario D: Low population - high income growth

### Table 6: Projections of the requirement for major food items under alternative development scenarios, 2010 and 2020

<table>
<thead>
<tr>
<th>Food Items</th>
<th>Actual consumption (million tons) 1992</th>
<th>Projected requirements (million tons)</th>
<th>Businesses as usual</th>
<th>Accelerated growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2010</td>
<td>2020</td>
</tr>
<tr>
<td>Rice</td>
<td>19.60</td>
<td>27.83</td>
<td>31.95</td>
<td>29.72</td>
</tr>
<tr>
<td>Others cereals</td>
<td>1.83</td>
<td>2.74</td>
<td>3.44</td>
<td>3.10</td>
</tr>
<tr>
<td>Pulses</td>
<td>0.75</td>
<td>1.23</td>
<td>1.68</td>
<td>1.16</td>
</tr>
<tr>
<td>Edible oils</td>
<td>0.43</td>
<td>0.91</td>
<td>1.28</td>
<td>1.16</td>
</tr>
<tr>
<td>Potato</td>
<td>1.85</td>
<td>3.17</td>
<td>11.62</td>
<td>10.62</td>
</tr>
<tr>
<td>Other vegetables</td>
<td>5.74</td>
<td>9.05</td>
<td>11.62</td>
<td>10.62</td>
</tr>
<tr>
<td>Fish</td>
<td>1.47</td>
<td>2.57</td>
<td>3.60</td>
<td>3.20</td>
</tr>
<tr>
<td>Meat and eggs</td>
<td>0.55</td>
<td>1.29</td>
<td>1.92</td>
<td>1.93</td>
</tr>
<tr>
<td>Milk</td>
<td>0.88</td>
<td>1.74</td>
<td>2.61</td>
<td>2.52</td>
</tr>
</tbody>
</table>

**Notes:**
- Business as usual: assumes a growth rate of national income at 4.5% per annum.
- Accelerated growth: assumes a growth rate of national income at 6.5% per annum

**Source:** Hossain and Shahabuddin (1999)

### Table 7: Projection of Changes in Expenditures on Food from 1990 to 2010

<table>
<thead>
<tr>
<th>Food Items</th>
<th>1990 Percentage of Average Income Spent on Food</th>
<th>2010 Percentage of Average Income Spent on Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario A Grains</td>
<td>29.60</td>
<td>22.73</td>
</tr>
<tr>
<td>Vegetables</td>
<td>5.17</td>
<td>4.43</td>
</tr>
<tr>
<td>Pulses</td>
<td>1.95</td>
<td>1.66</td>
</tr>
<tr>
<td>Fish</td>
<td>6.88</td>
<td>6.60</td>
</tr>
<tr>
<td>Meat</td>
<td>3.20</td>
<td>3.43</td>
</tr>
<tr>
<td>Milk</td>
<td>2.07</td>
<td>2.12</td>
</tr>
<tr>
<td>Oils</td>
<td>2.22</td>
<td>1.97</td>
</tr>
<tr>
<td>Sugar/Gur</td>
<td>1.19</td>
<td>1.24</td>
</tr>
<tr>
<td>Total</td>
<td>52.28</td>
<td>44.18</td>
</tr>
<tr>
<td>Scenario D Grains</td>
<td>28.74</td>
<td>16.11</td>
</tr>
<tr>
<td>Vegetables</td>
<td>5.09</td>
<td>3.62</td>
</tr>
<tr>
<td>Pulses</td>
<td>1.92</td>
<td>1.31</td>
</tr>
<tr>
<td>Fish</td>
<td>6.85</td>
<td>5.78</td>
</tr>
<tr>
<td>Meat</td>
<td>3.25</td>
<td>3.62</td>
</tr>
<tr>
<td>Milk</td>
<td>2.09</td>
<td>2.05</td>
</tr>
<tr>
<td>Oils</td>
<td>2.19</td>
<td>1.67</td>
</tr>
<tr>
<td>Sugar/Gur</td>
<td>1.20</td>
<td>1.22</td>
</tr>
<tr>
<td>Total</td>
<td>51.33</td>
<td>35.28</td>
</tr>
</tbody>
</table>

**Source:** Mahabub Hossain, 1989. Estimates based on Engel function fitted on 1985/86 Household Expenditure Survey data.
Table 8: Average Annual Rates of Growth of Expected Demand for Various Types of Food, 1985-2010

<table>
<thead>
<tr>
<th>Type of Food</th>
<th>Scenario A</th>
<th>Scenario B</th>
<th>Scenario C</th>
<th>Scenario D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains</td>
<td>2.76</td>
<td>2.89</td>
<td>2.33</td>
<td>2.33</td>
</tr>
<tr>
<td>Vegetables</td>
<td>3.30</td>
<td>3.75</td>
<td>3.02</td>
<td>3.45</td>
</tr>
<tr>
<td>Pulses</td>
<td>3.26</td>
<td>3.64</td>
<td>3.78</td>
<td>3.26</td>
</tr>
<tr>
<td>Fish</td>
<td>3.67</td>
<td>4.40</td>
<td>3.57</td>
<td>4.21</td>
</tr>
<tr>
<td>Meat &amp; Eggs</td>
<td>4.44</td>
<td>5.58</td>
<td>4.51</td>
<td>5.60</td>
</tr>
<tr>
<td>Milk</td>
<td>4.17</td>
<td>5.09</td>
<td>4.13</td>
<td>4.97</td>
</tr>
<tr>
<td>Edible oil</td>
<td>3.45</td>
<td>4.03</td>
<td>3.25</td>
<td>3.78</td>
</tr>
<tr>
<td>Sugar/Gur</td>
<td>4.22</td>
<td>5.20</td>
<td>4.23</td>
<td>5.17</td>
</tr>
</tbody>
</table>

Source: Mahabub Hossain, 1989

Note: Scenario A - Business as usual
      Scenario B - Medium population - high income growth
      Scenario C - Low population - low income growth
      Scenario D - Low population - high income growth
1 An Overview of Agriculture and Food System in Taiwan

Food security has been the most important issue all over the world. With increasing global population increasing, food demand in the developing countries, high petroleum price and promotion of bio energy, global crop price has risen since 2002. The trend was accelerated after 2006 and reached a peak in mid 2008. Countries all over the world have paid great attention to this challenge and have taken immediate action to secure their agriculture development and food supply, such as implemented the export restriction for staple food crops, increased domestic production and encouraged business investment of grain crop to abroad to secure food.

In 2005-2006, in average some 16% of the population in the Asia and Pacific region suffered from hunger; their food intake fell below the minimum dietary energy requirement set by the FAO. In 2007 and 2008, the figures of hunger were even higher due to the soaring food prices (ESCAP, 2009). Unfortunately, this important issue is also one of the most complicate issues. There are lots of factors that may cause food insecurity. The report of ESCAP elaborated the factors which lead to food insecurity including increasing demand, short of supply, trade condition, other countries’ food policy, lack of capital, high food price and petroleum price, decelerating productivity, speculation of food market, etc.

Taiwan is a mountainous subtropical island-country with limited natural endowment. The country has one of the world’s highest population density with a population of more than 23 million and only a total area of 36,000 km2. In the very beginning of Taiwan’s economic development, agriculture played an indispensable role in providing sufficient food for domestic consumption and enough employment opportunities for the densely populated rural communities. Agriculture and food industry stood as the foundation of national economy and provided a livelihood for a broad base of farmers (Chen & Han, 2000).

The agriculture sector of Taiwan is facing many challenges, such as low level of food self-sufficiency, aging farmers, large acreage of set-aside farmlands, small size of farming households, soaring price of fertilizers, natural disasters accelerated by climate change, and rapid changes in world food economy.

The share of agriculture in the gross domestic product(GDP) had accounted for 32.2% in 1952. Along with the rapid growth of other economic sectors, the share of agriculture in the economy has been declining. In 2008, agriculture generated a mere 1.5% of GDP, 1.5% of total exports, and 5.3% of total employment. However, agriculture still plays an important role in terms of food security, rural development and nature conservation (Chang, 2008). To cope with the challenges, the present agricultural policy is based on three guidelines: “Healthfulness, Efficiency, and Sustainability".
2 Supply and Demand of Food

In Taiwan, the per capita food consumption was 2,618 kilocalories per day in 2008. This level of energy for all the population of 23 million was equivalent to 22,357,000 metric tons food supply and was composed by cereals 81.9 kg (including rice 48 kg), vegetables 103 kg, fruits 125.5 kg, meats 72.6 kg, milk 37.9 kg, eggs 16.6 kg, seafood 34.5 kg, and oil and fat 23.7 kg. It also showed that the consumption of rice is decreasing, the consumption of meat and milk is increasing (Table 1).

Self-efficiency ratio is the key indicator of security level of domestic food supply. Higher self-efficiency ratio represents the country’s capability of producing and supplying food. The ratio of Taiwan appears decreasing due to changing consumers' behavior, free trade trend, small size of farmers and aging of agricultural labor force. In the 1960s, food consumption in Taiwan was largely domestically provided. There has been a fall in self-efficiency ratio from 107.9% in 1961 to 32.4% in 2008.

The food self-sufficiency ratio was only 32.4% weighted by calorie or 70.7% weighted by prices in 2008, which is almost the lowest one among East Asian countries (Table 2). The ratios varied among different categories of food. The ratios of fish and sea food, vegetables, and fruits remain high while the ratios of cereals are quite low except rice which is the main staple in Taiwan (Table 3). The total food supply disposed for feed was 5,267,000 metric tons; for manufacture, 2,463 metric tons; for gross food, 13,766,000 metric tons; and for seed and waste, 862,000 metric tons.

3 Food Trade

Food exports and imports of Taiwan have been growing steadily since the end of World War II. In the 1950s, agricultural productions dominated the total exports, with a share of over 90%. However, the shares steadily declined after 1970. Taiwan’s major food exports had been sugar and rice since 1952. In 1970, the major exported products were replaced by canned asparagus, canned mushrooms, and bananas. However, by 1990 the major food exports had become aquatic products, pork, and preserved vegetables. Innovation products have been adapted by well-trained and highly motivated farmers (Huang, 2007).

Total agriculture imports also have increased significantly, rising from US$66.5 million in 1952 to US$12,121 million in 2008. The rate of increase in agriculture imports is obviously greater than that of exports. The remarkable increase in the imports is mainly explained by two reasons (Huang, 2001):

i) The imports of dairy products and beef in response to the rapidly improved living standard in Taiwan, and

ii) Rapid increase in imports of cereals (5.8 million metric tons in 2008), and fishmeal due to the expansion of the livestock and fishery industries (Table 4).

4 Domestic Food Production

4.1 Land Use

At present, about 822,364 hectares or 22% of the total area of the island is used for agricultural and food production. Paddy field and dry land account for 52% and 48% of the total cultivated land, respectively. The multiple cropping indices, as an indication of farming intensity, reached a peak of 190.0 in 1964 and rapidly decreased to 83.6 in 2007. After Taiwan joined the WTO in 2001, ban on agricultural products was lifted; more farmland is set aside to reduce the outputs of farming in order to meet the international trade regulations.

The average farm size was less than 1 ha according to the 2006 census and only 25% of the farm households had a farm size with area more than
1.0 ha. The small scale of these farms was a major bottleneck to the enhancement of productivity in Taiwan’s agriculture. However, rapid development of the agribusiness in the country helped to overcome this constraint in recent years.

4.2 Labor and Other Inputs

The number of farm households according to the 2006 census was about 556 thousand nearly the same as that in 1955. However, full-time farm households decreased from 40% in 1955 to 21% in 2007. The agricultural employment has decreased from 1,667 thousand persons to 740 thousand persons during the same period, even decreased to 535 thousand in 2008.

Agricultural machines have been used to replace farm labor in farming since 1970s. Besides, inorganic fertilizers and chemicals were also used as substitutes for labor input.

Since last decade, trend of agricultural fixed capital formation has steadily decreased. The percentage in total fixed capital formation is only 0.31% in 2007.

4.3 Food Production

The total economic value of agricultural production in 2008 was about NT$417.5 billion (US$13 billion). The growth rate of agriculture has slowed down significantly in recent years. The average annual growth rate from 1995 to 2003 was only 0.13% compared to 1.82% during 1985 to 1995 and 3.7% during 1975 to 1985. Of the total value of agricultural products, crops, livestock, fisheries and forestry accounted for 42.9%, 35.0%, 22.0% and 0.1%, respectively in 2008. In relative terms, crops and forestry products have been declining, while fishery and livestock productions are increasing over the years.

5 The Food Security Policy in Taiwan

Agriculture in Taiwan is currently facing various challenges, both domestic and abroad, including trade liberalization, increasing concern about food safety, food security, and environmental conservation. The government has taken immediate actions to overcome the challenges.

5.1 Major Obstacles for Taiwan

5.1.1 Domestic Obstacles

a) Low level of food self-sufficiency

Taiwan’s food self-sufficiency ratio was only 32.4% weighted by calorie or 70.7% weighted by prices in 2008, which was almost the lowest one among East Asia countries. Given the food self-sufficiency ratios have constantly dropped, so the problem is getting severe and solutions must be found.

b) Aging farmers and set-aside farmlands

The average age of the farmers was 61 years old and 43% of the farmers are older than 65 years old in Taiwan’s farming according to the 2006 census. Aged farmers tend to be less efficient, and more likely to depend on subsidies from the government.

c) The small size of farming

As a commitment of being a WTO member, Taiwan lifted import ban on most agricultural import and has promised a tariff-rate quota of 144,720 metric tons of brown rice each year. In order to keep a balance between the supply and demand of crop products, some 220,000 hectares of farmland in Taiwan is currently lying fallow.

The average farm size of Taiwan is less than 1 hectares comparing to that of Japan, EU and US which are around 1.6, 20, and 190 hectares, respectively. Only 25% of the farm households had a farm size with area more than 1 hectares. The small scale of these farms is a major bottleneck to the enhancement of productivity in Taiwan’s agriculture (Huang, 2009).
5.1.2 Global Environment Obstacles

a) Soaring prices of fertilizers and other inputs

Prices of fertilizer and other agricultural inputs are inflated by high oil price, which may remain constantly high in the foreseeable future and will reduce the incentive of agricultural and food production.

b) Natural disasters accelerated by climate change

Natural disasters have contributed to the shortfall in production in recent years. Changing in production patterns and frequent floods and droughts resulted in unstable production.

c) Rapid changes in world food economy

Under the rapid increases in demand in emerging economies such as China, India, Brazil and Russia for higher quality foods, Taiwan tends to lose in buying competition. Soaring grain price is getting higher due to shift in demand for bio energy and this damages dairy and livestock farmers (Peng, 2008).

6 Major Food Security Policy and Actions in Taiwan

To meet those challenges mentioned above, the present agricultural policy of Taiwan is based on three guidelines: “Healthfulness, Efficiency, and Sustainability,” to promote agricultural policy with five concerns including modern practices to pursue profits and efficiency for farmers and to ensure their welfare; to provide consumers with fresh, stable quality, and safe agricultural products for their healthy eating; to put emphasis on landscape and energy saving, to assure sustainable development for the natural environment; to expect to conserve a piece of clean land for the follow generations and to make a good life for everyone by market development and R&D; and as a member of global village, to take responsibility for preserving resources, environment and increasing use of green energy. The major food security policy and actions in Taiwan included as follow:

6.1 Raising Government Purchasing Prices of Rice

The 220,000 hectares of farmland is currently lying fallow put-aside due to government policy. Facing the recent global food crisis, the guarantee price of rice purchase by the government was raised by about 10% from the 1st crop of 2008 on to stabilize the production of rice.

6.2 Enlarging Farming Scale

Launching a program to enlarge farming scale through the small landlord- turned large tenant program to stimulate farmland mobility, boost the utilization of farm land and encourage the long-term leasing of farm land by old peasants or farmers not keen on farming. By establishing a retirement system for old farmers and an easy lease payment scheme for both landlords and tenant-farmers, the program encourages small farmland owners who are not interested in or not capable of farming to lease their land on a long term basis. It also provides long-term interest-free loans to facilitate business-style management by tenant-farmers. The program will enable tenant-farmers to lower production costs, enlarge their farming scale, and boost production efficiency and competitiveness.

6.3 Securing the Inventory of Prime Farmland

Farmland has being converted into non-farm uses at the rate of 3,600 hectares a year during last 10 years, hence it is crucial to safeguard the quality and quantity of farmland to secure the self-efficiency ratio of food. The Taiwanese government has launched a series of plans to keep proper
farmland amount and the best allocation of farmland resource.

6.4 **Encouraging Farmers to Plant the Import Substitution Crop**

Taiwan imports 95% of corn to feed livestocks from overseas to feed the livestocks. To cope with the soaring grain price and decreasing trend of the food self-sufficiency ratio, the government adopts effective measures to revitalize the set-aside farmland to produce the corn and other grain crop. This leads to the shift of demand in corn by 25,000 tons and reduces the amount of farmland lie fallow by cultivating the corn required by 4,000 hectares and estimating 2 times of planted area in 2012.

6.5 **Encouraging Consumption of Local-produced Food**

The government started encouraging its people to consume food generated in Taiwan as well as asking people to consume more rice. The government also lays emphasis on the importance of eating locally to shorten the food miles, and stimulates the consumption of cow milk, vegetable, fruits etc.

6.6 **Improving Food Production Efficiency and Quality**

Efforts would be made to encourage all rice, fruit, vegetable, fish and livestock products are in compliance with GAP (Good Agricultural Practices) or CAS (Certified Agricultural Standards). Expansion in outputs of organic farming will come to 50,000 hectares, or 6% of the total farm land by 2012. Traceability system of selected farm products is also promoted. Meanwhile, Taiwan government also assists farmers to enhance their crop production efficiency by setting up designated areas for quality productions of rice, fruit, vegetables, etc., and aiming at turning Taiwan into a “Global Centre of Sub-Tropical Fruits” and an “Asia Pacific Centre for Seedling, Fishery and Livestock Breeding”. In order to upgrade the competitiveness of Taiwan-produced products, to improve quality and quantity of food supply, stress tolerance varieties of crops are chosen to make sure the food produce is not affected by climate change and other non man-made factors.

6.7 **Encouraging Rational Use of Fertilizers**

To cope with the soaring oil and fertilizer prices recently, Taiwan government enhanced the management on quality control of commercial fertilizers and the training on farmers to use fertilizers rationally based on soil testing and plant analysis. It also hires proper practices by using organic fertilizers and bio-fertilizers, planting green manures during fallow season, improving soil quality, avoiding soil acidifying and degrading, and promoting land sustainability.

6.8 **Promoting Export of Agricultural Products**

The Taiwan government promotes its agricultural products by using various approaches and channels to the international markets. The Council of Agriculture has being working with local government to promote Taiwanese fruits in various countries in an integrated approach.

6.9 **Securing Food Stocks**

To secure the food inventory to supply in the emergency, the government has purchased paddy rice from farmers with guaranteed prices and imported about 94 thousand metric tons of husked rice as security food stocks, which is not less than 3 months domestic consumption level per year.

7 **Taiwan’s Perspective on Crops and Food Security**

Agriculture is the foundation of sustainable development in Taiwan. The practical and timely
solutions to the current problems are crucial for sustainable agriculture. Taiwan’s food self-sufficiency ratio was only 32.4% weighted by calorie in 2008, which is almost the lowest one among East Asian countries. Taiwan is also a net food and energy importing country and heavily relies on imported food. Ensuring a certain level of crop production and boosting production efficiency has been the key to safeguarding food security of Taiwan.

To ensure the capacity of food production, it is necessary to plan designated areas for agricultural productions as well as conservation concerns to protect and make the most of prime farmland. Moreover, set-aside farmland should be utilized and the farm size has to be enlarged to optimize the structure of agriculture sector. How to take concerns including farming culture, agricultural competitiveness and future policy tendency into consideration to set the proper self-efficiency level and encourage domestic agricultural production are also important issues for the time being by government. On the other hand, it is necessary to educate the citizens to change consumption patterns and promotion of healthy life-styles. It is equally important to promote the concept of food miles, eat locally and raise self-sufficiency to secure the domestic food supply.

In order to meet the growing needs for the future, the government should invest in R&D of innovative technologies to improve modern agricultural practices, to develop advanced tools in crop production systems, to develop varieties to meet the requirements of production efficiency and consumer demand.

In view of global warming and climate change which resulted in extreme weather conditions, it is crucial to develop new crop varieties which can adapt to extreme environments and to cultivate stress-tolerance variety of agricultural productions and growing facilities so as to ensure food security for the future. Besides, government could encourage farmer to implement environment-friendly farming, including organic farming and green growing for timber forest, establish new order for fishery by co-working with the surrounding countries of the ocean and marine conservation initiative must be started to well adjust the change of ocean environment.

Quality and quantity of agricultural harvest are heavily affected by temperature, sunshine, rainfall and climate change. Facing the challenges caused by climate change and the burdens resulting from ever-growing global human populations, more collective efforts from the international community are required to tackle a broad range of problems in agriculture production. Among these problems, nutrition and food security appear to be among the first priorities of agriculture development in many developing countries.

To reach above goal, there is a need for the stepping up of efforts in international cooperation on R&D with regard to innovative technologies to further improve the production and marketing efficiency of crops. It is also important to invest in infrastructure and capacity building for enhancing self-sufficiency in basic food production in developing countries, as well as assisting farmers in developing countries in diversifying their production of vegetables, fruits and other food commodities. By establishing the regional cooperation from international countries, food security can be enhanced.

8 Concluding Remarks

Taiwan is a net food and energy importing country and heavily relies on imported food. Ensuring a certain level of crop production and boosting the production efficiency will always be the key to safeguarding food security of Taiwan. The fulfillment of optimum self-efficiency level of food of Taiwan is mainly subject to limited natural resource and farming environment. It is necessary to take many concerns including farming culture,
agricultural competitiveness and future policy tendency into consideration when a proper self-efficiency level is decided.

Food security is an important issue with worldwide concern. Facing the challenges brought by the climate change and the burdens resulting from ever-growing global populations, more collective efforts from international community are required to tackle a broad range of problems in agriculture production. Taiwan will secure the stable food supply through revitalization of its set-aside farmlands and international market, and provide technical assistance to developing countries, in particular for the staple food crops

Reference


4 ESCAP (2009), Sustainable Agriculture and Food Security in Asia and the Pacific. United Nations Economic and Social Commission for Asia and the Pacific (United Nations publication, Sales No.: E.09.II.F.12).


### Table 1: Food Availability for Consumption in Taiwan (Kg/ Per Capita Per Year)

<table>
<thead>
<tr>
<th></th>
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<tbody>
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<td>102.48</td>
<td>100.36</td>
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<td>Vegetables</td>
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<td>Fish &amp; sea food</td>
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<td>Wine &amp; beer (Liter)</td>
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<td>39.22</td>
<td>34.25</td>
<td>22.98</td>
<td>26.56</td>
<td>25.43</td>
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**Source:** Food Supply and Utilization Year Book, 1989-2008, Council of Agriculture

### Table 2: Average Food Self-sufficiency Ratios (Weighted by Calorie) (Per cent)

<table>
<thead>
<tr>
<th>Year/Country</th>
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<th>South Korea</th>
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<td>2000</td>
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<td>2005</td>
<td>30.5</td>
<td>40</td>
<td>50.6</td>
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<tr>
<td>2006</td>
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<tr>
<td>2007</td>
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<tr>
<td>2008</td>
<td>32.4</td>
<td>41</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

**Sources:**
3. Agricultural and Forestry Statistical Yearbook, Ministry for Food, Agriculture, Forestry and Fisheries (South Korea)

### Table 3: Taiwan Food Self-sufficiency Ratios in Taiwan (Weighted by Calorie) (Per cent)

<table>
<thead>
<tr>
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<tr>
<td>Vegetables</td>
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<td>87.3</td>
<td>83.8</td>
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<td>Fruits</td>
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<td>Meat</td>
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<td>Eggs</td>
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<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.1</td>
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<tr>
<td>Fish and sea food</td>
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<td>142.6</td>
<td>143.6</td>
<td>192.4</td>
<td>196.4</td>
<td>172.9</td>
<td>174.5</td>
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<tr>
<td>Milk</td>
<td>21.8</td>
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<td>26.7</td>
<td>27.9</td>
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<td>Average</td>
<td>43.4</td>
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<td>35.6</td>
<td>30.5</td>
<td>32.0</td>
<td>30.6</td>
<td>32.4</td>
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**Source:** Food Supply and Utilization Year Book, 1990-2008, Council of Agriculture
**Table 4**: Quantity of Food Imports in Taiwan (1,000 metric tonnes)

<table>
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<tbody>
<tr>
<td>Cereals</td>
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<td>Rice</td>
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<td>6.2</td>
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<td>161.6</td>
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<td>Fruits</td>
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<td>0.5</td>
<td>0.6</td>
<td>0.8</td>
<td>0.4</td>
<td>0.2</td>
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<tr>
<td>Fish &amp; sea food</td>
<td>78.1</td>
<td>145.5</td>
<td>179.8</td>
<td>172.2</td>
<td>149.3</td>
<td>183.7</td>
<td>289.7</td>
</tr>
<tr>
<td>Milk</td>
<td>100.3</td>
<td>154.1</td>
<td>140.4</td>
<td>137.3</td>
<td>140.7</td>
<td>132.0</td>
<td>107.6</td>
</tr>
<tr>
<td>Oils and fats</td>
<td>193.3</td>
<td>271.0</td>
<td>322.6</td>
<td>395.9</td>
<td>331.7</td>
<td>347.4</td>
<td>329.4</td>
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</tbody>
</table>

FOOD SECURITY IN EGYPT

Dr. Anwar Mahmoud Abd Elaal Shehata and Ms. Souad Ibrahim Mohammad

1 Background

Egypt's human development index (HDI) ranking has declined to 123rd out of 182 countries in the world and to 82nd position out of 134 countries in the human poverty index. Egypt has achieved a seven percent annual growth rate, which declined to less than five percent in the past two years due to the international financial crisis. Per capita GDP is estimated at $2,450, although the benefits of economic growth have been unevenly distributed.

Despite the annual economic growth, most Egyptian households have suffered the effects of major international shocks from 2006 to date – the avian influenza epidemic, followed by the Triple F crisis. The avian influenza outbreak compelled the Government to oversee major culling of the poultry stock throughout the country, severely affecting a major income source for poor Egyptian households, particularly women and reducing egg and poultry consumption by half, thereby impacting the nutrition and income of consuming and producing households.

By 2008, the global food crisis had set Egyptian food prices soaring; food inflation had reached more than 35 percent. Due to the financial crisis, several labour-intensive sectors of the economy, providing informal as well as formal employment, including tourism, energy, manufacturing, and Suez Canal revenues, have been particularly affected, and hence employment and income levels in those sectors were affected.

2 Definition of Food Security

"Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food which meets their dietary needs and food preferences for an active and healthy life. To achieve food security, the following four dimensions must be considered:

- Food availability: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).

- Food access: Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).

- Utilization: Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

- Stability: To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or...
cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

At a national level, food security exists when all of a country’s citizens are individually food secure.

3  Egypt - Food Security Analysis

Egypt continues to face substantial natural resource constraints, particularly land and water. More than half of total household consumption is spent on food. Although most Egyptians live in rural areas (57 percent), where agriculture represents the major livelihood source and the key determinant of household food security for a large proportion of households, farming households must cultivate within the context of limited resources; only three percent of the land throughout Egypt is arable and permanent crops are produced on only 0.5 percent of the total land surface.

Nearly twenty percent of the 80 million Egyptian population live below the poverty line and more than nine percent live in extreme poverty. Many Egyptian households remain food insecure, largely an accumulated result of food price inflation, few employment or income generating opportunities, and productive asset losses.

The agriculture sector contribution is over 30% of the employment opportunities. There is a strong contrast between the sector’s large workforce and its contribution to the country’s economy; which tends to underline a low level of productivity. Large number of rural households depends on agriculture and farming (production) is rarely the main income contributor. According to sources, farm incomes (crops and livestock) account on average 25-40% of total rural income; agricultural related off-farm incomes account for additional 20-35%; while non-farm revenues - including wages - account for about 40% of rural household incomes. The situation is similar for the rural poor, who derive on average 25.7% of their resources from agriculture, while 42% come from wages and salaries.

There is still no clear distinction between the concept of sustainable food security with its 4 major pillars and food self sufficiency. The concept of food security is built on: (i) food availability - from local production when comparative advantage prevails or from imports; (ii) stability of food supply and its prices; (iii) access to food by all income classes and capacity to buy food from the market; and (iv) food utilization where food safety and nutritional needs for all age and gender groups are accessible. This differs from the food self sufficiency at any cost which could be costly to the society and damaging to the limited natural resources and its sustainability for the upcoming generations.

Egypt is a major food producer with relatively high levels of self-sufficiency in a number of key field crops; it has attained full self-sufficiency in rice, onion and grain Sorghum and the self-sufficiency in barley is greater than 80%. Egypt achieved only 56% self-sufficiency in wheat production. Egypt has to import the rest of wheat needed for domestic consumption. Moreover, Egypt is only able to produce 5%, 55% and 75% of its domestic consumption of lentil, maize and sugar respectively, etc. More details are given in table 1.

Wheat, maize, and rice production has more than doubled since 1990. This overall increase has been primarily driven by increase in crop areas. Yield improvement rate was significant in the 80’s - however, from 1990 to 2000, yields grew at just above 1% per year for maize and rice and around 0.5% for wheat; wheat and maize yields have reached a plateau in 2000. Cereal supply has been a major issue for Egypt - per capita wheat consumption is around 180 kilos per year. Though domestic production has grown substantially over the last two decades, it covers only 55% of the country’s requirements. Over the recent period, Egypt imported 6.5% of the wheat traded worldwide - or around 7.15 million tons annually.
Based on present and planned research programmes contained in the strategy, as well as the wide potentials of using bio-technology, the projected land productivity by 2030 is expected to increase (Cereal Crops: 3.6 tonnes for wheat, 5.2 tonnes for rice and 5 tonnes for maize; Sugar Crops: 65.4 tonnes for sugar cane and 35 tonnes for sugar beet; Fibre Crops: 1.8 tonnes for cotton; Fodder Crops: 50 tonnes for perennial clover; Fruit Crops: 15 tonnes for citrus crops, 4 tonnes for grape and 10 tonnes for mango; and Vegetable Crops: 30 tonnes for tomatoes and 14 tonnes for potatoes (Table 2).

4 Geographic Dispersion of Food Insecurity

Food insecurity and poverty vary widely by region. Although fewer urban households are poorer than in the past, poverty has increased by approximately 2.3 million people in rural areas and extreme poverty is very much a rural phenomenon; approximately eighty percent of the poor and extremely poor live in Egypt’s rural areas. Vulnerability to food insecurity in the rural context is multi-layered, resulting from large family sizes, high dependency ratios, low adult education, virtually no savings, and limited access to employment or income earning opportunities.

By virtually every measure, food insecurity, vulnerability, poverty, and malnutrition are most profound throughout the rural areas of Upper Egypt – including the Governorates of Minya, Fayoum, Asyut, and Sohag – where 32-39 percent of households are vulnerable to food insecurity, more than one quarter of the population (34 percent) lives below the poverty line, and more than 36 percent consume less than the minimum level of dietary energy requirements. More than half of all poor Egyptian households (55 percent) and approximately two-thirds of the extreme poor live in Upper Egypt, where one-quarter of Egypt’s overall population live.

Upper Egypt has the highest rate of child mortality – infant mortality rate 24 per 1,000 live births and under-five mortality rate 31.4 per 1,000. Approximately nine percent of Upper Egypt children are underweight and more than 25 percent of under-five children are stunted, largely a result of inadequate food consumption compounded by poor hygiene, poor diets, poor child feeding practices, and limited diet diversity. A large number of children have also fallen victim to the child labour market, especially in workshops and in agricultural land, which further compounded the poor conditions of children in this region.

Upper Egypt households and communities continue to rely on agricultural production as the predominant source of their livelihoods and food. Agricultural producers nevertheless continue to face the following problems:

- Land fragmentation, which severely dampens efficient production;
- Diminished fertile land;
- Poor production and post-production practices and techniques;
- Limited entrepreneurial capacity or marketing opportunities; and
- Scarce water resources, which could decline further as a consequence of climate change and new Nile Basin Country agreements on the use and control of Nile waters.

5 Food Safety Nets and Food Security

In Egypt, food safety nets are the most important tools for government access to food security for those who are unable to receive sufficient income through their own efforts. The food subsidy program is one of the key safety nets implemented by the Government, and has been an important source of food security for a large portion of the population.
Implemented since World War II, it is credited with assuring the availability of affordable staples to the majority of the population.

Food rationing began as a temporary measure in Egypt in 1941, designed to help Egyptians cope with scarcity and inflation resulting from World War II. The initial system was not targeted to the poor or subsidize price but was set up to provide everyone with necessities such as sugar, kerosene, coarse cotton textiles, edible oil, and tea. The food subsidy system expanded in the 1960s and 1970s, becoming part of a broader set of consumer welfare programs that also subsidized transport, housing, energy, water, health, education, and some nonfood consumer products, such as soap and cigarettes.

The current food subsidy system in Egypt covers:

i) Baladi bread (Country Style): available to everyone

ii) Ration Card: that allows families to obtain pre-determined monthly quotas of subsidized commodities, especially cooking oil, sugar, tea and rice

6 The Government response to Food Price Crisis

From 2005-2008, prices of food and other basic goods and services, which constitute the consumption of the poor, increased much faster than the prices of non-essential goods and services. The cost of the minimum food basket increased by 47 percent in 3 years, much faster that the overall CPI (31%). The sharp increase in international wheat export prices back in February 2008 was one of the direct factors leading to the Balady bread crisis in Egypt. As Egypt is the world-wide largest importer of wheat, the price increase of this crop triggered a significant rise of the budget allocated for subsidized Balady bread in the fiscal year (2007-2008) from LE 8 billion to LE 11 billion. The increase in other food commodity prices led to increased consumption of subsidized bread, as a substitute for such goods. The sharp increase of food goods led to the increasing importance of subsidized food commodities, especially for the poor, therefore, the State interventions was necessary to help the poor to cope with the food price increases.

In response to the food price crisis, the government expanded the coverage of the subsidy program from 39.5 million to 63 million beneficiaries. Financial resources for food subsidies increased from 1.4 percent of the Gross Domestic Products (GDP) in 2005 to 1.8 percent in 2008. Eligibility criteria for the ration card were revised and people born since 1989 were allowed to apply for a new ration card. Food items that were on the card that were not in great demand were removed and quotas for some commodities were increased. The commodities currently being subsidized include sugar, rice, tea and cooking oil. The amount of resources spent on the subsidy program increased from 10 billion EGP in Fiscal Year (FY) 2007-08 to 21.5 billion in FY 2008-09. Sixteen billion LE was allocated to the baladi bread subsidy alone.

In addition to expanding the coverage and quantities of commodities made available at subsidized prices, the government separated the production and distribution of baladi bread to improve people’s access to bread. The Government also piloted the smart card system for distribution purposes, and increased social assistance to more beneficences. In addition, the Government enacted a 30 percent increase in wages of public service employees.

Data for 2008 in Table 3 shows expanded coverage across wealth groups. Greater numbers of the chronic poor are receiving coverage, although the ration cards have not been enough to move the chronically poor out of poverty. Additionally, Table 3 provides evidence that coverage has increased by a greater percentage for those that have never
been poor than for those who have always been poor (14% compared to 12% respectively).

While the in-kind transfers are reducing the depth of poverty for many households, they are not enough to enable the poorest households to break out of poverty. These food subsidies also absorb a considerable amount of public finances which could otherwise be targeted to more effective targeted assistance.

7 Major Challenges for Food Security in Egypt

7.1 Rapid Increase in Population

Adequately feeding a growing population with limited land and water resources is the most important challenge for Egyptian agriculture. Through the optimal allocation of agricultural resources, the agricultural sector can enhance food security by increasing the availability of food for a growing population. Egypt faces a number of challenges in maintaining food security. The recent surge in food prices has highlighted the vulnerability of a large proportion of the population to food insecurity and malnutrition.

Rapid population growth and increased demand for food has resulted in a widening gap between the total consumption and production of food. Feeding adequately a population growing at an annual rate of 2.1%, with limited land and water resources, is considered the most important challenge for Egypt. The population of 80 million is expected to rise to 90 million by the year 2017. The high population growth rate is a major constraint for sustainable development in Egypt. Population density is very high according to the 1986 census, about 1,170 persons per Km2. As much as 97% of the population is living in about 5% of the area. The high density in the Nile Valley and Delta is responsible for increasing deterioration of the environment. Geographical redistribution of population may have to be done on a large scale.

7.2 Scarcity of Arable Land

Arable land represents just less than 3 percent of the total land surface, while permanent crops cover 0.5 percent. Egyptian agriculture is almost entirely dependent on irrigation, while the agricultural land base is limited to about 3.4 percent of the total surface or about 3.5 million ha (8.4 million feddan11), of which 3.2 million ha lies within the irrigated Nile Basin and Delta (the remainder falls in rainfed areas and in the oases). Of the total Nile Basin and Delta area, about 2.3 million ha are located in the ‘old lands’, while the remaining 1.0 million ha are found in ‘new lands’, agricultural land reclaimed from desert areas. The main pillar for sustainable agricultural development in Egypt remains the horizontal expansion by reclaiming huge areas in the southern part of the country, namely Toshky, East Owaynat, Darb El Arba‘een with a net result of cultivating 1.3 million hectares more. Also, the so-called vertical expansion is applied, by adopting high yielding crop varieties of good quality and short duration. Improvements of the surface irrigation systems used in the old cultivated lands are carried out, as well as the introduction of new systems of irrigations will strengthen the Egyptian agriculture.

7.3 Scarcity of Water

One of the greatest challenges facing humanity is how to use scarce resources in an equitable and sustainable way. The availability of surface freshwater resources in Egypt is a major challenge—not least of all because the average population density doubled during the last 30 years. The major challenge faced by the Egyptian government is the limited annual freshwater quota from the Nile of 55.5 km3. Total water resources available to Egypt are carefully monitored and are estimated at 73.8 billion cubic meters (BCM) annually (Table 4). The total amount of water in use is about 62.6 billion cubic meters. The agricultural share of the water budget is about 81 percent (Table 5). A major challenge to the agricultural sector is to increase water availability, largely through increased water
use improved efficiency through more effective on-farm water management practices, changes in cropping patterns towards less-water consuming crops, the introduction of improved irrigation systems, as well as reuse of drainage water and treated sewage water.

7.4 Increased Fragmentation and Scattering of Agricultural Holdings

The last two decades have witnessed increased fragmentation and scattering of agricultural holdings. The percentage of holdings of less than 3 feddans has increased from about 2.29m feddans in 1980 to about 3m feddans in 2000, according to the latest agricultural census. Also, the average area of the holding decreased from 6.3 feddans in 1950 to 2.1 feddans. The percentage of dwarfish holdings (less than one feddan) increased to 43% of total agricultural holdings in 2000, from 21.4% in 1950. Because of this fragmentation, an estimated area of 12% of the most fertile agricultural lands is lost as boundaries and partitions between holdings, a situation that weakens the ability to modernize agricultural activities and increase productivity.

7.5 Deteriorating Land Efficiency (Classification of Land Resources)

Total agricultural land increased from 5.87 m feddans in 1980 to approximately 8.44 m feddans in 2007, and cropped area increased from some 11.1 m feddans in 1980 to 15.18 m feddans in 2007. Areas of the first grade lands in 2001–2005 have declined to less than one third of what it was in 1996-2000, while the percentage of the second grade lands has increased from about 33.6% to 41.8% during this period. The third and fourth grade lands have also increased from 1.455 m feddans to 2.936 m feddans. This phenomena underlines the importance of reviewing government policies in the field of land maintenance and putting land improvement programmes and projects as a top priority in the coming years.

7.6 Climate Change Threats

Climate risks to development (depending on available assumptions) includes:

- Drought (although flooding needs to be considered, it is not expected due the presence of the High Dams);
- Temperature stress (higher and more variable affecting productivity and seasonal pattern);
- Water stress (precipitation patterns - increased evaporation and water consumption); and
- Coastal flooding (affecting Delta Region and the Northern Lakes of Egypt).

- The potential direct impacts (scale of risk from climate change varies with assumptions about future development) includes:
  - Agricultural and rangeland failure (increases in aridity-water availability varies- Crops-Livestock-Fisheries- reduce wheat productivity by 18%, barley and maize by 19% and rice by 17%. Marginal agricultural areas would be negatively affected, and desertification rates would increase);
  - Displacement (to South – High land - and East-West Delta- Regional niches- Socio-economic effects of labour migration from marginal and coastal areas- 1-2 meters rise in sea level would compel some 8 million inhabitants to migrate from Delta to other areas);
  - Poverty, reduced GDP (high vulnerability consequence on low levels of income – economic losses due to changes in production and trade); and
  - Food insecurity (availability- Stability; Access; Utilization). The Potential Indirect Impacts include Social Services/Sectors such as deterioration of health and reduced education opportunities, while poverty leads to reduce capacities to sustain these services in the long run.
7.7 Challenges in Food Safety Nets

Despite safety net initiatives that have doubled coverage and amounts received, the expanded food rations cover less than 20 percent of the chronically poor individuals (i.e. 1.5 million people reached out of 7.5 million chronically poor). Many of the poor and most vulnerable households to food insecurity are not reached by existing safety net programs because of geography (70 percent of the poor live in Upper Egypt), eligibility criteria for ration cards or social assistance (proper documentation), and weak targeting. Significant leakages result in a strain on resources and are described in a recent WFP study as the program’s greatest weakness.\(^{13,14}\)

A 2005 WFP study points out that the ration card system suffers from little or no targeting. This was still the case in 2008. A considerable number of non-poor households have ration cards (66.8%). Additional problems noted by the survey include limited monitoring that permitted a diversion of commodities. Forty percent of ration cards included deceased household members or other persons that were not a part of the household. More than 50 percent were in the possession of non-registered persons in 2005. This has been addressed recently by the government by opening up the registration process to include those who were previously not registered. Still many of the chronically poor do not have ration cards.

The nutrient profile of the current food subsidy ration for the general population is focused excessively on the provision of energy. This is to the detriment of providing other important nutrition inputs. The heavy concentration of the current food subsidy ration on energy provided from fats and carbohydrate sources (the oil, bread and sugar, respectively) does not bode well for preventing future chronic health issues such as diabetes, overweight and obesity, and coronary heart disease. An increase in these chronic conditions has already been noted in women and men, as well as children. Not addressing these issues and conditions at present will incur increasing health care costs for the government. Education of the public at all levels should address this issue by encouraging a more diverse diet and levels of activity. Fortification of commodities with micronutrients should also be expanded.

Even though the coverage, adequacy and targeting have improved over the 2005-2008 period, the subsidies are too weak to prevent many households from falling into poverty or provide an adequate response to the increased volatility of the global food crisis.\(^{15}\) This fragmented approach to safety nets needs to be reconsidered. Through better targeting and reduction in leakage of the food subsidy program, more benefits can be provided to the poor without substantially increasing the Government budget. Food subsidy reform must be combined with other social protection mechanisms (e.g. better targeted and resourced social assistance programs) and new risk management approaches that target the vulnerable in rural areas.

Safety nets should serve two purposes: i) reducing the negative impact of increasing food and energy prices on the chronic poor; and ii) protecting the non-poor and transient poor from becoming more vulnerable to poverty and food insecurity. To improve the effectiveness of these safety nets, appropriate indicators need to be identified for targeting and good food security monitoring systems must be in place to insure timely response.

7.8 Financial Crisis

The impact of the financial crisis on food production is difficult to predict. The complex demand and supply forces in agricultural markets could create a number of different scenarios. The financial crisis may dampen demand for commodities, putting further downward pressure on agricultural prices through slower rates of GDP growth, negative market expectations, and falling oil prices. Falling
oil prices will reduce demand for commodities used in biofuel production (e.g. maize and sugarcane). On the supply side, the financial crisis could depress production incentives through lower crop prices and reduced producer access to credit. Falling petroleum prices, however, will lower the costs of agricultural production and transport. In the end, the net effect on production depends on the relative speed of adjustment of farm-gate crop and input prices. If input prices fall more slowly than producer prices, farmer margins will decrease, encouraging producers to cut production. However, if input prices fall in line with producer prices, farmers may be encouraged to maintain production.

The financial crisis may also restrict some countries’ access to credit, limiting their ability to import food. Whether or not the financial crisis decreases food production, it will slow down food trade, particularly for developing countries. As international food companies and food-exporting countries tighten credit, some Arab countries with limited financial resources will have difficulty financing cereal imports through debt. This is a serious concern since Arab countries are expected to depend increasingly on imports in the future.

8 The Governmental Programs to Improve Food Security

Strategies of agricultural development in Egypt since the 1980’s have shifted from being based on self-sufficiency - in the narrow sense - to being based on food security – at large sense - through better utilization of comparative and competitive advantages Egypt exports cotton, rice, vegetables, fruits, aromatic and medicinal plants and cut flowers.

During the sixties and seventies the agricultural sector in Egypt was subject to heavy government intervention in land tenure system, area restrictions, production, marketing, trade and prices. Also the agricultural sector was highly taxed in favor of other sectors of the economy. This had negative impacts on agricultural development and food security.

Since the eighties and within the framework of the strategies of agricultural development in Egypt in the 1980’s and the 1990’s which were formulated and implemented by the Ministry of Agriculture and Land Reclamation, drastic reforms of the past agricultural policies have been introduced through an agricultural economic policy reform, liberalization and privatization program. And since then, the agricultural sector has clearly been in the forefront of other sectors of the economy in this regard.

8.1 Agricultural Economic Policy Reform Programme

It has included the following wide variety of measures:

- Gradually removing governmental controls on farm output prices (this does not preclude government voluntary guarantee prices for some strategic crops); crop areas, and procurement quotas.
- Increasing farm gate prices to cope with international prices.
- Phasing out farm input subsidies.
- Phasing out governmental constraints on private sector in importing, exporting and distribution of farm inputs to compete with the Principal Bank for Development and Agricultural Credit (PBDAC).
- Deregulating governmental constraints on private sector in importing and exporting agricultural crops.
- Divestiture of PBDAC from non-banking activities.
• Imposing limitations on state ownership of land and sale of new land to private sector
• Confining the role of the Ministry of Agriculture and Land Reclamation (MALR) to Agricultural Research, Extension, Regulatory Measures and Economic Policies.
• Liberalizing the land tenure system.
• Adjusting the interest rate to reflect the commercial rate.
• Adjusting the foreign exchange rate to reflect the real value of local currency

Therefore, all governmental controls have been removed and the sector is, by now, private and free market-oriented. The role of the Ministry of Agriculture and Land Reclamation is confined to agricultural research, extension, regulatory measures and economic policies.

8.2 The Government Strategic Orientation and Objectives

The strategic objectives of the Government for achieving sustainable agricultural development by 2030 are:

a) Sustainable use of natural agricultural resources
• Increase efficiency of water use in agriculture
• Sustainable increase in areas of reclaimed land
• Sustainable development of the productivity of land and water unit:
• Maximizing sustainable return from rain-fed agriculture

b) Developing agricultural productivity per unit of land and water
• Directions of development of crop productivity
• Directions to develop productivity/animal unit
• Directions of fisheries development

c) Supporting competitiveness of agricultural products at local and international markets
• Available opportunities
• Elements of competitiveness capabilities and facing challenges
• Major directions to support the competitiveness capabilities
• Achieving high levels of food security in strategic commodities
• Increase the rate of self sufficiency of the strategic food commodities
• Development consumption patterns to improve nutritional levels
• Reduce market losses in food commodities
• Improving quality and safety of food commodities
• Development of social security network.

e) Improving agricultural investment environment
f) Improving livelihood of rural inhabitants

• Justification and available opportunities.

• Main elements for improving living conditions of rural inhabitants.

Constraints and obstacles include those related to agricultural policies are limited agricultural investments, inflexibility of credit policies, and capacity to formulate, analyze and monitor policies; agricultural institutions and coordination; the imbalance between the development of production and the improvement of marketing services and food quality/safety; poor information system; and discrepancies between Export agriculture and small scale farming.

9 Major Priorities and Areas of Action

9.1 Efficient Utilization of Natural Resources

• Enhance Efficiency of Irrigation System: One of the main components of the agricultural development strategy is to achieve a gradual improvement of the efficiency of irrigation systems to reach 80% in an area of 8 m feddans, and to reduce the areas planted to rice in order to save an estimated 12.4 billion cubic meters of water by 2030. The objectives include: meeting the needs of land reclamation plans; achieving an appropriate rate of vertical agricultural development; and effecting a voluntary change in the cropping pattern; and Improving environmental conditions and public health in rural areas.

• Maintaining and Protecting Agricultural Land and Expanding Reclaimed Areas: Expanding reclaimed areas is one of the main components of the strategy. This can be achieved by using the quantities of water due to be saved through developing field irrigation systems in reclaiming new areas estimated at 1.25 m feddans by 2017 and about 3.1 m feddans by 2030. Agricultural land in the Delta and the Nile valley regions suffers from two important problems, namely, continued encroachment on agricultural land and diverting it from agricultural to non-agricultural uses at an annual rate of 20,000 feddans, and continued degradation of soil fertility in so many agricultural areas. Dealing with these problems would require periodical soil surveys to be taken as a basis for establishing determinative fertilizer use rates, continued restoration and maintenance of agricultural drainage systems, as well as for establishing drainage systems in the areas lacking such systems. The objectives include: (i) Increasing the capability by adding new lands, through effective and less costly methods; and (ii) ensuring that the newly reclaimed areas are used for agricultural production; and (iii) securing conditions for establishing viable settled agricultural communities in the newly reclaimed areas.

9.2 Enhancing Productivity and Competitiveness of Agricultural Products

Enhancing productivity and competitiveness of agricultural products throughout the Value Chain: At the agricultural sector level, there are many elements and areas that have to be targeted for improvement. Strategic priority areas include: (i) Establishing quality standards for agricultural products; (ii) keeping abreast of modern and advanced techniques that support the economic efficiency of agricultural production; (iii) using modern information and communication techniques that serve the agricultural sector; (iv) developing marketing facilities and services and agricultural markets in general; (v) developing pre-and post-harvest practices for improving product quality; (vi) applying modern techniques in monitoring, analyzing and forecasting natural, technical and marketing risks, through a special unit for the management of agricultural risks; (vii) linking farmers, particularly small farmers, with markets, including the development of marketing systems and channels; (viii) activating and strengthening the role of the government in
exercising supervision on quality standards of both inputs and outputs, banning monopoly and adulteration, and consumer protection; (ix) strengthening institutional and organizational mechanisms that support the linkages between local and external marketing; and (x) reducing losses throughout the value chain

9.3 Institutional-Human Capacity Building and Policy Environment for Managing Agricultural Development

Institutional and Human Capacity Building for Managing Agricultural and Rural Development: The main objectives for this priority include: (i) upgrading the scientific and technical skills of research, extension and technology transfer staff; (ii) upgrading the scientific and technical skills and expertise with specific attention to the fields of agricultural policies formulation, analysis, monitoring and evaluation; (iii) modernizing agricultural education programmes in all educational institutions and at all levels; (iv) strengthening linkages between agricultural education programmes and the requirements of the labor market; (v) sensitizing farmers leaders of the importance of monitoring agricultural developments, and (vi) encouraging rural leaders to share their experiences and knowledge with other farmers.

Improving the Climate for Agricultural Investment: Improving agricultural investment climate requires greater attention by the Ministry of Agriculture and Land Reclamation, in collaboration with other concerned ministries, for eliminating bottlenecks limiting agricultural investments. The major objectives include: (i) facilitating the allocation of newly-reclaimed areas, through the establishment of a single administration comprising representatives from all concerned ministries with which investors and businessmen are in direct contact; (ii) reviewing land allocation laws and procedures and reviewing credit and lending policies; and (iii) MALR is to prepare a clear investment map for agriculture.

Enhance Research Based Technology Transfer: The main objectives of this priority action area includes: (i) Establishing close coordination between agricultural research institutions, under a national research plan defining research areas and budgets; (ii) improving the income levels of researchers; (iii) establishing the closest possible coordination and cooperation between universities and specialized research institutions; and (iv) enabling the younger generation of researchers to interact with their counterparts at the international level, for improving their research capabilities.

9.4 Poverty Reduction

a) Reducing Regional Disparities: There is a disparity in the level of development between the different geographic regions of Egypt. Each region has its own niche and comparative advantage that needs to be utilized efficiently. It is noteworthy that there are many indicators that underline the distinctive attributes of the different regions in Egypt, where the milk and rice production belts are concentrated in northern Delta, while the vegetable production belt is concentrated in the governorates surrounding the greater Cairo region, the medicinal and aromatic plants production belt in middle Egypt, the sugar cane and the dry- and semi-dry dates production belts in higher Egypt. In spite of the differences between the different regions in natural resources and climatic conditions, these differences have not been taken into consideration in polices regulating the use of land and water resources, as well as fertilizer application policies for the different crops, marketing policies and policies for localizing agricultural technology. To address this situation, it would be necessary to know the attributes of the different regions, as well as the problems and bottlenecks facing the developmental efforts, and recognize development opportunities in each region. This would help achieve two main goals, namely, establishing development strategies and goals on objective bases and laying executive plans in such a way that could exploit the distinctive
features of the different regions and address the regional problems and determinants that hinder development.

b) Off-farm income, employment with emphasis on better utilization of farm residues: Numerous advantages could be achieved from utilization of agricultural residues and industrial by-products in particular, including: (i) Creation of new small agro industries in the rural and pre-urban areas; (ii) generation of new job opportunities in rural communities; (iii) use as compost for land reclamation, contributing to addition of new cultivated areas; (iv) rationalization of water irrigation, for water needed of reclaimed lands; (v) fostering organic agriculture, thus promoting export; (vi) reduction of both chemical fertilizer and pesticides; (vii) substitute for fodder production, thus reduce imports of feedstuffs; (viii) reduce the costs of animal and poultry feed stuffs; (ix) generation of new and renewable energy sources like biogas, bio-fuel, ethanol, etc.; and (x) protection of environment from pollution.

Footnotes

2 GOE, Inter-agency Assessment Mission, Building Resilience in the Agricultural Sector, 2009.
3 IFAD, Rural Poverty in the Project Area, 2008.
4 WFP, 2009
6 DHS, 2008
9 WFP Vulnerability Analysis and Food Subsidy Study. A Panel Survey. October.
11 One feddan is equivalent to 1.038 acres or 0.42 hectares.
**Table 1**: Self-Sufficiency of Some Field Crops

<table>
<thead>
<tr>
<th>Winter Field Crops</th>
<th>Winter Field Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crop</strong></td>
<td><strong>Self Sufficiency Rate (%)</strong></td>
</tr>
<tr>
<td>Lentil</td>
<td>5</td>
</tr>
<tr>
<td>Barley</td>
<td>&gt;80</td>
</tr>
<tr>
<td>Wheat</td>
<td>56</td>
</tr>
<tr>
<td>Faba Bean</td>
<td>60</td>
</tr>
<tr>
<td>Berseem Forage</td>
<td>70</td>
</tr>
<tr>
<td>Seed</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Onion</td>
<td>&gt;100</td>
</tr>
</tbody>
</table>

**Table 2**: Production, Consumption, Imports and the Gap for some Field Crops in Egypt (2007)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Total Production (000t)</th>
<th>Total Consumption (000t)</th>
<th>Imports (000t)</th>
<th>% gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>7 400</td>
<td>13 800</td>
<td>6 400</td>
<td>46</td>
</tr>
<tr>
<td>Corn</td>
<td>6 150</td>
<td>10 650</td>
<td>4 500</td>
<td>42</td>
</tr>
<tr>
<td>Fababean</td>
<td>300</td>
<td>450</td>
<td>150</td>
<td>33</td>
</tr>
<tr>
<td>Lentil</td>
<td>1.6</td>
<td>80</td>
<td>78</td>
<td>98</td>
</tr>
<tr>
<td>Flax Seed</td>
<td>10</td>
<td>200</td>
<td>190</td>
<td>95</td>
</tr>
<tr>
<td>Sesame</td>
<td>41</td>
<td>55</td>
<td>14</td>
<td>25</td>
</tr>
<tr>
<td>Soybean</td>
<td>25</td>
<td>600</td>
<td>575</td>
<td>96</td>
</tr>
</tbody>
</table>

**Table 3**: Percentage of Ration Card Holders by Poverty Dynamics, 2005-2008

<table>
<thead>
<tr>
<th>Percent of Ration Cards Holders 2005</th>
<th>Percent of Ration Cards Holders 2008</th>
<th>Percent change in coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Poor</td>
<td>75.6</td>
<td>85.0</td>
</tr>
<tr>
<td>Into poverty</td>
<td>63.6</td>
<td>78.9</td>
</tr>
<tr>
<td>Out of poverty</td>
<td>73.8</td>
<td>78.1</td>
</tr>
<tr>
<td>Never poor</td>
<td>58.5</td>
<td>66.8</td>
</tr>
<tr>
<td>All Population</td>
<td>61.9</td>
<td>70.4</td>
</tr>
</tbody>
</table>

### Table 4: Available and Potential Water Resources (in billion m$^3$) Annually

<table>
<thead>
<tr>
<th>Water Resource</th>
<th>Potential Amount</th>
<th>Per cent</th>
<th>Amount in Use</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Nile</td>
<td>55.5</td>
<td>75</td>
<td>51.7</td>
<td>83</td>
</tr>
<tr>
<td>Groundwater</td>
<td>11.3</td>
<td>15</td>
<td>5.2</td>
<td>8</td>
</tr>
<tr>
<td>Reuse of Agricultural Drainage Water</td>
<td>5.0</td>
<td>7</td>
<td>3.7</td>
<td>6</td>
</tr>
<tr>
<td>Treated Sewage Water</td>
<td>1.5</td>
<td>2</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>Rainfall</td>
<td>0.5</td>
<td>1</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>73.8</strong></td>
<td><strong>100</strong></td>
<td><strong>62.6</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### Table 5: Distribution of Used Water on Various Sectors (in billion m$^3$) Annually

<table>
<thead>
<tr>
<th>Sector</th>
<th>Consumed Amount</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>50.8</td>
<td>81.1</td>
</tr>
<tr>
<td>Industry</td>
<td>8.8</td>
<td>14.1</td>
</tr>
<tr>
<td>Electricity</td>
<td>2.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Shipping &amp; Maintenance of Water in the River</td>
<td>1.0</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62.6</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Source:** Adapted from Abou Zeid, M. Water Res. Centre, Ministry of Irrigation, Cairo, 1992 and FAO 2003.
FOOD SECURITY IN GHANA

Mr. Emmanuel Kwesi Hedzro-Garti

1 Introduction

The essence of food security in the era of economic slow down has dire consequences for countries in the Afro-Asian region. The need to meet the daily nutritional needs for all people calls for governments to put in place the needed mechanism to enhance self sufficiency in the production of staples consumed most. The food and financial crisis of 2008 precipitated actions from national governments to sustain sufficient domestic food situations. Some actions taken include restriction on export of cereals from India, removal of import tariffs on import of food commodities such as rice and chicken into Ghana among others.

Declarations from the various international conferences since 1992 identified food security as one of the underlying and cross-cutting issues that require concerted action in order to ensure the sustainable reduction of absolute poverty in all countries. This realization culminated in the elaboration of the Millennium Development Goals (MDGs) to prompt all countries to work towards achieving the internationally agreed targets, now known as the MDGs by 2015.

According to the Food and Agriculture Organization (FAO, 1996, 2003), food security exists when all people at all times have physical or economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Ghana’s Ministry of Food and Agriculture defines food security as good quality nutritious food, hygienically packaged and attractively presented, available in sufficient quantities all year round and located at the appropriate places at affordable prices. The key elements of the definition, as is the case with other definitions, are nutritive quality of food, self-sufficiency, physical and financial availability. Both definitions have the underlying principles of financial and economic access to food.

2 Food Security in Ghana

There have been attempts in the past to kick start economic transformation through agriculture development. The very recent effort is the adoption and implementation of the food and agriculture sector policy document known as FADEP II. The implementation of this policy document is to be guided by the sector plan, also known as the Medium term Agriculture Development Plan (METASIP).

2.1 Nature of Food Insecurity and Emergency Preparedness

Ghana faces the challenge of making substantial progress toward food security because average yields have remained stagnant. Commercial food imports and food aid have constituted about 4.7% of food needs in the last 15 years. Food production fluctuates from year to year due to frequent variations in the magnitude of rains during and between growing seasons. This recurrence of climatic stress destroys crops and livestock. Rainfall is a major determinant in the annual fluctuations of household and national food output. This creates food insecurity at household levels, which can be transitory in poor communities and chronic in distressed areas (FASDEP II 2007).
In high population density areas such as the Upper East Region, the situation is cyclical and severe for three to five months each year. Regional disparities therefore exist in food insecurity due to seasonal food deficits in the three northern regions. A significant proportion of food-insecure Ghanaian households in rural, as well as, urban localities produce some of the food they consume. For most households, hunger is frequently associated with poor harvests resulting from environmental degradation, poor weather, natural disasters, or conflict. Almost all families supplement their food requirements with significant amounts of purchased staple crops.

While Ghana can be classified as generally food secure, pockets of food-insecure populations exist in all regions because of acute resource limitations and lack of alternative livelihood opportunities for some individuals and households to meet their dietary needs with purchased food. Malnutrition is a serious problem among children, adolescents and pregnant women due to insufficient levels of food intake and or diets not providing an adequate nutritional intake. Results from the 2003 Ghana Demographic Health Survey (GDHS) indicate that malnutrition contributes 40% to mortality among children less than 5 years. In that survey, 29% of these groups of children were chronically malnourished, an increase of 3 percentage points over the 1998 rate. Seven per cent of children were wasted (through acute malnutrition) and this reflected a 2-percentage point decline from the 1998 level. Twenty two per cent were underweight (with 5% severely under-weight) in 2003, a decline of 3-percentage points from 1998. However, in spite of the improvements in proportion of children wasted and underweight, the rate of wasting is 3.5 times that expected in a healthy population while the proportion of under-weight children is 11 times the level expected in a well nourished population.

The availability of food varies considerably from year to year, depending on the level of production. Adverse weather conditions often exacerbate drought-related crop failures, especially through bush fires that have a disproportionately severe impact on smallholder farm enterprises. Food insecurity is more prevalent in high population density zones, where women and children have specific dietary needs but are at higher risk of hunger than adult males in the household (FASDEP II).

2.2 Current Food Security Situation in Ghana

Solely on the basis of households’ food consumption, 5% of the population or 1.2 million people were observed to have very limited access to sufficient and nutritious food for an active and healthy life and are defined as food insecure (CFSVA 2009).

Food insecurity is concentrated in the poorest regions of the country which are also the areas most prone to adverse weather conditions, such as floods and droughts, and that have been disproportionately affected by last year’s soaring food prices. 34% of the population in Upper West region is food insecure, followed by Upper East with 15% and Northern region with 10%. This is the equivalent of approximately 453,000 people. The lowest prevalence of food insecurity was found in Accra (2%) and the rural areas in Greater Accra (1%) and Western Region (1%).

The statistics above are likely to improve and the number of food insecure population reduced due the provision of credit in kind to households who are resources constrained and provided them an opportunity to increase their average farm holdings.

2.3 Food Security at the District Level

The number of food production deficit districts reduced by 2 as against a target of 15 in 2009 for Greater Accra, Upper West and Western Regions. This is a significant improvement over 2008 where
the number of food production deficit districts increased from 6 to 12. All the districts in Greater Accra Region continued to experience deficit in food production but improved upon access to food by expanding their food outlets. Two districts in Greater Accra Region (Dangme East and Dangme West) however have difficulty in accessing food markets due to distance and poor roads. Three regions, Greater Accra, Upper West and Ashanti indicated that some of their districts are faced with nutritional deficit as a result of poor access to food markets and inadequate knowledge in nutrition based diets.

2.4 Food Supply and Demand of Key Staples

Trends in per capita production of the major staples in Ghana increased between 2000 and 2009. Cereals, namely, maize, rice, millet and sorghum recorded a per capita production of 67.42 kg, 9.78 kg, 10.22 kg and 14.59 kg respectively. The starchy staples cassava, yam and plantain followed a similar trend recording per capita production of 5.11 kg, 31.26 kg and 5.61 kg respectively. The legumes groundnut, cowpea and soybean also recorded increases of 1.8 kg, 0.85 kg and 1.49 kg respectively. The general trend observed is attributed to interventions such as the block farm programme, fertilizer subsidy programme, introduction of AMCETS and farmers willingness to adopt simple technologies for increased productivity especially during the production year.

Between 2007 and 2009, production increases were recorded for the various staples consumed. Grains such as maize increased by 33%, while cereals such as rice and millet increased by 111% and 117% respectively. Production of starchy crops such as cassava and yam increased by 20% and 32% respectively whiles legumes such soybean, groundnut and cowpea which are consumed by households and also have industrial purposes increased by 114%, 74% and 72% respectively. These increases in production were also accompanied by a commensurating increase in area cultivated. Over the same period of 2007 to 2009, area subjected to the cultivation of maize increased by 21%, rice by 49%, soybean by 50% and yam by 17%. These increases are in tandem with government effort to ensure food by bring more lands under cultivation whiles intensifying production methods. It is important to recognize that these significant increases in production and area cultivated are the result of specific government actions to achieve food security though youth employment and income generation.

On the other hand yields have not increased as much as much as area cultivated and production levels have despite improvements recorded. As the end of the 2009 farming year, though yield levels generally increased for some staples, these increases have been marginal. Comparing 2009 with 2008, maize, rice and plantain recorded deficits. These crops are among the high value staples of the country and this downward trend remains a challenge.

2.5 Food Price Situation

Generally the average wholesale nominal prices for major food commodities in 2009 increased compared to 2008. The highest percentage change was observed in tomato i.e. 236.7% and the least for cocoyam 10.9%. Maize and local rice are major staples which saw 14.6% and 18.8% increase in prices as against 72.8% and 49.3% change during the previous year.

Improvement in storage facilities, rehabilitation of warehouses, inventory credit system, introduction of quality rice processing mills (e.g. Bolga rice and Lolandi in the 3 northern regions) and re-imposition of taxes on rice contributed to increased prices.

Food situation was satisfactory as food was generally available. However the general increase in prices affected access to especially poor
households. The high increase in fresh tomato prices was due to its competition with the processing industries and farmers especially in Akomadan drifting from tomato production to production of staple foods. It is therefore recommended that interventions should be put in place to increase productivity and production to satisfy the fresh and processing markets. Though there were increases in prices of most food commodities, changes in price levels were relatively fair throughout major markets in the country.

2.6 Strategic Programmes Implemented to Achieve Food Security

Since the global food, fuel and financial crisis, efforts have been accelerated to enhance food security. Chief among these are the Fertilizer Subsidy and Block Farming programmes. High fertilizer prices were a disincentive for its usage. To improve farmer yields and productivity, the fertilizer programme was introduced. In 2009, a total amount of GH¢34.417 million was spent on the programme. The major financier for this programme was the World Bank who pledged to support the Government of Ghana with an amount of US $ 25 million. A coupon system was used to make sure that all farmers who needed it had access.

Another major approach used to ensure food security is the system called Block Farming. The programme was to target large tracts of available land (in blocks) for the production of selected commodities aimed at improving food security, farming as business and generate employment among the rural poor especially the youth to improve incomes through science and technology. This programme was implemented in six regions in 2009 and has been upscaled to all ten regions in 2010.

3 Land for Agriculture

Land in Ghana has spiritual significance and is hot topic for discussion. Its significance has consequences both for the living and the dead. Approximately 80% of land is customarily owned with 18% in the hands of the state and the remaining 2% in private hands and vested land administrative authority.

Since the global food crisis in 2007 indicating a failure in stability of world food prices, developed countries who import most of their food requirements, huge multinationals and investment firms have found alternatives of moving into developing countries to grow the food they need. An estimate by the International Food Policy Research Institute (IFPRI) indicated that between 15 and 20 million hectares of farmland in developing countries have been an issue involving foreign investors since 2006. This has led to large grabbing of lands and in some cases displacing most small holder farmers hence affecting their food sufficiency adversely. This is a violation of their human right to adequate food under article 11 of “The International Covenant on Economic, Social and Cultural Right of the United Nations”.

In the light of the above, it is critical to safeguard the interest of investors as well as host countries alike, that interments in large tracts of land are made responsibly in accordance with the 11 principles of human rights applicable to acquisitions and leases of large scale land. However, this may not necessarily validate large-scale investment in land. It also beholds on government to carefully examine the opportunity cost of ceding lands to investors and equally examine alternatives to agreements that have impact on land tenure. The benefits of investments whether on creation of infrastructure, marketing opportunities, and access to credit should work for the benefits of the investor and the producer. Governments could also critically look at other business models such as contract farming, without changes made to rights over the land.

Ghana’s own experience with land grabbing largely occurs in the North of Ghana where huge tracts of
land are marginal and rainfall is unimodal. Bio fuel firms have grabbed lands for the production of jathropha. Unfortunately not only marginal lands have been encroached upon but also fertile lands. Chiefs have been pressured by some locals fronting for multinationals to give up lands with the promise of jobs for dwellers.

4 Experiences from Ghana

Ghana’s land policy consists of a comprehensive set of proposals for improving access to land, ensuring security of tenure and protection of land rights, and ensuring planned land use. The National Land Policy (NLP) formulated and published by the Ministry of Lands, Forestry and Mines, June 1999, is the first comprehensive effort and documented land policy. This, however, should not be construed to mean that no serious efforts have been made in the past to evolve a national land policy.

Land acquisition in Ghana can be cumbersome because the individual will have to go through several processes to secure the land. Some of the processes include: find land of your choice, negotiate price with land owner, title search, survey the land, prepare indenture, register the land, put pillars on the land and build structure. Some challenges associated with this process have been identified below:

• Weak land administration system
• Low level of consultation and coordination among the land sector agencies and cumbersome processes
• Multiple sales
• Disregard for planning regulations

The Land Administration Project (LAP 2002) aimed at re-engineering the land administration system and to develop a system that is fair, efficient, transparent and cost effective. It is a long term comprehensive reform program that affects the entire continuum of land administration – policy and legal regimes, the administration of justice as it relates to land, rights and interest in land, institutional reforms (public and customary), customary land administration, land titling and registration, community based land use planning, surveying and mapping, valuation, land information systems, human resource development.

LAP initiated the establishment of land banks directory to enhance access, enforcing title registration, ensure tenure security. Through the work of the Ministry of Food and Agriculture and the Ministry of Lands, Forestry and Mines, approximately 320,126 ha. of land have been identified and committed to the Land Bank Directory. Most of these lands are to be used for agricultural purposes. There are however large parcels of it which can be used for real estate development, industrial or commercial purposes depending on the location.

5 Effects of Climate Change on Food Security

Climate change refers to a long term warming trend due to the increase of greenhouse gases (GHGs) such as carbon dioxide (CO2), chlorofluorocarbons (CFCs), methane (CH4) and nitrous oxide (N2O) since the onset of the industrial revolution. Human activities such as deforestation, combustion, of fossil fuels, production of agricultural commodities such as rice and livestock and other industrial outputs have caused atmospheric concentrations of GHGs to rise significantly (IPCC, 2007). GHGs absorb energy radiated from the earth to space and warm the atmosphere. According to IPCC, increases in GHGs emission have been associated with an increase in the mean global temperature of 0.3°C to 0.6°C since the late 19th century. By the end of the 21st century, GHGs emission could cause the mean global temperature to rise by another 1.4°C-5.8°C (Yang 2009).
Increases in mean global temperature will have numerous effects on agricultural production, chief among them being changes in growing seasons—the length of time that soil temperature and soil moisture conditions are suitable for crop growth. The earth’s oceans will expand, raising sea levels and reducing the amount of land available for agriculture. Extreme weather events, such as storms and floods, may increase in frequency. Higher atmospheric concentrations of CO2 will improve water-use efficiency of all crops (by reducing evapo-transpiration) and increase the rate of photosynthesis of most crops. The direct effects of CO2, however, will be small in regions where fertilizer use is low or other factors inhibit crop growth. The direct detrimental effects of other fossil fuel emissions, such as sulfur dioxide and ozone, will offset some of the benefits of high concentrations of CO2.

5.1 Impacts of Climate Change in Africa

The African climate is determined at the macro-level by three major processes or drivers: tropical convection, the alternation of the monsoons, and the El Niño-Southern Oscillation of the Pacific Ocean. The first two are local processes that determine the regional and seasonal patterns of temperature and rainfall. The last is more remote in its origin, but strongly influences the year to year rainfall and temperature patterns in Africa. Despite the importance of all three processes, we poorly understand how they interact and how they are affected by climate change.

Attempting to understand the effects of climate change on Africa is fraught with difficulties. While some things are known and relatively well understood, there is still great uncertainty about the key climatic processes and their consequences. There is also much that is simply unknown. It is important to recognize that Africa’s climate is naturally both highly diverse and highly variable. It encompasses the extreme aridity of the Saharan deserts at one end of the range and the extreme humidity of the Congo rainforest at the other. Interacting with these natural patterns are the combined effects of anthropogenic global warming and human interference more generally. In most instances it is difficult or impossible to disentangle one cause of change from another. Whether this current period is another natural episode or the result of environmental degradation or global warming we do not know. Probably it is a combination of these factors. What we do know is that global warming is likely to exacerbate droughts such as these, increasing their frequency and intensity.

Droughts or floods that last a few months can be highly destructive. When they last decades the effects can be devastating and sometimes irreversible, at least in the short term. The current Sahelian drought has resulted in the Sahelian, Sudanese and Guinean ecological zones shifting 25-35 kilometer further south, with loss of valuable grassland, savanna and other resources that the indigenous people rely upon. One of the most severe consequences has been the Darfur conflict in the Sudan, which originated from clashes between pastoralists and sedentary farmers over depleted water and other resources.

Africa’s climate is also a driver at a global level. The heat released in the ITCZ is a major source of the planet’s atmospheric warming. Africa is also a source of the Atlantic hurricanes that often develop from easterly atmospheric waves passing over Africa at the time of the monsoon. Africa is a not insignificant producer of greenhouse gases. Virtually all of the carbon released to the atmosphere from land use changes now comes from the tropics. Tropical deforestation, including logging and the permanent and temporary conversion of forests to croplands and pastures, releases about 1-2 PgCyr. This is 15-35% of annual fossil fuel emissions during the 1990s (adding in all the other gases that result from land use change e.g. methane, nitrous oxide etc., tropical deforestation accounts for about 25% of the total
anthropogenic emissions of greenhouse gases). Africa contributes about 0.12-0.35 PgC/year.

More significant than the carbon released by deforestation, large quantities of carbon are produced by the open burning of the savannas of Africa. It is estimated that over 50% of the annual carbon released from burning (both of forests and savannas) comes from Africa. Both biomass burning and wind-borne dust also produce large quantities of aerosols. The effects of aerosols (including those produced by burning fossil fuels and as a result of industrial processes) on climate are highly complex. In certain circumstances, some aerosols reflect incoming radiation, so cooling the planet, but others trap the heat and add to the greenhouse effect. Dust can either reduce or stimulate rainfall. In low clouds, water attaches to dust particles and prevents droplets from becoming heavy enough to fall. But in high clouds dust particles over wetter regions may provide surfaces for ice crystals to form around them, resulting in greater rainfall.

5.2 Sea-level Rise

Sea levels will rise around the globe as a result of global warming. The primary cause, at least in the near term, is the thermal expansion of the oceans resulting from rising oceanic temperatures. This will deliver a rise of about half a metre by the end of this century. Africa is less likely to be as damaged by rising sea levels than many small islands or delta regions such as the Ganges-Brahmaputra and the Mekong Rivers. The most extensive inundation is likely to be in the Nile Delta. A one metre rise would affect some 6 million people. There are also likely to be severe consequences along the West African coast. Banjul, the capital city of Gambia could be completely submerged in the next 50 years or so. In Ghana, the coastal zone occupies less than 7% of the land area but contains 25% of the population and so even relatively small rises could have damaging physical consequences on the economy. These could include:

- Permanent connection of lagoons to sea
- Penetration of salt water inland
- Increased coastal erosion
- Salinization of freshwater lagoons and aquifers
- Increased depth of water table in coastal areas
- Destruction of wetlands and associated industries
- Accelerated loss of the capital, Accra

5.3 Glacier Melting

The glaciers on Mount Kilimanjaro in Tanzania are melting fast and are expected to have disappeared by 2020. However, the major change in hydrology on the mountain and its environs is not due to the glacier melt but to the dramatic shift, as a result of climate change, in the vegetation zones on the mountain.

5.4 Floods and Droughts

Floods could become more common in Africa, in part because some regions will experience higher rainfalls, but even in drier regions there is likely to be a higher frequency of more intense downpours, which may create flooding. 2007 saw heavy flooding in both eastern and western Africa. There are many direct and indirect consequences of floods:

- Immediate deaths and injuries from drowning
- Non-specific increases in mortality
- Infectious diseases e.g. increased malaria
- Exposure to toxic substances
• Damage to infrastructure e.g. roads, dams, power generation
• Damage to crops and livestock
• Community breakdowns
• Increased psychological stress
• Increased demands on health systems and social security

Many of the consequences are similar to those for flood, but the most significant impact in Africa is likely to be on agricultural production.

6 Climate Change and Agriculture in Africa

Agricultural production and food security in many parts of Africa are affected by natural climate variability and are likely to be severely compromised by climate change, in particular by damaging high temperatures and the greater incidence of drought. We can expect a decrease in the area suitable for agriculture and in the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid areas. This is likely to further adversely affect food security and exacerbate malnutrition in Africa.

Many crops in Africa are grown close to their limits of thermal tolerance. We already know that just a few days of high temperature near flowering can seriously affect yields of crops such as wheat, fruit trees, groundnut and soybean. Such extreme weather is likely to become more frequent with global warming, creating high annual variability in crop production. But more prolonged high temperatures and periods of drought will force large regions of marginal agriculture out of production. The maize crop over most of southern Africa already experiences drought stress on an annual basis. This is likely to get worse with climate change and extend further southwards, perhaps making maize production in many parts of Zimbabwe and South Africa very difficult if not impossible. Wheat yields in northern Africa are likely to be threatened. Drought will also severely affect livestock production (Conway 2009).

In the 1980s, protracted drought killed 20-62% of cattle in countries as widespread as Botswana, Niger and Ethiopia. Drought in southern Africa may be particularly severe in El Niño years. Maize yields in Zimbabwe have long been highly correlated with the ENSO cycle as measured by sea surface temperatures off the Peruvian coast. During El Niño years, droughts tend to occur at the most susceptible time for the maize grain to develop (February). This correlation is so strong that it is possible to predict the Zimbabwean crop in March with 70% probability, using sea surface temperatures in the eastern Pacific from the previous September. In southern Africa and across western and north-central Africa lower rainfall may also shorten the growing period, reducing the chances of a second crop in some areas, and even the viability of a single one in others. Just how severe these impacts will be on agriculture will depend on the so-called ‘carbon fertilization’ effect. Carbon dioxide is a basic building block for plant growth and hence we would assume that rising levels will increase crop yields.

Adaptation does not guarantee that farming will be able to continue in an area, or if it does, that farm incomes will remain unchanged. Some adaptation will involve shifting agricultural production from one location to another. This adaptation, too, would benefit from government policies that provide reliable, long run information that identifies suitable and unsuitable crop locations as climate changes. Government policies that facilitate the migration of people from one location to another or the transition from one profession to another would likewise be helpful. Policies that stimulate economic growth and
development and thereby provide more alternatives to agriculture as a source of livelihood would benefit farmers transitioning to new professions.

7 How does Climate Change Impact Agriculture in Ghana

Climate Change has gradually gained a foothold in Ghana’s development process. He could have consequence for development plans, life and livelihoods and it is therefore seen as a developmental issue. It presents one of the greatest risks to the poor and vulnerable, especially women and children in rural areas.

Ghana must prepare for the worst case climate change scenario this year. Torrential rains, excessive heat and severe dry winds are expected. This is in addition, to more floods and droughts. Similar to other countries in Africa, the sustainability of the country’s ecosystems are at risk in areas such as terrestrial and aquatic ecosystems, habitats and wildlife. The Environmental Protection Agency (EPA), the institution that hosts the National Focal Point on climate change issues, also envisages adverse effects on soil, lands, coastal zones and tropical forests. Generally, national vulnerability assessments have established negative impacts around critical human security sectors such as agriculture, fisheries, water resources, land, health and energy (EPA, 2000).

Rainfall (quantity and distribution) has been observed to decrease in most parts of the country and is however expected to increase in the forest zone. Increased rainfall variability has resulted in increased unpredictability and unreliability, longer drier periods and more frequent floods are expected especially in the savanna zones. Climate change will affect Ghanaian agriculture through high temperatures and its accompanying evaporation and reduction in rainfall will have negative impact on productivity. Changes in rainfall are not consistent throughout Ghana (forest – 20 – 30%; transition – Savanna – 10 – 20%) with short dry spells receiving more rains than expected and minor season terminating earlier than expected. The resulting changes in temperature, humidity and drought could create favourable conditions for increases in pest and disease incidence including alien species e.g. variegated grasshopper; a cassava pest (LWMU 2009). Whilst root crops especially cassava, and sweet potatoes may withstand some adverse weather conditions, cereals are very vulnerable and whole season crops could be lost due to adverse weather conditions (drought or floods). Also Climate change impacts could also have adverse effects on a range of other food crops available to rural communities due to loss of biodiversity e.g. volunteer crops such as cocoyam under forest ecosystems. Finally, a more serious consequence is Cocoa production in Ghana is threatened to cease by 2080 if current trends should continue. This potential loss is more reason for Ghana to step up efforts toward adaptation.

On the socio-economic front, climate change impacts may increase migration from production areas resulting in labour scarcity for agriculture whilst increasing incidence of unemployment in urban areas. Whilst its impacts may reduce the productive capacity of lands, this is exacerbated by human activities that result in land degradation in various forms deforestation, erosion desertification, loss of biodiversity – alteration of livelihood capacities of rural communities.

Fishing activities in Ghana are gendered. Men go out to sea while women and children are responsible for the negotiation, purchase, storage, processing and marketing of fish (Dampsey and Mensah, 2005). Support to the fisheries sector by development planners has been particularly limited and gender specific measures and interventions have not been forthcoming. This is problematic given the extent of reliance by several groups of women on fish selling as an income generating activity. The majority of households in Ghana also
rely on fish as a major source of protein. It has, for instance, been estimated that fish constitutes about 60% of animal protein in Ghana (DFID, 2004). Any semblance of support to the activities of women in the sector has come in the form of micro-credit facilities which are often given without a proper gender analysis of the social relationships between women and men in the fishing activities and the household. To this end the sector is generally not regenerating itself and has not succeeded in addressing the gendered experiences of poverty of women and men. This situation can further be worsened by climate change impacts and leads to loss of income for poorer women, increases in the price of fish, and lower levels of protein in diets (Damptey and Mensah, 2005).

8 Adaptation to Climate Change

Ghana’s National Climate Change Committee (NCCC), which was established to prepare, present, report, implement, and evaluate national and international policies on climate change. In addition, the Committee initiates and develops relevant policy recommendations for government and ensures and coordinates climate change related education, training and awareness creation. Some of the challenges the committee faces include ineffectual national programmes on public education that lack the means for training and awareness raising about climate change, limited media coverage on climate change issues, and the lack of efficient systems for disseminating information on the work, results, and achievements in the various fields of climate change.

Adaptation to and coping with climate change is complex and will involve a range of social and economic factors including education and literacy as well as creative financial and technological solutions. It requires a better understanding and application of indigenous knowledge and traditional coping strategies.

8.1 Adaptation Strategies

To ensure sustainable food security there is the need to complement the efforts that national buffer stocks, improved food redistribution, crop insurance schemes, food pricing marketing mechanisms the reduce price fluctuations to facilitate access by households in all income categories. Clear policies on commodity development such as research and development of appropriate irrigation systems, stress tolerant and early maturing varieties and value chain development are needed.

Finally, extension service delivery should focus on climate change impacts and adaptation at the farmer level. This effort requires a sustained awareness creation for farming households to adopt climate change compliant technologies and techniques.

9 Conclusion

Whilst climate change does not appear as a pillar in the sector policies; all the six policy statements in the current food and agriculture development policy (FASDEP II) provide entry points for enhancing adaptation. Climate change is a development issues that requires a multi-sectoral approach backed by reliable information.

Note: In addition to the above text, seven tables and two figures have been given separately at the end to provide additional information on food security scenario in Ghana.

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Climate Change and the Ghanaian Economy, Policy Advice Series, Accra, Ghana.

3 Food and Agriculture Organization, 16, Global Climate Change and Agricultural Production: Direct and Indirect Effect of Changing Hydrological, Pedalogical and Plant Physiological Processes, Rome Italy


6 Ministry of Food and Agriculture, Ghana. 2009 Annual Progress Report.

7 Ministry of Food and Agriculture, 2007, Food and Agriculture Sector Development Policy II, Accra, Ghana.


Fig. 1: Food Supply and Demand of Key Staples (Deficit/Surplus MT)-2008 – 2009

Fig. 2: Percentage Change in Price Levels of Selected Agricultural Commodities, 2007 – 2009
### Table 1: Extent of Food Insecurity in Ghana

<table>
<thead>
<tr>
<th>Regions</th>
<th>Food Insecure</th>
<th>Vulnerable to food insecurity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No of People</td>
<td>Per cent of Population</td>
</tr>
<tr>
<td>Western (Rural)</td>
<td>12,000</td>
<td>1</td>
</tr>
<tr>
<td>Central (Rural)</td>
<td>39,000</td>
<td>3</td>
</tr>
<tr>
<td>Greater Accra (Rural)</td>
<td>7,000</td>
<td>1</td>
</tr>
<tr>
<td>Volta (Rural)</td>
<td>44,000</td>
<td>3</td>
</tr>
<tr>
<td>Eastern (Rural)</td>
<td>58,000</td>
<td>4</td>
</tr>
<tr>
<td>Ashanti (Rural)</td>
<td>162,000</td>
<td>7</td>
</tr>
<tr>
<td>Brong Ahafo (Rural)</td>
<td>47,000</td>
<td>3</td>
</tr>
<tr>
<td>Northern (Rural)</td>
<td>152,000</td>
<td>10</td>
</tr>
<tr>
<td>Upper East (Rural)</td>
<td>126,000</td>
<td>15</td>
</tr>
<tr>
<td>Upper West (Rural)</td>
<td>175,000</td>
<td>34</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,200,000</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Source:** CFSVA, 2009
Table 2: Major Crop Performance in 2007, 2008 and 2009

<table>
<thead>
<tr>
<th>Commodities</th>
<th>Cultivation area (ha)</th>
<th>Production (mt)</th>
<th>Yield (mt/ha)</th>
<th>Per cent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>790,068</td>
<td>846,258</td>
<td>954,430</td>
<td>1,219,601</td>
</tr>
<tr>
<td>Rice (milled)</td>
<td>108,928</td>
<td>132,795</td>
<td>162,360</td>
<td>185,341</td>
</tr>
<tr>
<td>Cassava</td>
<td>800,531</td>
<td>839,922</td>
<td>885,800</td>
<td>10,217,929</td>
</tr>
<tr>
<td>Yam</td>
<td>323,591</td>
<td>347,566</td>
<td>378,740</td>
<td>4,375,989</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>257,547</td>
<td>251,852</td>
<td>224,570</td>
<td>1,609,104</td>
</tr>
<tr>
<td>Millet</td>
<td>162,707</td>
<td>182,231</td>
<td>186,700</td>
<td>113,042</td>
</tr>
<tr>
<td>Sorghum</td>
<td>208,470</td>
<td>275,857</td>
<td>267,210</td>
<td>154,834</td>
</tr>
<tr>
<td>Soybean</td>
<td>51,547</td>
<td>61,824</td>
<td>77,250</td>
<td>52,812</td>
</tr>
<tr>
<td>Groundnut</td>
<td>341,638</td>
<td>350,656</td>
<td>342,550</td>
<td>301,775</td>
</tr>
<tr>
<td>Cowpea</td>
<td>138,803</td>
<td>161,270</td>
<td>162,670</td>
<td>118,929</td>
</tr>
</tbody>
</table>

Source: SRID/MoFA
### Table 3: Variation of Yield per main Crop During the 2001-2009 Periods Compared to 2000 Reference base

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1.46</td>
<td>1.55</td>
<td>1.7</td>
<td>-2.30</td>
<td>16.44</td>
<td>9.68</td>
</tr>
<tr>
<td>Rice (milled)</td>
<td>2.16</td>
<td>2.05</td>
<td>2.41</td>
<td>2.72</td>
<td>-11.40</td>
<td>11.57</td>
</tr>
<tr>
<td>Millet</td>
<td>0.81</td>
<td>0.90</td>
<td>1.31</td>
<td>1.06</td>
<td>23.58</td>
<td>61.73</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.97</td>
<td>1.00</td>
<td>1.31</td>
<td>1.20</td>
<td>9.17</td>
<td>35.05</td>
</tr>
<tr>
<td>Cassava</td>
<td>12.28</td>
<td>12.79</td>
<td>13.84</td>
<td>13.51</td>
<td>2.44</td>
<td>12.70</td>
</tr>
<tr>
<td>Yam</td>
<td>6.57</td>
<td>6.52</td>
<td>15.2</td>
<td>6.70</td>
<td>126.87</td>
<td>131.35</td>
</tr>
<tr>
<td>Cocoyam</td>
<td>12.88</td>
<td>13.05</td>
<td>6.7</td>
<td>14.08</td>
<td>-52.41</td>
<td>-47.98</td>
</tr>
<tr>
<td>Plantain</td>
<td>7.91</td>
<td>9.35</td>
<td>10.59</td>
<td>10.70</td>
<td>-1.03</td>
<td>33.88</td>
</tr>
<tr>
<td>Groundnut</td>
<td>0.96</td>
<td>1.08</td>
<td>1.54</td>
<td>1.34</td>
<td>14.93</td>
<td>60.42</td>
</tr>
<tr>
<td>Cowpea</td>
<td>0.70</td>
<td>0.88</td>
<td>1.26</td>
<td>1.11</td>
<td>13.51</td>
<td>80.00</td>
</tr>
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</table>

### Table 4: Yield Gap for Selected Agriculture Commodities (mt)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Observed Yields</th>
<th>Achievable Yields</th>
<th>Yield Gap</th>
<th>Yield Gap (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1.46</td>
<td>2.50</td>
<td>1.0</td>
<td>41.60</td>
</tr>
<tr>
<td>Rice-rainfed</td>
<td>2.16</td>
<td>3.50</td>
<td>1.4</td>
<td>38.29</td>
</tr>
<tr>
<td>Rice-irrigated</td>
<td>2.8</td>
<td>5.00</td>
<td>2.2</td>
<td>44.00</td>
</tr>
<tr>
<td>Millet</td>
<td>0.81</td>
<td>1.50</td>
<td>0.7</td>
<td>46.00</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.97</td>
<td>1.50</td>
<td>0.5</td>
<td>35.33</td>
</tr>
<tr>
<td>Cassava</td>
<td>12.28</td>
<td>28.0</td>
<td>16.1</td>
<td>56.14</td>
</tr>
<tr>
<td>Groundnut</td>
<td>0.96</td>
<td>1.00</td>
<td>0.2</td>
<td>4.00</td>
</tr>
<tr>
<td>Pineapple</td>
<td>60.0</td>
<td>100.0</td>
<td>40.0</td>
<td>40.00</td>
</tr>
<tr>
<td>Yam</td>
<td>6.57</td>
<td>20.00</td>
<td>7.6</td>
<td>67.15</td>
</tr>
<tr>
<td>Cocoa</td>
<td>0.40</td>
<td>1.00</td>
<td>0.6</td>
<td>60.00</td>
</tr>
<tr>
<td>Oil Palm</td>
<td>12.0</td>
<td>15.00</td>
<td>3.0</td>
<td>20.00</td>
</tr>
</tbody>
</table>

**Source**: SRID/MoFA
### Table 5: Below is a summary table showing details of parcels of lands identified in the various regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of Hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volta</td>
<td>9,435</td>
</tr>
<tr>
<td>Ashanti</td>
<td>801</td>
</tr>
<tr>
<td>Brong Ahafo</td>
<td>54,231.8</td>
</tr>
<tr>
<td>Greater Accra</td>
<td>6,631</td>
</tr>
<tr>
<td>Eastern</td>
<td>28,624</td>
</tr>
<tr>
<td>Northern</td>
<td>204,999</td>
</tr>
<tr>
<td>Upper West</td>
<td>1,986</td>
</tr>
<tr>
<td>Upper East</td>
<td></td>
</tr>
<tr>
<td>Western</td>
<td>9,045</td>
</tr>
<tr>
<td>Central</td>
<td>4,373</td>
</tr>
<tr>
<td>Total</td>
<td>320,126</td>
</tr>
</tbody>
</table>

**Source**: Land Administration Project

### Table 6: Land Use specific to agriculture

<table>
<thead>
<tr>
<th>Type of Land use</th>
<th>Hectares</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total land Area</td>
<td>23,853,900</td>
<td>100</td>
</tr>
<tr>
<td>Agriculture Land Area</td>
<td>13,628,179</td>
<td>57.1</td>
</tr>
<tr>
<td>Area under cultivation (2008)</td>
<td>7,693,500</td>
<td>32.3</td>
</tr>
<tr>
<td>Total area under irrigation (2008)</td>
<td>33,778</td>
<td>0.14</td>
</tr>
<tr>
<td>Area under inland waters</td>
<td>1,100,000</td>
<td>4.6</td>
</tr>
<tr>
<td>Others (forest reserves, savannah woodland, etc)</td>
<td>9,125,721</td>
<td>38.3</td>
</tr>
</tbody>
</table>

**Source**: SRID

### Table 7: Available Land by Regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Area (000 sq.km.)</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>70.38</td>
<td>29.5</td>
</tr>
<tr>
<td>Brong Ahafo</td>
<td>39.56</td>
<td>16.6</td>
</tr>
<tr>
<td>Ashanti</td>
<td>24.39</td>
<td>10.2</td>
</tr>
<tr>
<td>Western</td>
<td>23.92</td>
<td>10</td>
</tr>
<tr>
<td>Volta</td>
<td>20.57</td>
<td>8.6</td>
</tr>
<tr>
<td>Eastern</td>
<td>19.32</td>
<td>8.1</td>
</tr>
<tr>
<td>Upper West</td>
<td>18.48</td>
<td>7.7</td>
</tr>
<tr>
<td>Central</td>
<td>9.83</td>
<td>4.1</td>
</tr>
<tr>
<td>Upper East</td>
<td>8.84</td>
<td>3.7</td>
</tr>
<tr>
<td>Greater Accra</td>
<td>3.24</td>
<td>1.4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>238.53</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source**: SRID
FOOD SECURITY - GLOBAL TRENDS AND PERSPECTIVE: INDIAN EXPERIENCE

Ms. Reena Saha and Mr. Khurshid Ahmad Sanai

1 Introduction

Agriculture including crop and animal husbandry, fisheries, forestry and agro processing provides the underpinnings of the food and livelihood security in India. Agriculture provides significant support for economic growth and social transformation of the country. As one of the world’s largest agrarian economies, the agriculture sector (including allied activities) in India accounted for 15.7 per cent of the GDP (at constant 2004-05 prices), in 2008-09, compared to 18.9 per cent in 2004-05. It contributed approximately 10.2 per cent of total exports during 2008-09. Notwithstanding the fact that the share of this sector in the GDP has been declining over the years, its role remains critical as it provides employment to around 52 per cent of the total workforce in the country.

In the recent past, the impact of various food, financial and economic crises has been felt across the world. This has affected the lives, livelihood and food security of the people. Therefore, there is a compelling case for increased investment in the sector. The continued high growth of agriculture is essential to meet the food and nutritional security requirements of the people and provide livelihood and income in rural areas. Agriculture will continue to have the pride of place in national policies and plans, since the nation’s food security depends on the performance of the agricultural sector. The key indicators in the agriculture sector are given Table 1.

The overall target of GDP growth in the country for the Eleventh Five Year Plan (2007-12) is 9 per cent per annum with an annual average growth rate of 4 per cent in agriculture, 10–11 per cent in industry and 9–11 per cent in the services sector. The strategy for accelerating agricultural growth to 4 per cent per annum in the Eleventh Plan requires action in terms of bringing technology to the farmers, improving the efficiency of investments, increasing systems support and rationalising subsidies, diversifying, while also protecting food security concerns, and fostering inclusiveness through a group approach, by which the poor will get better access to land, credit and skills.

The annual growth rate of total GDP vis-à-vis growth rate in agriculture and allied sectors from 2005-06 to 2009-10 is given in Table 2.

The public investment in agriculture in real terms has witnessed steady decline from the Sixth Five Year Plan to the Tenth Five Year Plan. Trends in public investment in agriculture and allied sectors reveal that it has consistently declined in real terms (at 1999-2000 prices) from Rs 64,012 crore in the Sixth Plan (1980-85) to Rs 42,226 crore in the Ninth Plan (1997-2002). However, this trend was reversed in the Tenth Plan (2002-07) and public investment in agriculture sector registered an increase of Rs 25,034 crore and stood at Rs 67,260 crore, which is a positive and welcome trend. The GCF in agriculture and allied sectors as a proportion of total GDP stood at 2.66 per cent in 2004-05 and improved to 3.34 per cent in 2008-09. Similarly, the GCF in agriculture & allied sectors relative to GDP in this sector has also shown an improvement from 14.07 per cent in 2004-05 to 21.31 per cent in 2008-09.
1.1 Agro Climatic Zones

India is a country that extends from south to north for about 3200 kms between the latitudes of 37° 6' North and 8° 4' North and for 3,000 kms between the longitudes 68° 7' East and 92° 25' East. The Himalayas run along the entire length in the North and below that are the alluvial plains of the river systems of the Indus the Ganges and the Brahmaputra. The other macro physiographic regions are the Peninsular Plateau located between the Eastern & Western Ghats, the Eastern and Western Coastal Plains, the Central Highlands and North-Western Desert. Thus India is a land of many climates and varieties of soils affording scope for great diversity in agriculture.

Cropping activities go on all round the year provided water is available for crops. In Northern India, there are 2 distinct seasons: rainy, Kharif (July to October) and winter, Rabi (October to March). The major Kharif crops are rice, sorghum, pearl millet, maize, groundnut and cotton. While, major Rabi crops are wheat, barley, oats, sorghum, and chickpea. The most important element of farming in the country continues to be production of grains, and the dominant food chain is grain-man. On this basis the country may be divided into broadly 5 agricultural regions:

- **Rice Region**: Eastern, North Eastern, South Eastern India with a strip along west coast
- **Wheat Region**: Most of Northern, Western & Central India
- **Coarse Cereal (Millet-Sorghum) Region**: Mainly Centre of Indian Peninsula
- **Temperate Himalayan Region**: Northern provinces; potato is as important as cereal crops and fruits form large part of agricultural production
- **Plantation Crops Region**: Eastern hill areas and Southern hills for tea, coffee in the hills of Western peninsular, and spices and rubber mainly in the southern provinces.

1.2 Rainfall

Rainfall greatly influences crop production and productivity in a substantial way. More than 75 per cent of annual rainfall is received during the southwest monsoon season (June-September), except for the extreme South Peninsula that receives rainfall in the winter from the north east monsoon. LPA (Long Period Average) rainfall for all India during south west monsoon season from June to September is 892.5 mm.

1.3 Area Coverage

The total geographical area of the country is 328.7 million hectares, of which 140.3 million hectares is the net sown area, while 193.7 million hectares is the gross cropped area. The gross and net irrigated area is 85.8 million hectares and 60.9 million hectares respectively, with a cropping intensity of 138 per cent (2006-07). The average landholding size in India is 1.33 hectare (ha) in 2000-01, having declined from 1.41 ha in 1995-96. 80% of operational holdings are marginal (less than 1 ha) and small (between 1-2 ha). The area under food grains has increased from 97.32 million hectares in 1950-51 to 123.22 million hectares in 2008-09. The area under pulses, oilseeds and sugarcane in 2008-09 was 14.66 million hectares, 27.46 million hectares and 5.06 million hectares, respectively. Growth in production of agricultural crops depends upon acreage and yield. Limitations of expansion in agricultural land suggest multiple cropping to be a means to increase the gross cropped area and improvement in yields to be the main source of long-term output growth.

2 Food Production

In India, Green Revolution during mid 1960s helped in achieving higher production from a mere 74.23
million tonnes in 1966-67 to 217.28 million tons in 2006-07. The decadal percentage increase in food grain production from 1966-67 to 76-77 was nearly 50%, which was very impressive. However, after this, the food grain production increased at a decreasing rate and the trend showed a steep decline during the period 1996-97 to 2006-07 which was 8.94%. Production of food grains during 2009-10 is estimated at 217.81 Million Tonnes (MT) compared to 234.47 MT achieved during 2008-09. The target for food production in 2010-11 has been kept at 244.50 MT. The area, production and yield of the major food items in 2008-09 are given in Table 3.

2.1 Food Availability

The total population of India as per the 2001 Census was 1028.7 million and the average annual exponential growth rate is 1.95%. The per capita net availability of food per day has increased from 394.9 grams (gms) in 1951 to 442.8 gms in 2007 (Table 4).

Food consumption pattern has been changing with wider availability of food choices, sustained economic growth and increasing urban population. These changes influence the food choices and their demand. There has been an increased diversification of the food basket with increased demand for high value commodities like vegetables, fruits, milk, animal protein and sugar. Future increases in production to keep up with increasing demand will have to be met from increases in productivity.

2.2 Agricultural Inputs

Improvement in yield, which is key to long term growth, depends on a host of factors including technology, use of quality seeds, fertilizers, pesticides, micronutrients and irrigation. Each of these plays important role in determining yield level and in turn augmentation in the level of production. While agriculture is primarily a private enterprise and largely subsistence based, the Government in India has been actively involved in supporting the sector through various schemes and programmes, both at the Central and State levels.

2.2.1 Seeds

Seeds, which are considered the carriers of new technology for crop production and higher crop yields, are a critical input for sustained growth of agriculture. In the country, more than four-fifths of the farmers rely on farm-saved seeds leading to a low seed replacement rate. The Indian Seed Programme includes the participation of Central and State Governments, the Indian Council of Agricultural Research (ICAR), State Agricultural Universities, the cooperative and private sectors. There are 15 State Seed Corporations besides two national-level corporations, namely National Seeds Corporation and State Farms Corporation of India. Seeds are a basic and critical input for agricultural production. The Indian Seeds Programme recognises three generations of seeds, namely, breeder, foundation, and certified seeds. The details of production of breeder and foundation seeds, as well as distribution of certified seeds from 2005–06 to 2008–2009 and anticipated for 2009–2010 are shown in Table 5.

The Ministry of Agriculture, Government of India is implementing the Central-Sector Development and Strengthening of Infrastructure Facilities for Production and Distribution of Quality Seeds scheme. The aim of the scheme is to make quality seeds of various crops available to farmers timely and at affordable price. The scheme is being implemented on all - India basis from the year 2005-06. The major thrusts under the scheme are on improving quality of farm saved seeds through Seed Village Programmes to enhance seed replacement rate, boosting seed production in the private sector and helping public sector seed companies to contribute to enhancing seed production. More than 25,000 seed villages were organized across the country and certified/quality
seed production increased from 194.31 lakh quintals during 2006-07 to 250.35 lakh quintals during 2008-09. Considering the vital importance of the seeds sector in promoting agricultural growth, it is proposed to replace the existing Seeds Act 1966 by a new Act that is expected to (i) create a facilitative climate for growth of the seed industry, (ii) enhance seed replacement rates for various crops, (iii) boost the export of seeds and encourage import of useful germ plasm and (iv) create a conducive atmosphere for application of frontier sciences in varietal development and for enhanced investment in research and development (R&D). The Seeds Bill is under consideration by the Parliament of India.

2.2.2 Fertilizers

Chemical fertilizers have played a significant role in the development of the agricultural sector. The per hectare consumption of fertilizers in nutrients terms increased from 105.5 kg in 2005-06 to 128.6 kg in 2008-09. However, improving the marginal productivity of soil still remains a challenge. This requires increased NPK application and application of proper nutrients, based on soil analysis. A great deal of variability is also observed in fertilizer consumption among the States. While consumption of fertilizers per hectare is 239.7 kg in Andhra Pradesh, 221.4 kg in Punjab, 216.5 kg in Tamil Nadu and 201.6 kg in Haryana, consumption is comparatively low in Rajasthan (48.8 kg/hectare), Jharkhand (55.7 kg/hectare), Himachal Pradesh (60.6 kg/hectare), Orissa (61.6 kg/hectare), and in certain other states. Consumption is less than 5 kg/hectare in some of the North Eastern states. The total consumption of chemical fertilizers (in terms of nutrients) during 2008–09 was 249.09 lakh metric tonnes, 10.36% more than the previous year, 2007–08.

The Government has taken a number of measures to improve fertilizer application in the country. A new scheme, the National Project on Management of Soil Health & Fertility (NPMSF) has been introduced in 2008-09 with a view to setting up of 500 new Soil Testing Laboratories (STLs) and 250 Mobile Soil Testing Laboratories (MSTLs) and strengthening of the existing State STLs for micronutrient analysis. In order to ensure adequate availability of fertilizers of standard quality to farmers and to regulate trade, quality and distribution in the country, fertilizers have been declared an essential commodity as per the Fertilizer Control Order (FCO) 1985 promulgated under Section 3 of the Essential Commodity Act 1955.

Intensive cropping without replenishment of nutrients, other than NPK, results in a deficiency of micronutrients. The deficiency of secondary nutrients, namely, sulphur, magnesium, and calcium, and of micro-nutrients such as zinc, boron, iron, and manganese, has been reported in many parts of the country. In order to encourage the manufacture and use of fortified fertilizers, the procedure for the inclusion of new products in the FCO has been simplified. To encourage the balanced use of fertilizers, the concept of customised fertilizers has been introduced in the FCO, 1985. These fertilizers are soil and crop-specific and contain secondary and micro-nutrients, besides NPK. A total of 14 grades of customised fertilizers have been notified. In order to promote the use of organic and bio-fertilizers, the specifications of organic fertilizers, namely, city waste compost and vermi-compost and bio-fertilizers, namely, Rhizobium, Azotobacter, Azospirillum and Phosphate Solubilising Bacteria have been revised under the FCO. Organic farming has recorded an impressive growth during the previous five years due to the farmers’ movement, efforts by NGOs, Central and State government interventions, and market forces. The area under the organic certification process increased to 12.07 lakh hectares.

To ensure adequate availability of fertilizers to farmers, the Department of Agriculture and Cooperation (DAC) makes a demand assessment
well in advance through half-yearly Zonal Conferences on Agricultural Inputs in consultation with the State Governments, the Department of Fertilizers (DoF) and the fertilizer industry. Thereafter, under the Essential Commodities Act (ECA) supply plan, and under the Fertilizers Movement Control Order, movement orders, for both indigenous and imported urea, are issued by the Department of Fertilizers (DoF) to ensure timely availability to the farmers. DoF also facilitates the availability of decontrolled Phosphatic (P) and Potassic (K) fertilizers to the States/Union Territories. Urea is the only fertilizer under statutory price control. The Maximum Retail Price (MRP) is fixed by the Government for phosphatic and potassic fertilizers under the concession scheme to ensure their availability to farmers at a reasonable price. With effect from 18 June 2008, the Government of India has rationalised MRPs of complex fertilizers based on nutrient content of N, P, and K in the MRP of straight fertilizers such as urea, Di-Ammonium Phosphate (DAP) and Muriate of Potash (MOP) respectively.

2.2.3 Irrigation

Irrigation is one of the most critical inputs for enhancing the productivity and is required at different stages of crop/plant growth for optimum production. The Government of India has taken up irrigation potential creation through public funding and is assisting farmers to create potential on their own farms. Substantial irrigation potential has been created through major and medium irrigation schemes. The total irrigation potential in the country has increased from 81.1 million ha in 1991-92 to 102.77 million ha by March 2007. The Central Government has initiated the Accelerated Irrigation Benefit Programme (AIBP) from 1996-97 for extending assistance for the completion of incomplete irrigation schemes. Under this programme, projects approved by the Planning Commission are eligible for assistance. Further, the assistance, which was entirely a loan from the Centre in the beginning, was modified by inclusion of a grant component with effect from 2004-05. Under the AIBP, Rs 34,783.7823 crore of Central Loan Assistance (CLA)/grant has been released up to March 31, 2009. An additional irrigation potential of 54.858 lakh ha has been created under the AIBP up to March 2009.

2.2.4 Agricultural Credit

The Government has taken many policy initiatives to strengthen the farm credit delivery system for providing credit at affordable rates of interest to support the resource requirements of the agriculture sector. The emphasis of these policies has been on providing timely and adequate credit support to farmers, with particular focus on small and marginal farmers and weaker sections of society, to enable them to adopt modern technology and improved agricultural practices for increasing agricultural production and productivity. The policy essentially lays emphasis on augmenting credit flow at ground level through credit planning, adoption of region specific strategies and rationalization of lending policies and procedures, and bringing down the rate of interest on farm loans.

a) Institutional Arrangements: Agricultural credit is disbursed through a multi-agency network comprising of Commercial Banks (CBs), Regional Rural Banks (RRBs) and Cooperatives. With their vast network that covers almost all villages in the country, wide coverage and outreach extending to the remotest parts of the country, the Cooperative Credit Institutions, both in short and long-term structure, are the main institutional agency for the dispensation of agricultural credit. There are 1,06,384 Primary Agricultural Credit Societies (PACS), 370 District Central Cooperative Banks (DCCBs) with 12,991 branches and 30 State Cooperative Banks (SCBs) with 962 branches providing primarily short and medium-term agricultural credit in the country. The long-term cooperative structure consists of 19 State Cooperative Agriculture and Rural Development
Banks (SCARDBs) with 2,430 operational units, comprising of 626 branches and 506 Primary Agricultural and Rural Development Banks, with 1,283 branches.

b) Revival Package for Short-Term Cooperative Credit Structure: The Government of India had approved a Revival Package for Short-Term Cooperative Credit Structure (STCCS) aimed at making it a well managed and vibrant structure to best serve the credit needs of rural India. The revival package envisages an outlay of Rs. 13,597 crore for recapitalization of STCCS, capacity building, training, and computerization, subject to legal reforms by the state governments. The revival package seeks to i) provide financial assistance to bring the system to an acceptable level of health; ii) introduce legal and institutional reforms necessary for their democratic, self-reliant and efficient functioning; and iii) take measures to improve the quality of management as an integrated package. So far, 25 States, have signed a Memorandum of Understanding (MoU) with the Government of India and National Bank for Agriculture and Rural Development (NABARD). These states cumulatively cover 96 per cent of the STCCS units in the country. An amount of Rs. 7,051.75 crore has been released by NABARD as the Government of India's share for recapitalization of 37,303 PACS in 10 states as on 31 December, 2009.

c) Kisan Credit Card: Starting August 1998, Banks are issuing Kisan Credit Cards (KCCs) to farmers for providing adequate and timely support from the banking system for their cultivation needs, including the purchase of all inputs in a flexible and cost effective manner. About 878 lakh KCCs have been issued up to November 2009. Ownership of a KCC enables a farmer to avail of loans for the short, medium, and long term, and a reasonable component of consumption credit within the overall limit sanctioned to the borrowers. Banks have been advised to provide active KCCs to all eligible and willing farmers in a time-bound manner.

d) Rate of Interest on Agricultural Loans: From Kharif 2006–07, farmers are receiving crop loans up to a principal amount of Rs 3 lakh at a seven per cent rate of interest. Additional subvention of one per cent is being paid from 2009-10, as an incentive to those farmers who repay short term crop loans on schedule, resulting in bringing down the rate of interest to six per cent per annum.

e) Flow of Credit: The target of agriculture credit flow for the year 2008–09 was fixed at Rs 2,80,000 crore and the achievement as on 31 March 2009 was Rs 3,01,908 crore, forming 107.82 per cent of the target. The target of agriculture credit flow for the year 2009–10 was fixed at Rs 3,25,000 crore and the achievement as on 30 November 2009 is Rs 1,96,228 crore, forming 60.37 per cent of the target.

2.2.5 Crop Insurance

The frequency and severity of droughts, floods, cyclones and erratic climatic changes accentuate uncertainty and risk in agricultural production and livestock breeding in India. The National Agricultural Insurance Scheme (NAIS), with increased coverage of farmers, crops, and risk commitment, was introduced in the country from Rabi 1999–2000, to protect farmers against crop losses suffered on account of natural calamities, such as drought, flood, hail-storms, cyclone, pests, and diseases. The scheme is being implemented by the Agriculture Insurance Company of India, Ltd. (AIC). The scheme is available to all farmers—loanee and non-loanee—irrespective of their size of holding. It envisages coverage of all food crops (cereals, millets, and pulses), oilseeds, and annual commercial/horticultural crops, in respect of which past yield data is available for an adequate number of years. The scheme is operating on the ‘Area Approach’ basis, i.e., with defined areas for each notified crop. The premium rates range between 3.5 per cent (of the sum insured) to 1.5 per cent. At present, a 10 per cent subsidy on premiums is
available to small and marginal farmers, which is to be shared equally by the Centre and state governments. The scheme is optional for states/UTs. At present, the scheme is being implemented by 25 states and two UTs. The outlay for the Eleventh Plan is fixed at Rs. 3,500 crore. Despite low premium and a high claims ratio, farmers are not coming forward to avail of crop insurance in a big way. Modification of the existing NAIS is under consideration by the Government with improved features, and will provide an effective risk mitigation mechanism to the farming community in the form of effective crop insurance solutions.

2.2.6 Extension

The Government supports transfer of agricultural technologies and information to the farming community through various initiatives. The Support to State Extension Programmes for the Extension Reforms scheme launched in 2005-06, aims to make the extension system farmer driven and farmer accountable by way of new institutional arrangements for technology dissemination in the form of an Agricultural Technology Management Agency (ATMA) at district level. The ATMA has active participation of farmers/farmer groups, non-governmental organizations (NGOs), Krishi Vigyan Kendras (KVKs), PRIs and other stakeholders operating at district level and below. Up to January 2010, 595 districts-level ATMAs have been established. Gender concerns are being mainstreamed by mandating that 30 per cent of resources on programmes and activities are allocated for women farmers and extension functionaries. Further, the Mass Media Support to Agriculture scheme is focusing on the use of National Television Network (“Doordarshan”) infrastructure for providing agriculture-related information and knowledge to the farming community. The other component of the mass media initiative is use of 96 FM transmitters of All India Radio (AIR) to broadcast area-specific agricultural programmes.

The Kisan Call Centres scheme provides the farming community agricultural information through toll-free telephone lines. A country-wide common number has been allocated for the Kisan Call Centres. The Agri-clinic and Agri-business Centres Scheme launched in 2002 provides extension services to farmers through agriculture graduates on payment basis by setting up of economically viable self-employment ventures. NABARD monitors the credit support to Agri-clinics through commercial banks. Provision of a credit linked back-ended subsidy at 25 per cent of the capital cost of the project funded through bank loan as well as full interest subsidy on the bank credit for the first two years has recently been approved under the scheme.

2.2.7 Agricultural Marketing

Organized marketing of agricultural commodities has been promoted in the country through a network of regulated markets. Most of the State and Union Territory Governments have enacted legislations (Agriculture Produce Marketing Committee Act—APMC Act) to provide for regulation of agricultural produce markets. There are 7,139 regulated markets in the country as on March 31, 2009. The country has 20,868 rural periodical markets, about 15 percent of which function under the ambit of regulation. The advent of regulated markets has helped mitigate the market handicaps of producers/sellers at the wholesale assembling level. But rural periodic markets in general and tribal markets in particular have remained outside the developmental ambit of the APMC Act.

The Ministry of Agriculture has formulated a Model Law on agricultural marketing for guidance of and adoption by State Governments. The legislation provides for establishment of private markets/yards, direct purchase centres, consumers’/farmers’ markets for direct sale and promotion of public-private partnership in the management and development of agricultural markets in the country.
Provision has also been made in the law for constitution of State Agricultural Produce Marketing Standards Bureaus for promotion of grading, standardization and quality certification of agricultural produce. This would facilitate pledge financing, direct purchasing, forward/futures trading and exports. Sixteen States/UTs have amended their APMC Acts and the remaining States are in the process of doing so APMC Model Rules based on the Model Law are under formulation in consultation with States.

3 Price Policy for Agricultural Produce

The Government’s price policy for agricultural commodities seeks to ensure remunerative prices to the growers for their produce with a view to encouraging higher investment and production, and to safeguard the interests of consumers by making supplies available at reasonable prices. The price policy also seeks to evolve a balanced and integrated price structure in the perspective of the overall needs of the economy. Towards this end, the Government announces Minimum Support Prices (MSPs) each season for major agricultural commodities and organizes purchase operations through public and cooperative agencies. The designated Central nodal agencies intervene in the market to undertake procurement operations with the objective of ensuring that market prices do not fall below the MSPs fixed by the Government. The Government decides the support prices for various agricultural commodities after taking into account the recommendations of the Commission for Agricultural Costs and Prices (CACP), the views of State Governments and Central Ministries as well as such other relevant factors as considered important for fixation of support prices.

3.1 Price Support Scheme (PSS)

The Department of Agriculture & Cooperation is implementing the Price Support Scheme (PSS) for procurement of oilseeds and pulses through the National Agricultural Cooperative Marketing Federation of India Limited (NAFED), which is the Central nodal agency, at the MSP declared by the Government. NAFED is also the Central agency for procurement of cotton under the PSS in addition to the Cotton Corporation of India (CCI). NAFED undertakes procurement of oilseeds, pulses and cotton under the PSS as and when prices fall below the MSP. Procurement under the PSS is continued till prices stabilize at or above the MSP. During 2009-10 (up to January 4, 2010) NAFED has procured 64,802 metric tonnes of various oilseeds costing Rs 278.07 crore under the PSS.

3.2 Market Intervention Scheme (MIS)

The Department of Agriculture & Cooperation implements the MIS on the request of State/Union Territory (UT) Governments for procurement of agricultural and horticultural commodities that are generally perishable in nature and not covered under the PSS. The MIS is implemented in order to protect the growers of these commodities from having to make distress sales. In the event of a bumper crop and glut in the market, prices tend to fall below economic levels/cost of production. Procurement under the MIS is made by NAFED as the Central agency and by State-designated agencies.

4 Food Management

The main objectives of food management are procurement of food grains from farmers at remunerative prices, distribution of food grains to consumers, particularly the vulnerable sections of society, at affordable prices and maintenance of food buffers for food security and price stability. The instruments used are the MSP and central issue price (CIP). The nodal agency which undertakes procurement, distribution and storage of food grains is the Food Corporation of India (FCI). Procurement at MSP is open-ended, while distribution is governed by the scale of allocation and its off-take by the beneficiaries. The off-take of food grains is primarily under the targeted public
distribution system (TPDS) and for other welfare schemes of the Government of India. Off-take of food grains under the TPDS has been increasing in the last five years and has gone up from 29.7 million tonnes in 2004-05 to 34.8 million tonnes in 2008-09.

4.1 Procurement of Food Grains

Overall procurement of rice and wheat which was 35.8 million tonnes in 2006-07, increased marginally to 37.6 million tonnes in 2007-08. However, increased MSP along with various other steps taken by the Government has resulted in record wheat procurement of 22.69 million tonnes in 2008-09 and 25.38 million tonnes in 2009-10 (April to December). As regards rice, the procurement in 2008-09 was 32.8 million tonnes and 22.9 million tonnes in 2009-10 (April – December). The record procurement of rice and wheat during 2007-08, 2008-09 and 2009-10 (April December) has resulted in comfortable food stock availability to meet the TPDS needs and buffer stocks norms.

4.2 Decentralized Procurement Scheme (DCP)

A number of states have opted for implementation of the (DCP) introduced in 1997, under which food grains are procured and distributed by the State Governments themselves. Under this scheme, the designated States procure store and issue food grains under the TPDS and welfare schemes of the Government of India. The difference between the economic cost fixed for the State and the CIP is passed on to the State Government as subsidy. The decentralized system of procurement has the objectives of covering more farmers under MSP operations, improving efficiency of the PDS, providing food grains varieties more suited to local tastes and reducing transportation costs.

4.3 Buffer Stock

The stock position of food grains as on January 2010 is 47.4 million tonnes comprising 24.3 million tonnes of rice and 23.1 million tonnes of wheat against buffer norms of 11.8 million tonnes and 8.2 million tonnes respectively. This is adequate to meet the requirements under the TPDS and welfare schemes during the current financial year.

Food subsidy Provision of minimum nutritional support to the poor through subsidized food grains and ensuring price stability in different States are the twin objectives of the food security system. In fulfilling its obligation towards distributive justice, the Government incurs food subsidy. While the economic cost of wheat and rice has gone up continuously, the issue price has been kept unchanged since July 1, 2002. The Government, therefore, continues to provide large amount of subsidy on food grains for distribution under the TPDS, other nutrition-based welfare schemes and open market operations.

4.4 Allocation under the Targeted Public Distribution System (TPDS)

Allocations of food grains for Below Poverty Line (BPL) and Antaodaya Anna Yojana (AAY) categories are made at the rate of 35 kg per family per month for all accepted 6.52 crore families in the country. The total BPL and AAY allocations made during 2009-10 were 276.77 lakh tonnes comprising 181.05 lakh tonnes of rice and 95.72 lakh tonnes of wheat. Allocations under the APL category are made depending upon the availability of stocks of food grains in the Central Pool and past off take. Presently, these allocations range between 10 kg and 35 kg per family per month in different States/UTs. During 2009-10, 197.17 lakh tonnes of food grains has been allocated to States/UTs under the APL category as against 112 lakh tonnes during 2008-09.

4.5 Open Market Sale Scheme

In order to check inflationary trends in the food economy, the Government took a decision in August 2008 to release wheat into the open market
under the Open Market Sales Scheme (Domestic). These releases have been made through a) allocation to State/UT Governments for distribution to retail consumers; and b) sale to bulk consumers by the FCI through open tenders. The release of wheat under the OMSS has helped stabilize wholesale prices of wheat.

4.6 Sugar

Sugar production in India is cyclical in nature. High production of sugar in the 2006-07 and 2007-08 sugar seasons (October-September) was followed by low production in the 2008-09 sugar seasons. The production in the current sugar season 2009-10 is also expected to be low as compared to sugar seasons 2006-07 and 2007-08. The estimated production of sugar seasons 2006-07 and 2007-08 was 282 lakh tonnes and 263 lakh tonnes respectively, whereas the production of sugar in the 2008-09 sugar season is estimated at 146.8 lakh tonnes. Thus, the production of sugar in the 2008-09 sugar season declined by about 116.2 lakh tonnes, which put pressure on prices. The production of sugar in the 2009-10 sugar season is estimated to be about 160 lakh tonnes. The Government has accordingly taken a number of measures to augment domestic stocks of sugar and also to moderate prices. This, inter alia, includes allowing sugar mills to import duty-free raw sugar on ton to ton basis under the advance authorization scheme with effect from February 17, 2009, which effectively implies meeting their export obligation two-three years later; allowing import of raw sugar at zero duty under open general licence (OGL) by sugar mills up to December 31, 2010; allowing import of white/refined sugar by STC/MMTC/PEC and NAFED up to 1 million tonnes under OGL at zero duty up to March 31, 2010. Furthermore, the duty-free import of white/refined sugar under OGL has been opened to other Central/State government agencies and to private trade in addition to existing designated agencies and levy obligation in respect of all imported raw sugar and white/refined sugar has been removed. Apart from measures taken to augment supplies, stockholding and turnover limits have been imposed in March 2009 in order to moderate prices of sugar.

4.7 Edible Oils

Estimated production of oilseeds and net availability of edible oils from all domestic sources in 2008-09 was 281.57 lakh tonnes and 85.98 lakh tonnes, respectively, against the total estimated requirement of 132.80 lakh tonnes. India imported 67.2 lakh tonnes of edible oils in 2008-09 and the same was estimated to be 101 lakh tonnes in 2009-10. In order to increase the availability and control prices of edible oils, Government has reduced the custom duties on crude and refined edible oils to “nil” and 7.5 per cent respectively since April 1, 2008. It has been decided that this duty structure would continue till September 30, 2010. Export of all major edible oils from the country has been banned since March 17, 2008 up to 30.9.2010 (except coconut oil through Cochin Port and certain oils with minor forest origins). The tariff values on edible oils have been frozen in 2006. The Government had launched a scheme for “distribution of subsidized edible oils” in 2008-09 to provide relief to consumers from rising prices of edible oils. Under this scheme, imported edible oils were distributed through State Governments/UTs at the rate of 1 kg per ration card per month. The scheme continues in the current year (2009-10) with a subsidy of Rs 15 per kg on imported oil up to 10 lakh tonnes and has been extended till October 31, 2010.

5 Allied Sectors

5.1 Horticulture

Horticulture in India is a major producer of fruits and vegetables in the world. For the holistic development of the horticulture sector, a Centrally Sponsored Scheme called the National Horticulture Mission (NHM) was launched in 2005-06. The
objectives of the Mission are to enhance horticulture production and improve nutritional security and income support to farm households and others through area-based regionally differentiated strategies. Crops such as fruits, spices, flowers, medicinal and aromatic plants, plantation crops of cashew and cocoa are included for area expansion, whereas vegetables are covered through seed production, protected cultivation, integrated nutrient management/integrated pest management (INM/IPM) and organic farming. The impact of the Mission can be seen in the increasing area and production of fruits and vegetables.

Technology Mission for Integrated Development of Horticulture in the North Eastern States (TMNE) covers the hill States and North Eastern States of India. Apart from introduction of improved production technology in traditional crops, a significant contribution of the Mission has been in the promotion of commercial cultivation of potential crops, namely citrus, fruits, banana, pineapple, strawberry, kiwi, apple, passion fruits; anthuriums, roses, lilies, orchids and other cut flowers; and high value vegetable crops. The most remarkable development under the scheme has been the expansion of area under specific crops in the States and in clusters which will facilitate easy marketing access in the future.

5.2 Animal Husbandry, Dairying and Fisheries

The livestock and fisheries sector contributed over 4.07 per cent of the total GDP during 2008-09 and about 26.84 per cent value of output from total agriculture and allied activities. The Eleventh Five Year Plan envisages an overall growth of 6-7 per cent per annum for the sector. In 2008-09, this sector contributed 108.5 million tonnes of milk, 55.6 billion eggs, 42.7 million kg wool and 3.8 million tonnes of meat. The 17th Livestock Census (2003) has placed the total livestock population at 485 million and total of poultry birds at 489 million. India ranks first in world milk production, its production having increased from 17 million tonnes in 1950-51 to 108.5 million tonnes by 2008-09. The per capita availability of milk has increased from 112 grams per day in 1968-69 to 258 grams per day in 2008-09, but is still low compared to the world average of 265 grams per day. About 80 per cent of milk produced in the country is handled in the unorganized sector and the remaining 20 per cent is equally shared by cooperatives and private dairies. Over 1.33 lakh village-level dairy cooperative societies, spread over 265 districts in the country, collect about 25.1 million litres of milk per day and market about 20 million litres. The efforts of the Government in the dairy sector are concentrated in promotion of dairy activities in non-Operation Flood areas with emphasis on building cooperative infrastructure, revitalization of sick dairy cooperatives and federations and creation of infrastructure in the States.

A major programme for genetic improvement of cattle and buffaloes named the National Project for Cattle and Buffalo Breeding (NPCBB) was launched in October 2000 to be implemented over a period of 10 years in two phases of five years each with an allocation of Rs 402 crore and Rs 775.9 crore, respectively. The NPCBB envisages genetic up-gradation and development of indigenous breeds on priority basis.

Poultry continues to play an important role in providing livelihood support and food security, especially to the rural population. India produces more than 55.6 billion eggs per year, with per capita availability of 47 eggs per annum. As per the estimate provided by the Food and Agriculture Organization (FAO) for 2008, the annual chicken meat production in India is around 2.49 million tonnes. The value of exports was around Rs 422 crore during 2008-09. Eggs and poultry are among the cheaper source of animal protein. During 2009-10, a new Centrally Sponsored Poultry Development Scheme with an outlay of Rs 150 crore was launched. The scheme, through its Rural Backyard Poultry Development component is
expected to cover below poverty line (BPL) sections of the society to help them gain supplementary income and nutritional support. In order to encourage entrepreneurship skills of individuals, a Poultry Venture Capital Fund is also being implemented covering various poultry activities.

Animal wealth in India has increased manifold and animal husbandry practices have also changed to a great extent. With increased trade activity, the chances of ingress of exotic diseases into the country have also increased. With improvement in the quality of livestock through launching of extensive cross-breeding programmes, the susceptibility of this livestock to various diseases, including exotic diseases, has increased. To ensure maintenance of disease-free status and compliance with the standards laid down by the World Animal Health Organization, major animal health schemes and programmes have been initiated. Further, for control of major livestock and poultry diseases, the Government of India provides financial assistance to States/UTs in their efforts to prevent, control and contain animal diseases and also to strengthen veterinary services including reporting of animal diseases.

Fish production increased from 7.1 million tonnes in 2007-08 to 7.6 million tonnes in 2008-09. Fishing, aquaculture and allied activities are reported to have provided livelihood to over 14 million persons in 2006-07 apart from being a major foreign exchange earner.

Adequate availability of feed and fodder for livestock is very vital for increasing milk production and sustaining the ongoing genetic improvement programme. It is estimated that there is green fodder shortage of about 34 per cent in the country. To increase the availability of fodder, the Department of Animal Husbandry & Dairying is implementing a Centrally Sponsored Fodder Development Scheme throughout the country to supplement the efforts of the States.

6 Schematic Support for Agricultural Production

A number of Centrally Sponsored Schemes are funded and monitored by the department of Agriculture & Cooperation (DAC) for increasing the production and productivity of agricultural crops. These schemes are to be implemented by the States in accordance with the District Agriculture Plans developed under the Rashtriya Krishi Vikas Yojana. States have been given complete freedom and flexibility to plan the interventions as per the felt needs, agro-climatic requirements and priorities and in terms of the overall strategic goals of agricultural development. Table showing the nature of the major schemes in operation for increasing the production and productivity of the agriculture crops is placed below.

There is quantum jump in the budgetary allocation to the States to support implementation of these schemes. The Budget Estimates of DAC has increased from Rs 1041.35 crore in 1991-92 to Rs 11,307.07 crore, inclusive of State Plan Schemes, in 2009-10. Table 6 and Fig. 1 show the funds released to the States under various schemes during 2007-08, 08-09 and 09-10.

From the current financial year 2010-11, two new initiatives are planned for implementation for improving the agriculture production and productivity of the food crops. The first focuses on Eastern India where substantial potential exists to increase crop productivity as is evident from the variation between yields recorded from frontline demonstrations/adaptive trial on farmers’ fields and yields recorded with farmer practice. The other aims at increasing the production of pulses and oilseeds, especially in rain-fed areas by taking up watershed plus activities like land development and provision of agricultural machinery on a custom hiring basis to identified watershed clusters. These initiatives aim to widen the food basket and promote pulses production.
The Way Ahead

The agricultural sector, however, faces various challenges which need to be addressed on a priority basis. Although the yield per hectare of food grains has shown some improvement in recent years, it is not significant enough to cater to the needs of the rising population particularly when income levels are also rising. The Working Group of the Planning Commission of India on Crop Husbandry, Agricultural Inputs, Demand and Supply for the XI Five year Plan had identified the key factors for decelerated agricultural growth as follows:

- Stressed natural endowments,
- Capital stock depletion and inadequate investment supplementation,
- Fatigue in production response to application of various inputs,
- Declining resource use efficiency,
- Persisting technology gap and knowledge deficit in agriculture,
- Weakness of the supporting institutions of research, extension, credit and marketing, and
- Inadequate risk mitigation measures.

The two staple food grains – rice and wheat, have been the primary commodities to fulfil the food demand of the people in India. Intensive cultivation of rice and wheat has resulted in considerable depletion of natural resources. The rain-fed dry areas having maximum concentration of resource poor farmers, on the other hand, have remained largely pockets of low productivity, aggravating problems of inequity and regional imbalances. The rice-wheat based cropping system is stagnating. Smaller growth in yield and decelerating growth in Total Factor Productivity (TFP) in some high input use areas is also a matter of concern.

Moreover, the productivity levels vary considerably across the states/ districts and in different agro-climatic regions. For instance, the productivity of rice and wheat in Trans-Gangetic region has been > 3 tonnes per ha and 4 tonnes per ha, respectively, against 2 to 2.5 tonnes per ha in lower and Mid-Gangetic plains (Eastern Uttar Pradesh and Bihar).

In case of wheat, the interstate variation in productivity is very prominent ranging from as low as 1406 kg/ha in Maharashtra to as high as 4265 kg/ha in Punjab. Similarly, in rice the inter-state variation ranges from 1233 kg/ha in Bihar to 3876 kg/ha in Punjab. The higher productivity of states like Punjab could be attributed to higher input use efficiency. Similarly, the inter-district variations in productivity are also prominent within a state. For example, in high productivity state like Punjab, districts of Mohali, Ropar, and Hoshiarpur have low wheat productivity compared to districts like Patiala, Ludhiana, etc. Some variation may be attributable to the fact that farmers are hesitant in making more investment on inputs, particularly under rain-fed farming, but in case of value added crops/hybrid seeds, farmers not only make investment, also protect these crops with sprinkler irrigation when exigencies arises.

Area under cultivation being constant, there is a need for targeting low productivity states/ districts to bridge the yield gaps and enhancing the productivity. Since farm productivity is not showing desirable growth there is urgent need to focus on research as well as better agricultural practices to ensure that productivity levels are increased in the shortest time possible. Special attention may be required for States with relatively low productivity. Production and productivity in pulses and oilseeds are of growing concern. A sizeable proportion of these items is met through imports. The scope for import of pulses is limited due to the limited number of countries producing it. Due to this supply demand gap, domestic prices fluctuate with availability and prices in the international market apart from the impact of domestic production trends.
The two new initiatives started from year 2010-11 is expected to address the issue of low productivity States of Eastern India and also try to achieve self sufficiency in oilseeds and pulses. Consistent decline in the share of private sector investment in the agriculture sector is a matter of concern. This trend needs to be reversed through creation of a favourable policy environment and availability of credit at reasonable rates on time for the private sector to invest in agriculture. Adequate policy support, production strategies, public investment in infrastructure, research efforts and transfer of technology is required in order to increase the production and productivity of crops to the desired level.

In order to deliver the planned services to the farmers in time and in the manner desired as per the strategy envisaged in different schemes and programmes, it is essential to gear up administrative machinery and the institutions with capacities for better accountability. Institutions created for delivery of vital services like credit, seeds, farm machinery, training and research etc. need to be revived. It is seen that the low productivity States/districts have the commensurate non-functional institutions for delivery of services. With the increased focus of the schemes targeting low productivity districts in creating demand from the farmers for these services, the institutional presence in the districts need to be enhanced for increasing seed production, supply of soil nutrients, farm machinery, credit etc. Revival of the institutions would improve the capacity of these districts to deliver the services more competently and predictably. Measures/programme for effective management of inputs especially water, fertilizers, pesticides are critical for achieving higher land use efficiency for maximizing crop yield. Soil health care through promotion of soil testing facilities, soil health campaigns, application of micro-nutrients and soil ameliorants like gypsum/lime also need to be given priority.

Adequate measures are also required for improving the Post harvest handling of the grains by better grading, bagging, transportation and storage for reducing losses and enhancing quality. Mechanisms for facilitating integration of the farmers to the markets through creation of producers’ companies or through transparent, fair and enforceable contract farming with the private retailers or processors would ensure that agriculture becomes a viable and profitable occupation.

Various aspects of agriculture development are being handled in different Departments and Ministries like Irrigation, Energy, Credit and Cooperatives, Rural Development, Meteorology etc. In order to facilitate smooth delivery of the services to the farmers, an effective coordinating mechanism needs to be set up so that timely decisions are taken. It is expected that the coordinated response from the State would help the farmers to take maximum benefits from the various planned activities of different departments. Convergence of development schemes of different Ministries like NREGA, DAC schemes, other rural development schemes etc. in the long run would complement the efforts of the farmers in enhancing development and promote prosperity of rural India. Most Government Schemes have elaborate mechanism for monitoring the progress of implementation. Web based information systems have been designed for information exchange. Through intensive monitoring by documentation, reporting systems, reviews, inspections and visits it is expected that timely corrective steps are taken for proper utilization of funds. Design of the schemes could be modified or amended with inputs coming from the monitoring teams which would enhance the effective delivery of envisaged services to the farmers.

There is also a need to reform the process for collection of agriculture related statistics to correctly reflect the crop area and health disaggregated for various parameters for better
policy inputs and for better impact analysis of the schemes. Apart from better coordination between Agriculture and the Revenue Departments in the States, it is necessary to use science and technology inputs particularly remote sensing data for better assessment of the crop wise area and health. There has been substantial increase in Minimum Support Prices (MSPs) of various crops over the last few years. This is considered necessary to incentivize the farmers to increase production and productivity. At the same time, the MSP signals the floor price for the produce which, in turn, has the potential of increasing the prices. Addressing the welfare of agricultural producers and consumers simultaneously poses a challenge. Further, inability of a large number of small and marginal farmers to directly access the agri-market puts a question mark on increases in MSP actually benefiting such farmers.

Record procurement of rice and wheat in the last few years has helped to build up the buffer stock and strategic reserve of wheat and rice. There is, however, a huge cost involved in the process which is met through budgetary sources in the form of food subsidy. This puts a lot of stress on the fiscal system. The issue of efficient food stocks management and offloading of stocks in time needs urgent attention. Studies indicate adverse impact of climate change on agriculture. Crop improvement and research to develop drought-resistant, high-yielding varieties of seeds assumes importance with a view to combating adverse impact of drought on food production and to ensure food security.

To feed the ever increasing population of the country, extensive cropping systems have given way to intensive cropping that are depleting natural resources. Therefore, in future the thrust will be more focussed on efficient natural resource management and sustainable production systems. Since resource management is closely linked with production systems, technologies related to integrated production system involving crops, livestock, horticulture, and fisheries need to be addressed. Further, with changing economy, commercialisation of agriculture would increase and farmers would take decisions regarding land use based on comparative advantage rather than subsistence needs of the farm household. Therefore, a major shift in agricultural production from food grains to vegetables, fruits, flowers, livestock etc is expected. The renewed focus on the agriculture and allied sectors in the Eleventh Five Year Plan is certainly a step in the right direction and there have already been indications that investment in agriculture sector is picking up and agricultural activities and interventions are being taken up on a renewed scale. To sum up, we need to address the challenges of the agriculture sector through comprehensive and coordinated efforts. Renewed attention needs to be paid for improving farm production and productivity, better utilization of agricultural inputs, proper marketing infrastructure and support, stepping up investment in agriculture with due emphasis on environmental concerns and efficient food management.

References

### Table 1: Agriculture Sector: Key Indicators at Constant Prices (2004-05) (per cent)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Item</th>
<th>2007-08</th>
<th>2008-09</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Growth in GDP in Agriculture &amp; Allied Sectors</td>
<td>4.7</td>
<td>1.6</td>
</tr>
<tr>
<td>2</td>
<td>Share in GDP – Agriculture and Allied Sectors</td>
<td>16.4</td>
<td>15.7</td>
</tr>
<tr>
<td>3</td>
<td>Share of Agriculture &amp; Allied Sectors in Total GCF</td>
<td>7.01</td>
<td>9.05</td>
</tr>
<tr>
<td>4</td>
<td>Share of Agricultural Imports in Total Imports at Current Prices</td>
<td>2.95</td>
<td>2.74</td>
</tr>
<tr>
<td>5</td>
<td>Share of Agricultural Exports in Total Exports at Current Prices</td>
<td>12.05</td>
<td>10.23</td>
</tr>
<tr>
<td>6</td>
<td>Employment in the Agricultural Sector as Share of Total Employment in 2004-05 as per CDS</td>
<td>-</td>
<td>52.1</td>
</tr>
</tbody>
</table>

**Source:** Economic Survey of India, 2009-10

### Table 2: Growth in Agriculture and Allied Sector GDP vis-à-vis total GDP from 2005-06 to 2009-10 (at 2004-05 prices)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total GDP Actual Growth</th>
<th>Agriculture and Allied Sector (per cent) Actual Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005-06</td>
<td>9.5</td>
<td>5.2</td>
</tr>
<tr>
<td>2006-07</td>
<td>9.7</td>
<td>3.7</td>
</tr>
<tr>
<td>2007-08</td>
<td>9.2</td>
<td>4.7</td>
</tr>
<tr>
<td>2008-09</td>
<td>6.7</td>
<td>1.6</td>
</tr>
<tr>
<td>2009-10 (AE)</td>
<td>7.2</td>
<td>0.2</td>
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</table>

**Source:** Planning Commission, Centre Statistical Organization (CSO)

### Table 3: Area, Production and Yield of the Major Food Items in 2008-09

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Area (M HA)</th>
<th>Production (MT)</th>
<th>Yield (Kg/HA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Grains</td>
<td>123.22</td>
<td>233.88</td>
<td>1898</td>
</tr>
<tr>
<td>Pulses</td>
<td>22.37</td>
<td>14.66</td>
<td>655</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>27.46</td>
<td>28.16</td>
<td>1026</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>4.40</td>
<td>273.93</td>
<td>62321</td>
</tr>
<tr>
<td>Fruits</td>
<td>6.11</td>
<td>69.45</td>
<td>-</td>
</tr>
<tr>
<td>Vegetables</td>
<td>8.02</td>
<td>133.07</td>
<td>-</td>
</tr>
</tbody>
</table>

**Source:** Agricultural Statistics at a Glance 2009
### Table 4: Demand Projection for Food Grains During the XI Plan (MT)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cereals</th>
<th>Pulses</th>
<th>Food Grains</th>
<th>Oilseeds</th>
<th>Sugarcane</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>197.25</td>
<td>16.77</td>
<td>214.02</td>
<td>45.56</td>
<td>261.75</td>
</tr>
<tr>
<td>2008-09</td>
<td>201.49</td>
<td>17.51</td>
<td>219.01</td>
<td>47.43</td>
<td>275.91</td>
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<tr>
<td>2009-10</td>
<td>205.75</td>
<td>18.29</td>
<td>224.04</td>
<td>49.35</td>
<td>290.74</td>
</tr>
<tr>
<td>2010-11</td>
<td>210.04</td>
<td>19.08</td>
<td>229.12</td>
<td>51.34</td>
<td>306.28</td>
</tr>
<tr>
<td>2011-12</td>
<td>214.35</td>
<td>19.91</td>
<td>234.26</td>
<td>53.39</td>
<td>322.54</td>
</tr>
</tbody>
</table>

*Source:* NDC’s Working Group on Crop Husbandry, Agricultural Inputs, Demand and Supply Projections and Agricultural Statistics for the Eleventh Five Year Plan (2007-12)

### Table 5: Production of Breeder & Foundation Seeds, Distribution of Certified/Quality Seeds

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeder Seed Production</td>
<td>6,865</td>
<td>7,382</td>
<td>9,196</td>
<td>9,441</td>
<td>10,500</td>
</tr>
<tr>
<td>Foundation Seed Production</td>
<td>74,000</td>
<td>79,654</td>
<td>85,254</td>
<td>1,14,637</td>
<td>1,20,000</td>
</tr>
<tr>
<td>Certified/Quality Seed Distribution</td>
<td>14,05,000</td>
<td>14,81,800</td>
<td>19,43,100</td>
<td>25,03,500</td>
<td>27,97,200</td>
</tr>
</tbody>
</table>

### Table 6: Funds released to the States under various schemes during 2007-08, 08-09 and 09-10

<table>
<thead>
<tr>
<th>Name of the Scheme</th>
<th>2007-08</th>
<th>2008-09</th>
<th>2009-10*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISOPOM</td>
<td>343.45</td>
<td>399.78</td>
<td>449.69</td>
</tr>
<tr>
<td>RKVY</td>
<td>1246.89</td>
<td>2895.80</td>
<td>3761.43</td>
</tr>
<tr>
<td>MMA</td>
<td>1001.26</td>
<td>922.77</td>
<td>914.95</td>
</tr>
<tr>
<td>NFSM</td>
<td>398.74</td>
<td>883.29</td>
<td>1014.61</td>
</tr>
</tbody>
</table>

*Note: * Figures for 2009-10 are as on 25.03.10
Fig. 1: Different Agricultural Programmes in India

RKVY: Rashtriya Krishi Vikas Yojana
MMA: Macro Management of Agriculture (Revised)
NFSM: National Food Security Mission
ISOPOM: Integrated Scheme on oilseeds, pulses, oil palms and maize
NPMSF: National Project on Management of Soil Health and Fertility
NREGS: National Rural Employment Guarantee Scheme
FOOD SECURITY IN IRAQ

Mr. Sami Gheni Khudhair Attrah

1 Introduction

Iraq covers a geographic area of 435,052 km. Climatic variation ranges from cool to cold winters, and hot to extremely hot, dry summers. Regional differences are such that Baghdad is fairly dry; the South is very humid; the North is cool all year round, with very cold winters. Of the total land area of Iraq, only 25% is arable. The rainfall pattern is one of great irregularity and ranges from under 100mm to about 1,000mm/year. The population of Iraq is estimated to be 29.6 million (July 2007). The average population density is estimated at 61/km², ranging from 9/km² in Anbar governorate in the western desert to more than 1,490/km² in Baghdad governorate. While average population growth before the sanctions was estimated at 3.6 percent, this rate has been greatly reduced by emigration, severe economic hardship and lower fertility rate, reaching a low of 2.76 percent in 2003.

2 Economic Characteristics

Iraq is one of the largest oil-producing countries in the world—traditionally, 95 percent of Iraq’s foreign exchange earnings are from the petroleum sector. The country developed a solid infrastructure and a well-performing education and health care system during the 1970s, widely regarded as the best in the Middle East. Income per capita rose to over US$3,600 in the early 1980s. Since that time, successive wars and a repressive, state-dominated economic system have stifled growth and development and debilitated basic infrastructure and social services. Following Iraq’s invasion of Kuwait, the international community imposed economic sanctions on Iraq from 1991-2003, which dramatically reduced economic activity. The UN Oil-for-Food Programme (1996-2003) allowed the export of oil in exchange for food, medicine, and other humanitarian goods. In 2003, the World Bank reported that (Gross Domestic Product) GDP per capita declined by 30 percent to $480-630. Since 2003, Iraq has been taking steps towards liberalising the economy from the state-dominated system towards a free market economy. In spite of the prevailing security conditions, the IMF estimates that per capita GDP has increased to $2,109 in 2007. Crude oil prices during this period increased from $29/barrel in June 2003 to over $120/barrel in June 2008.

3 Food Security

The successive war, economic slowdown and 12 years of economic sanctions have adversely affected Iraq’s food security. The prevailing conditions and political uncertainty further affected the food security of the country. As a result, large parts of the population continue to depend on the monthly food ration provided under the Public Distribution System (PDS) which was introduced by the Government of Iraq in 1991 and managed by the Ministry of Trade. The PDS is designed to provide all Iraqis with a monthly food and non-food rations at a heavily subsidized price.

In 2003, the first Food Security Baseline Survey sponsored by World Food Programme (WFP) undertaken by the Central Organization for Statistics and Information Technology (COSIT), Ministry of Planning and Development Cooperation
and Nutrition Research Institute (NRI), the Ministry of Health. It revealed very high levels of poverty and malnutrition (arising from decades of conflict, loss of heads of household members, disruption of economic activities, unemployment, illiteracy and insecurity) and identified areas where the population was most vulnerable. This baseline analysis report (published 2004) concluded that 11 percent of the population in Iraq (roughly 2.6 million people), were found to be extremely poor and vulnerable to food insecurity. If the PDS were discontinued, an additional 3.6 million people would have a high probability of becoming food insecure. Food insecurity has largely attributed to the insufficiency of the PDS to provide adequate food for Iraq’s poorest households, those who lack sufficient income to supplement their food supplies. Low purchasing power was associated with high rates of unemployment, particularly in rural areas. Female-headed households seemed most likely to be vulnerable to poverty (Survey, 2003).

Acute malnutrition for children under five was 4.4 percent, underweight 11.5 percent and chronic malnutrition was 27.6 percent. In addition the baseline results showed that despite the PDS, there was a prevalence of extreme poverty, particularly among women and children in rural areas. Furthermore, it found that despite the availability of food on the market, the poorest people faced problems in buying it. Chronic poverty, a lack of job opportunities and inadequate purchasing power all contributed to Iraq’s overall food insecurity.

### 3.1 Underlying Causes of Food Insecurity

The main factors affecting food insecurity in Iraq consisted of the following:

- Wealth status;
- Income and expenditure;
- Education level of the head of the households;
- Geographic location (urban vs. rural); and
- Sex of household head (female headed more vulnerable).

### 3.2 Poverty Reduction and Food Security Policies

In May 2007, the International Compact with Iraq was launched. The Compact is a five-year national plan that includes benchmarks and mutual commitments from both Iraq and the international community, all with the aim of helping Iraq on the path towards peace, sound governance and economic reconstruction. The results of this (Comprehensive Food Security and Vulnerability Analysis) CFSVA relate directly to two of the goals outlined in the Compact i.e., 1) Social Safety Net – Taking care of the poor and vulnerable, and 2) Reforming Subsidies – Phase out inefficient, large-scale subsidy programmes while ensuring delivery of services to the poorest. Information provided in this analysis identifies the locations of the most food-insecure people inside Iraq and could be used by the Government of Iraq in fulfilling the two goals above as set out in the Compact. The data can be used to establish a social safety net, targeting the poorest and most vulnerable segments of Iraqi population with appropriate assistance.

In 2003-2004, the United Nations World Food Programme (WFP) carried out a baseline survey to look at the food security situation in Iraq. The results from the baseline survey showed that despite the blanket food distribution to all Iraqis through the Public Distribution System (PDS), there was a prevalence of extreme poverty (particularly among women and children in rural areas) and despite the availability of food on the market, the poorest people could not afford to buy it. Based on this survey, it was concluded that while Iraq is a country with a wealth of natural resources, it would need external help until it stabilized politically and economically. As a result, WFP launched a one year emergency operation.
costing US$60 million, targeting the most vulnerable groups in Iraq. The operation has supported these groups by providing 67,000 metric tons of food to 220,000 malnourished children and their family members (over 1.1 million), more than 1.7 million primary school children, 350,000 pregnant and lactating mothers and over 6,000 tuberculosis patients.

One of the principal outcomes of WFP’s intervention in the emergency operation is the establishment of a consolidated Food Security Unit within the Central Organization for Statistics and Information Technology (COSIT) of the Ministry of Planning and Development Cooperation (MoPDC). The unit is responsible for coordinating, conducting surveys and monitoring food security situation and its related activities for the Government of Iraq. Its work includes the establishment and continual development of a food security knowledgebase in Iraq. WFP is working to provide this new unit with (i) policy advice on food security and safety net options, (ii) necessary technical and conceptual tools, and (iii) provisions for monitoring food security indicators. Since 2003, training was provided by WFP to the staff of this unit with the objective of improving institutional methodologies for food security analysis, targeting, baselines, monitoring and impact evaluation and linking these to the geographic dimension. The targeting of WFP assistance to Iraq is based on previous surveys. WFP is now providing food assistance to 750,000 food insecure internally displaced persons inside the country. This 12-month project is a stop-gap measure for those who have moved across governorate lines and have been unable to transfer their PDS ration cards to their place of displacement. WFP, the Government of Iraq, and other organisations working in food aid can use the results of this CFSV A for designing future targeted food assistance interventions inside Iraq.

3.3 Public Distribution System (PDS)

Under the food rationing system (Public Distribution System - PDS), each Iraqi is entitled to a monthly food basket for a nominal fee of 250 Iraqi dinars ($0.21). The food basket is distributed, and fees collected, through approximately 45,000 “Food and Flour Agents” (FFAs) throughout the country. Food agents are typically local groceries. Each Iraqi within Iraq is entitled to receive the PDS ration, tied to his official residence. The monthly ration provided to an individual under PDS is as follows: wheat (9 kilos), rice (3 kilos), sugar (2 kilos), tea (200 grams), vegetable oil (1.25 kilo), detergent (500 grams), pulses (250 grams), adult milk (250 grams), soap (250 grams) and infant formula (1.8 kilo). This ration should supply 2,200 kcal per person per day. However, shortfalls in distributions have affected the people of the country. Data from WFP field monitors indicate that the PDS supplied an average of 60 percent of the caloric requirements during 2006. This further dropped to 51 percent during 2007. Managed by the Ministry of Trade, the PDS is implemented through a combination of state owned enterprises and private sector companies while importing, rice processing and warehousing functions are largely performed by state-owned enterprises. Wheat processing, transportation and retailing activities are predominately done by the private sector of the country. During the years of economic sanctions, all PDS ration goods were produced abroad and imported by the Ministry of Trade. In the past year, efforts have been made to use locally produced goods (especially Iraqi wheat) and to use Iraqi import companies. These efforts have had mixed success due to problems of security deterioration, low product quality and insufficient capacity of staff of the Ministry of Trade and import companies.

4 Agricultural Production

4.1 Farming Systems

In Iraq, small subsistence farmers are responsible for most agricultural output. Iraqi wheat production in marketing year (May) 2007/2008 (July/June) is
estimated at 2.2 million metric tons (MMT), down slightly from the estimated 2.3 MMT harvested in 2006. In 2007, an estimated 1.4 million hectares of wheat was harvested in the country. Yields are low by regional standards, largely due to the lack of availability of improved seeds and fertilizer, increased soil salinity, and the poor state of the irrigation and drainage system. Iraqi rice production in calendar year (CY) 2007 is estimated at 328,000 MT, higher from the estimated 290,000 MT produced in CY 2006. Farmers generally regard rice as a profitable crop and are expanding area planted. 26 percent of households reported having an agricultural land. In rural areas, 49 percent of households have agricultural land compared to 7 percent of those living in urban areas. Forty-two percent of households in Salah Al Din reported farming compared to around 30 percent of households in Ninawa, Babil, Diale, Sulaymani, Najaf, Dahuq, Qadissia, Wasit. Lowest rates of household holding were reported in Basrah with only 5 percent of the households reported having a farming land (Fig. 1).

Overall, the average holding size of those households having a farming land is 24.6 Dunum (Dunum=2500 square meter). More than 50 percent of households having a farm land reported cultivating an area of approximately 15 and 17 Dunum (Dunum=2500 m$^2$) of wheat and barley in winter. The most important secondary crop was vegetables, cultivated by 8.5 percent of households. In summer, vegetables were cultivated by 31 percent of the households followed by the fruits cultivation by 17 percent of the household. When production was assessed by governorate, it was clear that production in central and northern governorates was much more diversified than production in the southern governorates (i.e. Basrah, Muthanna, Missan, Thi – Qar, Qadissia) (Table 1).

4.2 Household Expenditures

The data showed that 18 percent of the population surveyed is spending less than US$1 per capita per day compared to 54 percent (2005). The national average of the overall expenditure was US$63 per person per month, almost twice the US$35 reported in 2005 survey. They were spending an average of 52 percent of their expenditure on food items and 48 percent on non-food items (Fig. 2).

5 Current Household Food Security Status

5.1 Food Consumption Patterns

Food consumption patterns are an important indicator of food security. Those who frequently consume a wide variety of foods (from different food groups) are more food secure than people who only eat bread everyday with some vegetables and rarely ever eat meat. To develop the food security profile of households, information on dietary diversity and the consumption frequency of foods was analyzed at the household level. Dietary diversity is a good proxy indicator of household per capita consumption and household per capita caloric intake, both of which are measures of the ‘food accessibility’ component of food security. Studies reported a significant correlation between diet diversity and nutrient adequacy, children’s and women’s anthropometry and socio-economic status (Ruel, 2003). It can also play an important role in identifying the food insecure, monitoring changes in circumstances and assessing the impact of interventions. WFP has created a custom dietary diversity tool intended to capture different consumption patterns in terms of both the number and frequency of food groups consumed. The “food consumption score” is calculated by examining the number of times certain foods (grouped into basic food groups) are consumed in the 7 days preceding the survey and then weighting them by approximate nutrient density values. Eight food groups (Table 2) and
their corresponding weight were classified as follows:

Households are categorized into three food consumption groups according to their score: poor food consumption, borderline food consumption, and good food consumption. The determination of which cut offs to use was very complicated, because sugar and oil consumption was common (6-7 times per week) and the existence of the PDS. The results indicated that there was a strong correlation between those households reporting certain commodities being consumed more frequently with those commodities being distributed by the PDS. Thus, using the lower cut offs are likely to underestimate the prevalence of poor food consumption. The cut-off points used in this analysis to define poor, borderline and adequate Food Consumption Groups (Table 3) are those used for Haiti example and reported by the International Food Policy Research Institute (IFPRI).

Households can be classified into three main consumption groups according to their food consumption score. It should be noted that this classification is a snapshot of the food consumption situation at the moment of the data collection and it cannot be considered representative of what households consume at other times of the year. The vast majority of the surveyed population - 87.4 percent (estimated population 26,220,000) - have an acceptable food consumption score, 9.4 percent (estimated population 2,820,000) have borderline food consumption, and 3.1 percent (estimated population 930,000) have poor food consumption. Study found that households in the poor food consumption group, cereals and tubers, mainly bread and rice, are consumed on a daily basis. Sugar and fats, vegetable oils or ghee are used six days per week and vegetables are used four days. Other food items are rarely, if ever, eaten. The main source of the items consumed more frequently by this group is usually the PDS. This diet type is poor in terms of macronutrient and micronutrient intake. Micronutrient intake might be compromised by this very low dietary diversity. Regarding macronutrients, the diet might provide enough carbohydrates but it is likely to be deficient in proteins.

The borderline food consumption group has a similar pattern to that of the poor food consumption group. However, vegetables are accessed in general on five days per week rather than four and meat or egg is consumed in general on five days per week. Quantities of food available for consumption may also be problematic among these households due to their low purchasing power. The main source of the items consumed more frequently by this group (except vegetable and meat or eggs) is the PDS. Any changes in the current PDS could severely affect this portion of the population. For the acceptable food consumption group, households have daily access to cereals and carbohydrates and a good combination of other foods (i.e. milk products, vegetables, fruits and meat/egg) are eaten on a regular basis. This profile seems to indicate that the quantities of food consumed by households in this group should satisfy household needs. Main source of cereals, sugar, oil and pulses is the PDS.

The potential of Iraq's spring grain crop are promising and the outlook is good for food security in the short-term. However, this positive outlook is tempered by several dependencies: 1) continued favourable weather conditions; 2) concern over the ability to provide basic services needed to support harvest and distribution; 3) the reality that only a fraction of Iraq's nutritional requirements will be met by domestic production; and (4) the successful restoration of the United Nations Oil for Food Program (OFF). Until some semblance of normalcy, modernization, and institutions of civil society are injected into Iraq's political and social infrastructure, it will be difficult to ascertain Iraq's food security outlook beyond this current period of readjustment and dependency on the OFF programme. Iraq's economic history and its internal
production capacity (barring weather disruptions) point to a nation ultimately capable of economic self-sufficiency and food security.

Iraq’s food production system appears resilient to meet exceed production levels depending on the favourable weather conditions. However, success will depend on a stable rural labour force and access to infrastructure and services required for a bountiful harvest. This is drawing the attention of the international community as nations reach out to shore up basic governmental services. However, domestic product provides for only a fraction of Iraq’s total caloric consumption requirement. Accordingly substantial imports are required. The Foreign Agriculture Service (FAS) of U.S. Department of Agriculture’s has indicated that weather conditions have been favourable for development of Iraq’s grain crop. About 2.5 million acres typical for recent years, were sown prior to the outbreak of the Gulf War and were largely unaffected by military operations. Satellite observations indicate that vegetation density in the productive northern regions meet or exceed historical averages and appear to match the historical average in central and southern regions. The satellite derived index has been found to be a reliable indicator of yield potential.

5.2 Underlying Causes of Food Insecurity

Decades of conflict and economic sanctions have had serious effects on Iraqis. Their consequences have been rising unemployment, illiteracy and, for some households, the loss of wage-earners. Iraq’s food insecurity is not simply due to a lack of production of sufficient food at the national level, but also a failure of livelihoods to guarantee access to sufficient food at the household level. Food insecurity in Iraq is a result of many chronic factors and their complicated interactions, amongst which are the low income rate and high unemployment. The latter is a major problem in Iraq. Human capital and skills of the poor are very low and there are serious problems for the poor to enter into the current labour market where prevailing security conditions do not necessarily make it an attractive proposition. Job creation is a key to reducing vulnerability to food insecurity in Iraq. Private and public sector job creation activities could serve the dual purpose of improving infrastructure and transferring cash to Iraq’s poorest households. The educational levels of the Iraqi poor have an impact on their ability to earn money and to access food. For the poor and food insecure population, the PDS ration is the single most important food source in the diet. Social protection mechanisms targeting these groups should be carefully considered.

6 Conclusion and Recommendations

Food insecurity persists in Iraq, despite the fact that virtually the entire population continues to receive a monthly food ration through the Public Distribution System (PDS). Although the bulk of Iraq’s population is able to acquire sufficient food for an active and healthy life, the same cannot be said with regard to an estimated population of 930,000 (3.1% of households). It is indicated that an additional 9.4 percent of the population (2.8 million) is extremely dependent upon the PDS food ration, without which they could be expected to become food insecure. This group along with the 12.3 percent food secure households in the poorest income quintiles (less than 1 USD per capita per day) would be rendered food insecure if no sustainable safety net programme to address the needs of those vulnerable were taken. Thus, if the PDS is discontinued without an establishment of a robust and sustainable safety net, an estimated 25 percent of the total population would face real difficulties in ensuring their food security.

Results indicate significant improvement from the estimated four million people (15.4 percent) food insecure and a further 8.3 million people (31.8 percent) potentially food insecure if they were not provided with a PDS ration as reported in the previous survey. Several factors may have contributed to this significant and positive trend.
and might include: (i) an overall security improvement; (ii) improvement in some macroeconomic indicators that are used to monitor the level of economic growth in Iraq including Gross Domestic Product (GDP) and (iii) humanitarian enhanced efforts of all stakeholders including Government of Iraq, UN organizations, and NGOs during the period of 2006-2007. However, it should be stressed the fact that while the study provides information based on recent trends, the overall situation in Iraq remains highly volatile. While, hopefully, the situation will continue to improve, thus permitting the consolidation of these positive trends, any reversal in the security situation may impact negatively particularly on the performance of the PDS, in reducing economic opportunities and jeopardizing the implementation of humanitarian assistance programmes.
Fig. 1: Households Having Farm Land Per Governorate (%)

Fig. 2: Food Expenditure by Governorate
### Table 1: Crops Produced by Season

<table>
<thead>
<tr>
<th>Crop</th>
<th>Winter Per Cent Household</th>
<th>Area Cultivated (Dunum)</th>
<th>Summer Per cent Household</th>
<th>Area Cultivated (Dunum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>54</td>
<td>14.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Barley</td>
<td>52</td>
<td>17.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vegetables</td>
<td>8</td>
<td>3.5</td>
<td>31</td>
<td>4.4</td>
</tr>
<tr>
<td>Fruits</td>
<td>6</td>
<td>4.7</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Potatoes</td>
<td>2</td>
<td>3.6</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Chickpea</td>
<td>2</td>
<td>15.1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Maize</td>
<td>1</td>
<td>7.2</td>
<td>11</td>
<td>5.9</td>
</tr>
<tr>
<td>Beans</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>4.3</td>
</tr>
<tr>
<td>Cotton</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>6.4</td>
</tr>
<tr>
<td>Paddy</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>8.4</td>
</tr>
<tr>
<td>Sunflower</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>5.6</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>2.6</td>
<td>5</td>
<td>3.8</td>
</tr>
</tbody>
</table>

### Table 2: Food Groups and their Corresponding Weight

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Type of Food</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals and Tuber</td>
<td>Bread, Rice, Pasta, Potatoes and Other Grains</td>
<td>2</td>
</tr>
<tr>
<td>Meat</td>
<td>Red, White Meat and Eggs</td>
<td>4</td>
</tr>
<tr>
<td>Pulses</td>
<td>Beans and Nuts</td>
<td>3</td>
</tr>
<tr>
<td>Dairy Products</td>
<td>Milk and Yoghurt</td>
<td>4</td>
</tr>
<tr>
<td>Oils/Fats/Ghee</td>
<td>Animal Fats, Vegetable oil, and Ghee</td>
<td>0.5</td>
</tr>
<tr>
<td>Vegetables</td>
<td>All type of Vegetables</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 3: Food Consumption Score Cut-off for Best Match of Proportion of Food Insecure Households

<table>
<thead>
<tr>
<th>Food Consumption Group</th>
<th>Cut-off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor Consumption</td>
<td>&lt;=45</td>
</tr>
<tr>
<td>Borderline consumption</td>
<td>&gt;45 and &lt;=61</td>
</tr>
<tr>
<td>Acceptable Consumption</td>
<td>&gt;61</td>
</tr>
</tbody>
</table>
1 Introduction

Jordan is an open economy as about 60% of the food consumed is imported and approximately 20% of the country’s agricultural production is exported. Agriculture in Jordan is natural disaster prone, mainly due to cyclic droughts and unpredictable frosts. Jordan has been classified as a net food importing developing country by the WTO Committee on Agriculture. It depends heavily on imports to feed its population of about 6 million. The government of Jordan has since then adopted and implemented several programmes to improve food security.

Jordan’s status as an importer of both food and fuel, along with the limited potential for food self-sufficiency makes it particularly vulnerable to food price shocks. With the global food crisis in 2008, the government made immediate attempts to alleviate the effects on the population of fast-rising commodity prices through several various measures and set out to develop a national food security strategy. The continuing reforms by the Hashemite Kingdom of Jordan, centered on trade liberalization, have resulted in real GDP growth of 5.9% and relatively low inflation of 3.1%, on average per year during 2000-06.

Jordan is a country of limited agricultural resources. The area of arable lands does not exceed 4 million dunums, less than 1 dunum per person. This is accompanied by severe scarcity of regenerated soft water resources, which do not exceed 750 mcm/year, or an average of 170m3 per person for all uses. The lands cultivated under rainfed conditions constitute 80% of the total area of agricultural lands. Country has been classified as a net food importing developing country by the WTO committee on agriculture. The downward trend of real food prices for the past 25 years came to an end when world prices started to rise in 2006 and escalated into a surge of price inflation in 2007 and 2008. Prices of staple foods, such as rice and vegetable oil, doubled between January and May 2008. The upturn coincided with record petroleum and fertilizer prices for low-income and highly import-dependent countries, higher food prices and a larger import bill have become a major challenge, particularly for those with limited foreign exchange availability and high vulnerability to food insecurity. High food prices, in combination with high and volatile petroleum prices, have the potential of spurring inflationary pressures. Bad weather reduced production levels in many important exporting countries, notably Australia (one of the major wheat exporters), over the last two years. World cereals stocks as a proportion of production also declined to one of their lowest levels in recent years, exacerbating the crisis. Besides the high oil prices, which resulted in higher food production and transport (including freight) costs, the weak dollar, speculative activities and trade policies also contributed to high food prices.

Jordan has suspended/ reduced domestic taxes on food items and eliminated food tariffs, but the impact of tariff reduction on food prices depends on the extent of the reduction. The Government announced that wheat and barley and maize sales will be done through government at fixed price. Social safety nets are intended to dampen the
social impact of the crisis and to avert starvation and malnutrition of most vulnerable groups in both urban and rural areas. The policy responses to high food prices have implications for macroeconomic stability of the country. Government responses to mitigate the impact of the food security crisis have required increased public outlays with adverse implications for financing basic services. It has been faced with the challenge of financing subsidies, social protection and food as well as fuel imports, and had to draw down their foreign exchange reserves or resort to domestic borrowing, risking reallocation of resources, higher inflationary pressures and balance of payment difficulties.

The Special Programme for Food Security in Jordan was formulated in collaboration with the Food and Agriculture Organization of the United Nation (FAO). The programme aims at improving food security for poor rural households, mainly through improvement of agricultural productivity and production, increasing employment opportunities and promoting income generating activities. Objectives also include stabilizing farming income and enhancing the role of women as partners in rural development. The National Programme for Food Security defining policies and strategies adopted for enhancing food security in Jordan and Programme Implementation Plan* consisting, of detailed documents for 21 projects was implemented during the period 2004 - 2010 in the highland regions of Jordan, at a total cost of JD 37 million.

2 Food Access, Nutrition and Poverty in Jordan

Jordan administers a range of general subsidies and tax breaks aimed at keeping consumer prices down. These include maintaining bread prices at current levels, subsidizing the sale of barley, a cash subsidy for livestock herders to cushion against fodder price increases, partially subsidizing cooking gas, maintaining electricity prices at current levels for small consumers and reducing taxes and import duties on a large number of items, including inputs for production. Increasing expenditures on food subsidies in 2008 served, to some extent, to keep consumer prices down. On the other hand, some of the measures taken to protect consumers from price increases (raising the salaries and pension of the civil service and the military, raising social security pensions, a onetime cash subsidy for all low paid, non-public sector employees), may have contributed to inflation during that time.

Subsidies for food and fuel impose significant fiscal strain and there is a widening recognition in Jordan that there is a need for replacing these general subsidies with more targeted interventions based on accurate identification of the vulnerable sections of the population, and maintaining or improving their access to food. High food prices affect poor people the most and impact their livelihoods as households would substitute expenditures on education or healthcare for example with food expenditures. The most vulnerable are the urban poor, the landless, and small and marginal farmers. Safety nets that are well targeted would help prevent household level food insecurity.

Poverty in Jordan is estimated at 14% (2008). Despite that the numbers of the urban poor are higher; the incidence of chronic poverty, vulnerability to poverty, and food insecurity are seen to be significantly greater in rural regions. The poverty situation in Jordan varies across governorates. The government of Jordan identified twenty ‘poverty pockets’ where the poverty rates exceeded 25% and an additional 21 ‘poverty pockets’ in 10 governorates were included where the poverty rates range between 14.1% and 25%. Projects by non-governmental charity and development organizations have also addressed the challenge of poverty. A partial list of these organizations includes The Noor al-Hussein Foundation, The Zakat Fund, and The General Union of Voluntary Societies, which consists of
more than 600 public service societies and charities, along with several foreign agencies. To complement the efforts of the Economic Restructuring Programme, the government developed a comprehensive and integrated Social Productivity Package. This multi-track concerted strategy aims at alleviating poverty and unemployment through two concomitant tracks. The first, which was initiated in early 1998, aims at reducing poverty pockets and addressing the essential social needs in the short-term. The programme involves: expanding the cash transfers and other benefits of the National Assistance Fund to cover more eligible beneficiaries; developing or upgrading the physical and social infrastructure facilities in disadvantaged areas, training and rehabilitation of the unemployed, providing micro-financing for small enterprises to generate sustained income in poor regions.

2.1 Nutritional Indicators

Average per capita energy supply in Jordan is about 2400 kcalories. The carbohydrate share in the dietary energy supply is about 64 percent (1997) and that of fat about 25 percent. The protein share has been fluctuating around 10.5 percent with 35 percent coming from animal products. The relatively high carbohydrate share is characteristic of developing countries. Fats and oils are generally used in the Jordanian diets for cooking and seasoning purposes. Cereals (wheat and rice) represent the main source of energy in the Jordanian diet, providing 47.6 percent of total energy intake. Grain legumes, dairy products and meat, fruit and vegetables provided less than 2 percent, 5 percent and 7.4 percent of total energy, respectively. The intake of sugar is relatively high contributing of 13.5 percent of total energy less than 2100 kcalories per capita per day. If the based minimum daily energy requirement of 2224 kcalories is used, about 27 percent of the population in the lowest income categories are not consuming this level percent had Vitamin A deficiency. Food insecurity and nutritional inadequacy are all inter-linked and work through inadequate access to food, insufficient capacity to have appropriate sanitary and health conditions and insufficient awareness on nutritional issues.

2.2 Agriculture and Food in Jordan

During the past three decades, agriculture has also started to play a major role in the protection of the environment. The contribution of Agriculture to the GDP, at current prices, has declined steadily from 14.4 percent in 1971, to 3 percent in 2009. The area of arable lands does not exceed 4 million dunums, less than 1 dunum per person. This is accompanied by severe scarcity of regenerated soft water resources, which do not exceed 750 MCM/ year, or an average of 170m3 per person for all uses. The lands cultivated under rain-fed conditions constitute 80% of the total area of agricultural lands.

The total area of lands allocated for agriculture in 2008 was about 4 million dunums, distributed as follows:

- 1.56 million dunums planted with olive and other trees
- 0.42 million dunums planted with vegetables
- 1.08 million dunums planted with field crops
- 0.9 million dunums left as fallow and unpanted areas

Calculations of agricultural production in current prices indicate that the total gross value of the agricultural sector production is 554 million Dinars.

- Agriculture and related activities contribute 28% of the GDP.
• Agricultural exports represent 20% of total exports.

• Agriculture is the main income source for 15-20% of the population in the Kingdom (Tables 1 and 2).

3 National Agriculture Strategy

The national strategy for agricultural development (2002 to 2010) acknowledged the issues mentioned above mainly the need for sustainable agricultural development and achieving food security. The main objectives were to diversify and improve rural livelihoods by improving access of the rural population to available technology and resources. The strategy to support and develop the rural areas in the highlands, Jordanian Badia and the Ghor is based on three main thrusts: (i) achieving sustainable agricultural development in its economic, social and environmental dimensions; (ii) achieving food security and reducing poverty in rural areas through the optimum use of natural resources such as soil and water; and (iii) making rural financial and marketing services available to farming households.

Jordan’s status as an importer of both food and fuel, along with the limited potential for food self sufficiency due to limited agricultural land and water resources makes it particularly vulnerable to food price shocks. These shocks also increase the fiscal costs of general subsidy based safety nets, and make it imperative to identify the most vulnerable, and support them through targeted measures.

3.1 Goals of the National Agriculture Strategy

- Increase Jordan’s self-reliance in foodstuff.
- Conserve and efficient use the agricultural resources and the environment.
- Improve the living standards for the farmers and agricultural sector workers, provide equal social and economic opportunities for them, and increase and diversify their income.

3.2 Constraints

- The limited agricultural resources (lands and water).
- Inefficient legislation that fail to cope with the changes and developments.
- Overlapping and duality of tasks and duties among institutions concerned with the agricultural sector, and lack of coordination between these institutions.
- Low investment levels in the agricultural sector.
- Inefficient marketing system.
- Low level of support provided to the agricultural research and extension.
- Insufficient financial resources allocated to the Ministry of Agriculture.
- Inefficient use of the various production elements.

3.3 Development Affecting the Agricultural Sector

- Trade liberalization, which has increased the foreign origin commodities’ competition to locally produced commodities in the local, regional and international markets.
- Elimination of subsidies, which increased the production costs.
- International trade groupings.
- Population growth, which increases the demand on food.
- The accelerated technological development, which increases productivity and encourages the shift towards intensive farming.
- Increased competition on the available agricultural resources.

3.4 Potentials and Strengths

- The diversity of the climate in Jordan allows continued agricultural production all over the year and outside production seasons.
- There is a comparative advantage for production of certain crops.
- Availability of technically qualified human resources.
- A possibility to adapt and develop modern technologies to cope with the Jordanian environment, and as to serve rangeland development and water harvesting activities.
- General stability and availability of favourable investment environment and a suitable infrastructure.

4 Situation Analysis

Food security exists when all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. To ensure food security in a region, there should be adequate quantities of food available at all times within the region, either produced locally or procured from outside markets, and all people should be able to obtain sufficient amounts, either through cultivation or purchase at market or subsidized prices. The following analysis of the food security situation is developed on these lines—first, at the macro level of total food availability in the country and then, at the micro level, focusing on issues of individual access and safety nets.

Jordan is a resource poor country with no oil, and limited land and water resources. It has a population of 6.00 million, about 80% of whom are urban. The major cereals consumed are wheat, maize and barley, the last being used as fodder. Jordan is self-sufficient in vegetables, poultry, eggs and fruits and 50% of milk and dairy, however it relies mostly on imports of wheat, cereals and fodder. There is no domestic production of some other items like oil seeds and rice. The natural consequence of this situation is that Jordan is a net food importing country, with large (in both volume and value terms) amounts of cereal imports.

The rise of global food prices in 2008 increased the food import bill at the time and any future fluctuations in the global food prices would continue to impact the country. Jordan also imports all of its petroleum needs, and is largely affected by the fluctuations in the oil prices globally. It is highly reliant as well on foreign grants, workers’ remittances (especially in oil producing neighbouring countries) and FDI and portfolio investments (also largely from the oil producing rich neighbouring countries), which in normal situations would buffer price hikes and help mitigate the impact. However, within the context of the global economic crisis, food prices went down, fuel prices fluctuate, however foreign grants, remittances and FDIs are decreasing.

A Regional Report on food security in Arab Countries indicated that despite that global food prices have dropped recently after the 2008 hikes, fluctuation and unpredictability of prices still pose a risk to Arab Countries including Jordan, due to the high reliance on international food markets and the structural internal factors that impact food security. The increasing global demand for food, slowness of global growth rates of yields of major cereals, the inelasticity of the food market, the
thinnness of international food markets as well as the impact of climate change on agriculture are all factors that contribute to potential global food shocks. Internally, for Arab countries, supply and demand factors play a role in food availability due to the limited amount of arable land and water, constraints in expansion of arable land and in sustainable increase of water use, low cereal production, increasing population, income growth and urbanization. Furthermore, according to the report, there are two kinds of risks related to food security: Price risks and Quantity risks. The level of vulnerability is determined by the level of dependence on cereal imports and fiscal balances. Since Jordan is a net importing country of cereal and has a weak fiscal balance, it is placed within the category of the most vulnerable countries to both quantity and prices risks respectively.

According to the Arab Human Development Report 2009, “Challenges to Human Security in the Arab World”, the concept of food security evolves to rest upon three pillars: i) Food availability: ensuring sufficient food supply whether from local production or the international market; ii) Food stability: ensuring a stable supply of food throughout the year and from one season to the next; iii) Food accessibility: ensuring that the food is available to the public at affordable prices relative to their income.

5 Policies and Programmes to Achieve Food Security and Sustainable Agriculture

The WTO Committee on Agriculture has classified Jordan as a net food importing developing country. It depends heavily on imports to feed its population of about 6 million (2008). It will have to feed at least two more million people by the year 2010 if the present rate of population growth remains at its 2000 level of 2.8 percent. The availability of food in Jordan depends on the amounts of food produced and imported, as well as, the amounts used for seeds, and amounts lost due to post harvest losses as provided by the FAO food balance sheets. For instance, the main cereal used in Jordan is wheat of which only 10% is locally produced, so the availability of cereals is rather dependent on the amount imported. The second most important cereal in Jordan is rice, which is entirely imported.

Most of the food consumed in Jordan especially cereals is imported. Jordan has witnessed an increasing trend, in the last four decades, towards the average daily per capita energy and macronutrient supply. Review of trends in per capita supply of calories, protein and fat in Arab countries over the last four decades revealed patterns similar to those of Jordan. Food availability in Jordan has been characterized, over the last three decades, by a considerable increase in cereals (primarily wheat) through imports, and a relative increase in milk, eggs, meat products, sugars, and vegetable oils. Removal of food subsidies, implementation of price liberalization policies, and the economic and social changes may have affected food expenditure and the purchasing power of the lower social segment of the population.

The World Food Programme (WFP) identified key risks to food security in Jordan’s as follows:

- Lack of job opportunities and low income;
- Decline in economic indicators;
- Agricultural land degradation;
- Self-insufficiency in food products, especially cereals; and
- Water scarcity, with Jordan ranking among the ten most water-deficit countries.

6 Food Availability in Jordan

Even within the limited available land, there has been a decreasing trend in the land used for
cereals. Land under ‘field crops’ (cereals, pulses, tobacco and vegetables) has fallen steadily (over 32% from 1992-2008), while that under fruit trees and olives has increased (about 64% from 1992-2008). This is attributed to increasing urbanization, which has disproportionately reduced the land that is suitable for field crops, and the increasing fragmentation of land holdings, since wheat cultivation is not economically viable on holdings below a minimum size. Therefore, strategic interventions would need to address improvements in grain procurement from the world market, its storage and distribution; sustainable and water conserving ways to improve yield; and increasing the value of the small farmers’ production of fruits and vegetables to boost their income, so as to enable them to buy cereals from the market. The main fruits and vegetables produced in Jordan are; tomatoes, potatoes, cucumbers, eggplants of which the average annual production is; 750, 190, 140, and 60 thousand tons respectively. Other types are also produced with less quantity such as; pepper, beans, lettuce, okra, onion, etc. In regards to fresh fruits, Jordan produces on average 160, 100, 70, 80, 60, and 160 thousand tons annually of citrus, water melons, apples, bananas, grapes and olives respectively.

7 Special Programme for Food Security in Jordan

7.1 Program Philosophy

The programme has been established on the following assumptions:

• That viable opportunity for farmers to increase their food production does exist.

• That farmers’ failure to utilize these opportunities is due to the presence of a range of constraints that prevent them from responding to needs and potentials. They belief that increasing productivity and improving the quality of life of rural families as well as creating an enabling environment for sustainable agricultural and rural development is possible by working with farmers and other stakeholders in identifying available opportunities and demonstrating better ways of increasing farm output and incomes and in defining and resolving constraints whether they are technical, institutional, economical, social or political. The Programme considers that improving the productivity of small farmers is the preferred option for enhancing food security in the rural areas, given that the agricultural sector is the main source for employment, providing food and income and is the basis on which many non-agricultural activities rely, both pre- and post production.

7.2 Objective of the Programme

Improving the food security of rural families is the main objective of the Programme. It is to be accomplished through achieving sustainable increase in productivity, reduction in year-to-year variability in production on the basis of stability of economic and environmental conditions, and the incentives emerging as a result of the increase in production, within the national and local economic framework. The Programme also aims at maximizing the degree of self-reliance of rural women and increasing net incomes through activating the role of rural families. The programme consists of twenty-one projects proposed to be implemented during the period from 2004 to 2010 in the highland regions of Jordan, at a total cost of JD 37 million with the following core components:

• Soil and water management at farm level.

• Development of field crops production.

• Diversification of production systems by introducing horticulture.

• Development of small livestock projects at household level.

• Income generating activities for employment and poverty alleviation.
• Policies and programmes to enhance agriculture productivity and farmers incomes.
• Community-based and indigenous approaches to sustainable food production.
• Actions to improve water management in agriculture (e.g. more efficient use, improved irrigation); measures to make more efficient and effective use of energy and other essential inputs for sustainable agricultural production.
• Measures to improve and develop infrastructure to enhance distribution to markets.

The Government of Jordan has been approaching food security largely through the following, 3 sectoral entry points:

i) Social protection initiatives: e.g., increases in distribution of cash, food or vitamin supplements to vulnerable people;

ii) Short-term responses to economic events: e.g., removal of taxes and tariffs on essential commodities; removal of interest from agricultural loans; subsidizing some food items and removal of subsidies on some others; and,

iii) Longer-term Poverty alleviation interventions: e.g., policy support and project-based actions for increasing agriculture; income generation projects, particularly for agro-industry; capacity building, job re-training and provision of credit.

7.3 On-going Initiatives

7.3.1 Food Fortification

The Ministry of Health (MoH) has been working on flour fortification (Al Mwahhad) and Vitamin A supplementation. Ministry plans to expand fortification to all four types of flour, provide training for millers and health inspectors, introduce vitamin D supplementation for infants, and iron supplementation for pregnant women. Additionally, MoH plans to improve the monitoring and evaluation of its programmes, strengthen the national surveillance system and develop a public communication plan on nutrition.

7.3.2 School Feeding

The key government activity in this area is the Ministry of Education (MoE) Universal School Feeding Programme (SFP). The School Feeding Programme (SFP) was launched in 1999, aiming to provide meals to all public school children at the age group 6-12 years. Initially, 10000 students were targeted. The programme has expanded to target 526,146 students in 2009 and is planning to reach 610,000 by the coming few years. It aims to improve the feeding and health status of children in public schools in the less privileged areas, develop and fix life-long positive attitudes and nutritious food habits, reduce drop-outs and enhance the interactions of the educational process. The MoE plans to continue expanding its reach to cover the entire Kingdom.

7.3.3 Safety Nets

The Ministry of Social Development and the National Aid Fund are developing with the support of the World Bank an alternative to replace the current categorical cash transfers with transfers targeted through a proxy-means test. This involves determining a set of observable characteristics that are correlated with poverty to identify the eligible population. This is based on household surveys and a particular formula. The approach is still being tested and is under consideration by the government.

7.3.4 Enhancing Livelihoods

Several initiatives to enhance rural livelihoods are implemented by the government and especially by the Ministry of Agriculture (MoA). Key initiatives
include Agro-processing income generating projects in rural areas, combating rural poverty programme to enhance food security at rural household level. Rural livelihoods and climate change adaptation which is planned in cooperation with the International Fund for Agricultural Development (IFAD) that aims to draft a definition of agriculture and rural life to adapt to climate change, the management of water resources used in agriculture and diversity in the cultivation of crops that are less affected by climate change.

References

### Table 1: Percentages of Self-sufficiency in Agricultural Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Self-sufficiency (%)</th>
<th>Production</th>
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<tbody>
<tr>
<td>Vegetables</td>
<td>124</td>
<td>1.4 million tons</td>
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<tr>
<td>Fruits and olives</td>
<td>110</td>
<td>0.6 million tons</td>
</tr>
<tr>
<td>Table eggs</td>
<td>103</td>
<td>810 million eggs</td>
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<tr>
<td>Poultry meat</td>
<td>97</td>
<td>94,000 tons</td>
</tr>
<tr>
<td>Milk</td>
<td>56</td>
<td>171,000 tons</td>
</tr>
<tr>
<td>Red meat</td>
<td>32</td>
<td>15,000 tons</td>
</tr>
<tr>
<td>cereals</td>
<td>12</td>
<td>54,000 tons</td>
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### Table 2: Agricultural Production and Agricultural Production Index

**Agricultural Production (Thousand Tonnes)**

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<tr>
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<th></th>
<th></th>
<th></th>
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<tr>
<td>Plant Production</td>
<td></td>
<td></td>
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<tr>
<td>Wheat</td>
<td>7.8</td>
<td>21.0</td>
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<td>Barley</td>
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<td>18.4</td>
<td>31.8</td>
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<td>Tobacco</td>
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<td>0.0</td>
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<td>Lentils</td>
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<td>0.8</td>
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<td>Maize &amp; Sorghum</td>
<td>29.3</td>
<td>18.8</td>
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<td>36.2</td>
<td>19.2</td>
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<td>Clover</td>
<td>162.6</td>
<td>89.8</td>
<td>275.5</td>
<td>264.6</td>
<td>296.2</td>
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<td>Vegetables, of which:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tomatoes</td>
<td>600.3</td>
<td>610.2</td>
<td>545.6</td>
<td>596.9</td>
<td>449.5</td>
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<td>Eggplant</td>
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<td>98.1</td>
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<td>Cucumbers</td>
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<td>Cauliflowers and Cabbages</td>
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<td>118.7</td>
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<td>Potatoes</td>
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<td>Zucchini</td>
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<td>Fruitfull Trees, of which:</td>
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<td></td>
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<td>Olives</td>
<td>94.1</td>
<td>125.0</td>
<td>146.8</td>
<td>113.1</td>
<td>160.7</td>
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<td>Grapes</td>
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<td>27.6</td>
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<td>Citrus Fruits</td>
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<td>90.4</td>
<td>139.2</td>
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<tr>
<td>Bananas</td>
<td>41.5</td>
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<td>42.1</td>
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<td>Apple</td>
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<td>Peach</td>
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<td>19.0</td>
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**Livestock Production (thousand head)**

<table>
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<tbody>
<tr>
<td>New Born Sheep &amp; Goats</td>
<td>2533.7</td>
<td>1747.1</td>
<td>1624.5</td>
<td>1608.6</td>
<td>1400.1</td>
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<td>New Born Cattle</td>
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<td>41.0</td>
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<td>35.0</td>
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<tr>
<td>Broiler</td>
<td>187.8</td>
<td>180.3</td>
<td>157.5</td>
<td>181.1</td>
<td>167.8</td>
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<td>Milk</td>
<td>417.4</td>
<td>345.1</td>
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<td>Table Eggs</td>
<td>816.4</td>
<td>439.6</td>
<td>504.0</td>
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<td>557.3</td>
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<tr>
<td></td>
<td>2023</td>
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<td>2021</td>
<td>2020</td>
<td>2019</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
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<tr>
<td>Hatchery Eggs (million egg)</td>
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<td>185.8</td>
<td>217.0</td>
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<td>Chick ( Million Bird)</td>
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**Agricultural Production Index Number (1997=100)**

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<td>Field Crops</td>
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<td>64.6</td>
<td>70.1</td>
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<td>Vegetables</td>
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<tr>
<td>Fruitfull trees</td>
<td>174.6</td>
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<td>220.4</td>
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<td>General Index</td>
<td>159.7</td>
<td>162.1</td>
<td>180.9</td>
<td>183.4</td>
<td>180.3</td>
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**General Index Number for farm - Gate Prices (1997=100)**

<table>
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<tr>
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<th>2022</th>
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<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Index</td>
<td>170.1</td>
<td>144.2</td>
<td>111.9</td>
<td>97.0</td>
<td>97.5</td>
</tr>
</tbody>
</table>
1 Introduction

Malawi is a land locked country that lies in central east of Africa. Malawi is bordered by Tanzania to the north, Mozambique to the south east and Zambia to the west. According to 1998 Malawi’s Housing and Population census results, Malawi has a total population of about 13,077,160. Out of this population about 85% still lives in rural areas. The annual population growth rate between 1998 and 2008 was 2.8%. Poverty level has reduced from 52% in 1998 to almost 45% in 2008. The poverty levels have reduced simply because of achieving food security, in the country apart from other basic needs. Malawi has achieved tremendous food security due to a number of policies and programmes that the country is implementing.

Malawi got its independence from British Colonial on 6th July, 1964. Since then economy of Malawi has been registering negative growth, until early 2000. The main macro-economic indicators remained unsatisfactory with the increase of domestic debt stock as a major setback. In addition, socio-economic indicators were still poor with food security being a continuing threat to better life, apart from education and health. This can be due to structural adjustment programmes that the government was following, placing emphasis on physical infrastructure development, ignoring social economic growth. In September 2000, Malawi was one of the 159 countries that signed and adopted the United Nations Millennium Development Goals (MDGs). These are: eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empowerment; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria and other diseases; ensure environmental sustainability; and lastly, developing global partnership for development.

As one way of achieving the MDGs, country developed Malawi Growth and Development Strategy (MGDS). The MGDS is the overarching strategy for socio-economic growth and development. The main goal of MGDS is to reduce poverty levels and ensure food security among Malawians. The MGDS initially had six priorities but three more priorities have been included in order to address fully the MDGs.

The priority areas in the Malawi growth and development strategy are: Agriculture and Food Security as the first priority; the Green Belt Irrigation and Water Development; Education, Science and Technology; Transport Infrastructure, Climate Change Natural Resources and Environment Management; Integrated Rural Development; Public Health Sanitation and HIV/AIDS Management; Youth Development and Empowerment; and Energy, Mining and Industrial Development. This paper will dwell much on first and second priorities of agriculture and food security and the green belt irrigation.

2 Agriculture and Food Security as Priority in Malawi’s Growth and Development Strategies

Agriculture is still the backbone of the economy
of Malawi as it contributes over 80 per cent of foreign exchange earnings and employs about 80 per cent of the work force. The main food crops grown in the country are: maize, cassava, rice, beans, soya beans, peas, sweet potatoes, Irish potatoes and sorghum. The main cash crops are: tobacco, tea, cotton and sugarcane. Livestock also contributes to household food security in terms of provision of protein. Some of the livestock that are reared at household level are; chicken, goats, cattle, pigs and sheep. In addition Malawi is blessed with water bodies like Lake Malawi, Malombe, and Shire River, which are important sources of different species of fish. These increase protein intake among the communities hence ensuring quality food security.

Agriculture in Malawi in the past has had some characteristics that made it difficult to achieve food security. Some of the characteristics have been: low and stagnant yields; overdependence of rain fed farming which increases vulnerability to weather related shocks, low level of irrigation development and low uptake of improved farm inputs. Currently, the main goal of improving agriculture is to increase its contribution to economic growth by increasing production for food security, through agro-processing and manufacturing for both domestic and export markets thereby, increasing foreign exchange.

The people have suffered with food insecurity in the past and starvation so that it used to rely on food aid from different donors until in 2004 when it reviewed the food security strategy. Some of the policies that Malawi adopted with the wise leadership of Ngwazi Dr Bingu Wa Mutharika are as follows:

3 Government’s Strategies for Improving Food Security

3.1 Farm Inputs Subsidy Programme

The prices of fertilizer and farm inputs have been increasingly world wide and Malawi inclusive. At the same time the soils continue to degrade due to poor agricultural practices, so that one can yield unless one applies fertilizer. Malawi government realized that most of the poor population cannot afford to buy the fertilizers and farm inputs like chemicals, pesticides or seeds. Therefore, in 2004, Malawi embarked on a programme of subsidizing the price of fertilizer and farm inputs especially to the poor of the poorest. The programme has been very effective and only targeting the poor of the poorest by allowing them to pay one tenth the price of fertilizer on the market shelf. The input subsidy programme that the Government has been implementing in the past five years resulted in maize surpluses of 500,000 metric tons in 2005/06; 1.1 million metric tons in 2006/2007; 500,000 metric tons in 2007/2008 and 1.3 metric tons of maize in 2008/2009. Some of the maize is exported and donated to Zimbabwe - a neighbouring country and sold out to Mozambique and Tanzania.

<table>
<thead>
<tr>
<th>Year</th>
<th>Surplus of Maize (metric tones)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005/06</td>
<td>500,000</td>
</tr>
<tr>
<td>2006/07</td>
<td>1.1 million</td>
</tr>
<tr>
<td>2007/08</td>
<td>500,000</td>
</tr>
<tr>
<td>2008/09</td>
<td>1.3 million</td>
</tr>
</tbody>
</table>

Malawi has actually managed to achieve the first UN Millennium Development Goal of halving the poverty levels because of registering high on food security. One can also argue that poverty levels were dropped from around 55% in 1998 to 40% in 2008, due to the reason that most Malawians were food secured.

3.2 Diversification of Agriculture

Maize has been the staple food crop in Malawi, this resulted in most Malawians depending on maize meal for food and not any other food crops that can also do well with the Malawian weather.
The government of Malawi has embarked on diversifying agriculture, so that people should not only rely on maize but other food crops. Therefore, farmers increased the production of other food crops apart from maize. For instance, in 2009 there was an increase of 135,000 tons rice, 293,000 metric tons of ground nuts, 499,000 metric tons of pulses like (beans, pigeon peas, cow peas), 3.7 milliohm metric tons of cassava, 2.69 metric tons of sweet potatoes, 775,000 metric tons of European potato, 60,000 metric tons of sorghum and 26,000 metric tons of millet. This is helping Malawians to eat other food crops apart from rice.

3.3 Improving Food Storage

The government has realized that most of the crops are lost through post harvest. Therefore, it has come up with modern ways of ensuring that crops are properly taken care through proper storage. The government has constructed grain reserves in all the four political region of the country so that crops will be stored soon after harvest and sell it at a very reasonable price during the dry season or when farmers have run out of stocks in their households. In addition government is sensitizing farmers on new methods of grain storage at household level. This is done by constructing steel bin silos in strategic areas to improve medium to long term food storage capacity. In addition every household is being educated to store the right amount of food that can last for the whole year.

3.4 Agro-Processing

Agro-processing enhances value addition to produce thereby, fetching high on local and international markets. Agro-processing ensures food security throughout the year as food crops will not be damaged or destroyed. The MGDS identifies agro-processing as potential for growth. Processing of crops in the past was largely concentrated on tobacco, tea, sugar, cotton, and wheat for estate farmers. However, government is training local farmers in different skills of agro-processing of fruits, vegetables, rice, cassava, macadamia, cashew nuts, Irish potatoes and spices at household level. The government is investing in agro-processing in order to increase food security at household and national level by improving infrastructure for agro-processing by establishing rural factories through One Village One Product (OVOP). Some of the products that are being processed at community level are: cassava flour, starch, crisps, packed rice, honey, tomato puree, fruit juices and fruit jams.

3.5 The Green Belt Irrigation and Water Development

Malawi has been relying on rain fed agriculture and yet the country is blessed with water bodies like Lake Malawi, Lake Chilili, lake Malombe, Shire River, Bua, Ruo, Dwangwa, lithipe, Diaphwe, and Rukuru Rivers which are potential sources of irrigation as waters in these sources are never dry throughout the year. In 2009/2010 almost 1,000,000 hectares of land was put under irrigation. This was done by constructing and promoting small and medium scale irrigation schemes, in order to enhance food crop production.

3.6 Promoting Use of Manure

The government of Malawi has realized that continuous use of chemical fertilizer will in the long run damage the fertile soil. As a result the government, in conjunction with development partners is coming up with different ways of making organic fertilizer. This needs a lot of research, investment and sensilization.

4 Challenges

The major challenges are infrastructure development in terms of road and access to good markets where local communities can sell their products at very competitive prices. This is because
the supply is too much, the demand is so low as a result prices is reduced. However, the Government is controlling the price of food crops so that business vendors who are middle men should not exploit farmers.

The other challenge that Malawi may face in future will be degradation of soil due to continuous application of fertilizers and chemical to soil. However, the Malawi government is sensitizing and training communities on manure making in order to conserve soil and water.

5 Conclusion

Malawi has achieved food security for the past five years due to subsidizing on farm inputs, diversification of food crops from maize, agro-processing through value addition and processing of crops fruits, vegetables and increase irrigated land so that more crops can be grown per year thereby increasing production per household and for the nation and use of manure. However, access to good markets and some value addition skills are some of the challenges to food security.
1 Introduction

The thrust of Agricultural Policy in Nigeria is to increase the food production to attain the comfortable level of food security to feed the teeming population in excess of 140 million and also generate surplus to contribute to global food production.

Food security and poverty alleviation are some of the vital requirements for political stability, security of lives and properties which will ultimately lead to rapid economic development of our nation.

2 General Information

2.1 Demographic

i) Population - 144,749,000
ii) Total Area - 923,768.64 Sq. Kilometre
iii) Location - Sub-Sahara (West) Africa

2.2 Social

Life Expectancy:

i) Male - 48 years
ii) Female - 51.7 years

Percent of population under poverty line:

i) Less than $2 a day - 67.5%
ii) Literacy rate - 30.1%

UNDP Human Development:

i) Index Ranking (2007) - 158

2.3 Economic

Gross Domestic Product:

i) Growth Rate (Average over 3 years) - 3.5%
ii) Current growth rate of Agricultural GDP - 4.1%

3 Climate, Vegetation and Rainfall Pattern

The general climatic condition prevailing is favourable for the production of large varieties of agricultural produce. Three (3) major agricultural zones exist within the six geo-political zones of the country.

i) Southern tree and root crop zone mainly found in the rainforest belt;

ii) Mixed crops zones of the guinea savannah mainly found in the middle belt zone;

iii) Northern zone comprises of Sudan Savannah.

3.1 Rainfall Pattern and Temperature Distribution

Rainfall pattern is evenly distributed in many parts of the country. It lasts up to eight months (March – October) in the Southern tree and root crop zone, decreasing to 7 months in the mixed crop zone. In the North the rainy season lasts for continuously...
5-6 months usually from May – October. However, in the extreme arid areas, 3 months of rainfall between July-August and September-October the temperature ranges from 15°C to 43°C as illustrated in Table 1.

4 Soil

The major soil classifications in Nigeria are as follows:

i) Alluvial soil formed along the banks of River Niger and Benue, and in Niger Delta is mangrove swamp;

ii) Red and red-yellow fossil found in the North of the Mangrove area around the basins of River Niger and Benue;

iii) Ferruginous tropical soil in the South West part of the country;

iv) Lithe soil is found in the Central North, extending to the eastern boundary; and

v) Semi arid brown or reddish brown soil located in the North East pans. The potential of Nigerian land resources is yet to be fully exploited as illustrated in Table 2.

5 Agricultural Prospects

i) Nigeria has:

- A total area of 92.4 million ha.
- Land area of 79.4 million ha.
- 72 million ha. is good for farming but less than half is being explored.
- Arable Land 30.3 million ha.

ii) The population involved in farming is high (60 – 70%);

iii) Agriculture’s contribution to GDP is also high (41.5%);

iv) Output of food per capital is among the highest in SSA; and

v) Crops, livestock and fish have potentials for providing food and nutrition.

5.1 Paradox

i) Yet, there is threat of hunger and poverty; 70% of the population lives on less than N100 (US$ 0.7) per day;

ii) Youth unemployment is high;

iii) Smallholder farmers constitute 80% of all farm holdings; their production system is inefficient; there is regular shortfall in national domestic production; and

iv) Food import is thus a common feature.

5.2 Hope

i) Agriculture is a key sector that can affect majority of Nigerians.

6 Food Security Situation

6.1 Food Security Status

This is a fundamental agricultural objective in Nigeria:

- Households should have access to good and nutritious food for healthy living; and

- Population should be healthy to create national wealth.

6.2 Fundamental Issues of Food Security

6.2.1 Is food Available?
- Domestic food production is on the increase; but not enough to meet national food demand.

6.2.2 Is Supply of Food Stable?
- Post harvest losses are high (20-40%), because harvesting, processing/storage techniques are inefficient; as a result, supply is unstable.

6.2.3 Do people have Access to Food?
- Access to adequate and nutritious food is limited by low income/poverty, because nutritious foods are sometimes expensive.

6.2.4 What is Food Utilization Like?
- Food intake and nutritional well-being of many households are of relatively low quality; and are affected by their low economic status.
- The vulnerable and food insecure include the poor, smallholder farmers, children, pregnant women, lactating mothers and the elderly.
- About 60.8% Nigerians are malnourished.

6.3 Prevalent Deficiency Diseases
i) Iron deficiency which affects physical capacity, and in severe cases lead to death and susceptibility to infections;
ii) Protein Energy Malnutrition (PEM) which causes growth failure in children, and weight loss in adults; Relationship exists between PEM and infectious like measles, diarrhoea, whopping cough, tuberculosis, and malaria;
iii) Vitamin A, deficiency, which decreases resistance to infections;
iv) Obesity, which is on the increase, affects more of urban dwellers and results from imbalanced nutrition. It is accompanied by hypertension, diabetes mellitus and cardiovascular diseases; and
v) Problem of the vulnerable and food insecure can be addressed by low poverty, high accessibility of households to adequate and nutritious food all the time.

6.4 Food Balance Sheet
i) Table 3 shows domestic food production, demand and shortfalls during 1994–2001 and the graph shows production, demand and supply;
ii) Domestic production increases but demand remained above production; and
iii) Shortfall increases and food import equally increases. If nothing is done about the shortfalls, it may sooner than expected become too high to manage.

6.4.2 Managing Food Production for Increased Growth
Food production must grow consistently well above demand to bridge shortfalls.

7 Evolution and Trend of Agricultural Support

7.1 Agriculture’s Importance
i) Agricultural sector has hope considering the prospects mentioned in 1.1.
7.2 **Origin of Support**

i) Nigeria’s agriculture at independence (1960) was characterized by:

- High production achieved by mobilizing small scale farmers;

- Provision of infrastructure (roads, railways) geared towards developing crops required for export;

- Food was abundant; demand met without resort to import; and

- Foundation for research and export was laid.

ii) Government interventions in agriculture after independence were realized within the Development Plans and annual budgets.

7.3 **Agriculture’s Contribution to Food Security**

i) Agriculture has contributed to national food security by helping to maintain health and peaceful population;

ii) It has also been a source of food and nutrition for households; and

iii) Agricultural export earnings grew from N2.85b (US$ 0.354b) to N19.17b (US$ 2.484b) between 1990 and 2000.

7.4 **Challenges and Opportunities for Agricultural Development**

i) Some of the obstacles on the way to agricultural development include:

- Soil infertility problems which are caused by water and wind erosion. Problem of water erosion can be addressed by developing covers for the soil, and improving soil structure through promotion of organic matter use, and good agronomic practices;

- Problem of wind erosion can be addressed by planting trees which are also of economic value, and can provide cover for the soil;

- Inadequacy of rain-fed agriculture - This can be addressed by providing more support for fadama development and management;

- Non fine-tuning of macroeconomic and agricultural sector policies to meet the need for farmers and investors in agriculture; and

- Uncontrolled food import including those with local substitutes: a) This can be address by not allowing food import to be a disincentive to local producers; b) Local food production needs to be encouraged by making inputs available, giving farmers access to more farm land, providing micro credit at subsidized cost, supporting adequate processing and storage, providing market facilities, and discouraging import of produce with local substitutes through increased tariffs.

ii) External Development Assistance should be pursued in view of meagre financial allocations to the sector.

7.5 **Budget and Fiscal Support**

i) Development Plans and annual budgets provided funds for support to agriculture. These are however hardly enough to support the sector as shown in Tables 4 and 5.

7.6 **Institutional Support**

i) Many institutional programmes in agriculture have been undertaken since the sixties, such as:

- National Accelerated Food Production Programme (NAFPP) 2nd plan;
- River Basin Development Authority Programme (RBDA) 1970 – 74;
- Operation Feed the Nation (OFN);
- Rural Integrated Agricultural Development Programme (ADP);
- Green Revolution Programme (GR) 3rd plan;
- Agro Service Center Programme (ASC);
- National Seed Service (NSS);
- National and State Food Production Companies 1975-80: Fourth Development Plan was characterized by slow progress, there was massive food import; and SAP was introduced (1985-86) to deregulate and stimulate local production;
- National Acceleration Crops Production Programme (NAICPP) – 1996;
- Agricultural and Rural Transformation Programme (ARTP) – 2000: National Economic Empowerment Development Strategy (NEEDS) was introduced in 2003-04; it is a reform programme that encourages private sector operations; and
- Presidential Initiative Programmes (being implemented within the framework of NEEDS: There are many other externally supported programmes e.g. RTEP, SPFS, etc.

7.7 Agriculture’s Funding Problem

i) Funding was and remains a major problem for both the government and farmer investor;

ii) Government budget for agriculture has been low and should rather be increased; and

iii) Development assistance from external agencies should be sourced, to complement sparse local funding. Effort should be made to achieve reasonable drawn down of external development funds by playing to rule.

7.8 Comparing Evolution of Public Support with Trends in Agricultural Development and Food Security

i) Government has been intervening in agriculture in the past;

ii) Food production has also been on the increase;

iii) But food deficit has not only remained, but is on the increase;

iv) Many Nigerians are food poor/food insecure; with attendant health risks; and reduced work capacity; and

v) Agriculture deserves concessional support to raise output, and attain food security.

8 Impact of Food Import

8.1 Level of Dependence on Food Import

i) Nigeria depends on commercial food and import to fill the gap in deficit supply as shown in Table 6.

8.2 The Impact

It has favourable and unfavourable impacts:

8.2.1 Impact on Domestic Food Supply

- Affects household food consumption and demand patterns by heightening the taste for foreign foods (e.g. foreign rice, fruit juice); and

- Linked with this change is growing dislike
for some local foods (Yam – Dioscorea; Cocoyam – Colocasia).

8.2.2 Impact on Domestic Producer and Consumer Price
- Low domestic produce; reduces farm income;
- Low consumer price: leading to consumer sovereignty (farmer is price taker); and
- Low farm income is disincentive to production; some farmers (younger/inexperienced ones) leave.

8.2.3 Impact on Farmers’ Productivity
- Low farm income has spiral effects;
- Affects socio-economic status of farmer (poverty/hunger);
- Household health is affected (low resistance to disease);
- Low capacity for work;
- Low educational achievement (farm household); and
- Puts pressure on some farmers to pursue new technologies.

8.2.4 Impact on Vulnerable Group
- Has different impacts on the vulnerable group;
- Among small-scale farmers and low income earners, where income is low, there is inadequate feeding/poor nutrition;
- Among vulnerable consumers, when price is low, it sometimes brings about better feeding/improved nutrition; and
- New eating habits from some imported foods increase incidents of nutritional problems (beriberi and obesity).

8.2.5 Macroeconomic Impact
- Commercial food import is demanding on the economy (see Table 7).
- What is spent on foreign exchange to import food with local substitutes could be used in direct investment in agriculture to achieve higher result.
- Food import bills are worsened by declining foreign exchange rate; this fans local inflation e.g. highest inflation rate of 72.8% recorded in 1995 occurred same year highest quantum leap in food import bill of N88.35 b (US $10.99b) was recorded.

8.2.6 Positive Impact of Food Import
- It is a reliable short term measure for meeting deficit food supplies;
- It helps to stabilize domestic price;
- Provides employment for importers, even though some local producers may have been displaced; and
- Food import is probably a concept that will remain in a global world. As an agricultural nation, Nigeria has natural endowments to drive agriculture towards export orientation, and cease being a net food importer.

9 Proposal for making Nigeria Food Secure on Sustainable Basis

9.1 Development Opportunities

9.1.1 Crops
- Research support for raising foundation/breeder seeds; and development of seed gardens for tree crops;
- Support for field planting of arable/tree crops (land acquisition assistance; mechanization; extension; training; micro credit for inputs);
- Soil fertility improvement using organic matter to plant arable crops and planting of economic trees in marginal and eroded soils;
- Infrastructure and organizational support for fadama development; and
- Farmer/investor support for production, processing, storage and market of produce.

9.1.2 Livestock

- Research support for improvement of stock breeds (sheep/goat, cattle, ruminants (grass cutter), poultry;
- Control of livestock diseases;
- Development of grazing reserves (settle pastoralists); and
- Farmer/investor support for production/processing/storage/market.

9.1.3 Fish

- Support to hatcheries for production of fingerlings;
- Stocking high quality and fast growing fingerlings in reservoirs, dams and lakes; and
- Support to fish farmers for production/processing/storage/market.

9.2 Policy Orientation

9.2.1 Farmland

- The policy orientation will be directed toward making more farm land available to the farmer by organizing the pooling of land, so that operations can benefit from economy of scale. This will be started on pilot scale in rice and maize grown areas in the country.

9.2.2 Fertilizer

- The objective will be to deliver inorganic fertilizers through private suppliers so that it will be available to the farmer on time; and
- The approach will minimize racketeering, and prepare farmers towards buying fertilizer at cost. The policy will in addition encourage the use of organic matter as alternative to inorganic manure.

9.2.3 Mechanization

- The objective is to promote farm power use by making more functional tractors available; and
- Purchase of work bull and animal drawn implements will be facilitated.

9.2.4 Fadama Development

- The objective is to provide support for water management systems in low lying flood plans (fadama), so that farming activities can go on, particularly in the dry season; and
- This will involve provision of infrastructure like access road in fadama areas, and promotion of institutional organization of fadama users.

9.2.5 Processing

- Policy orientation to add more value to produce from the farm and promote shelve life;
- This will be encouraged through provision of credit to farmers/investors; and
- More studies on processing of staple foods that are on production decline will be undertaken to improve their form and acceptability.

9.2.6 Storage

- The objective will be to provide models of on-farm storage facilities at the ADPs for farmers to see, and arrange to reproduce.

9.2.7 Market

- The policy objective is to prepare the produce for the market by providing support for the provision of facilities for sanitary and phyto-sanitary services in order to improve the grade of their product; and

- Market information will be made available through the commodity association which the farmer belongs.

9.2.8 Micro-credit

- Policy thrust will be towards providing credit support for small scale farmers who constitute 80% of farm holdings, and some medium scale operators; and

- Interest rate (IR) on borrowed capital should be low.

9.2.9 Extension and Training

- Extension support will be provided to farmers. Training on relevant skills will be extended to both farmers and extension officers.

9.2.10 Food Import

- Policy orientation will be to minimize food import, particularly those that have local substitutes, so that local production can be stimulated; and

- This will be achieved through recommending high tariffs on such imported foods.
Table 1: Rainfall Pattern and Temperature Distribution

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Zone</th>
<th>Altitude</th>
<th>Rainfall</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South-South</td>
<td>0-100(m)</td>
<td>1,500mm-3200mm</td>
<td>24-32°C</td>
</tr>
<tr>
<td>2</td>
<td>South-West</td>
<td>0-150(m)</td>
<td>1,200mm-2600mm</td>
<td>26-35°C</td>
</tr>
<tr>
<td>3</td>
<td>South-East</td>
<td>80-200(m)</td>
<td>1,500mm-3000mm</td>
<td>25-35°C</td>
</tr>
<tr>
<td>4</td>
<td>North-West</td>
<td>500-1200(m)</td>
<td>500mm-1200mm</td>
<td>17-39°C</td>
</tr>
<tr>
<td>5</td>
<td>North-East</td>
<td>250-1200(m)</td>
<td>250mm-1200mm</td>
<td>17-43°C</td>
</tr>
<tr>
<td>6</td>
<td>North-Central</td>
<td>150-1600(m)</td>
<td>500mm-2000mm</td>
<td>15-40°C</td>
</tr>
</tbody>
</table>

Table 2: Agricultural Statistics

<table>
<thead>
<tr>
<th>Sl.</th>
<th>Region</th>
<th>Agricultural Land (Million ha.)</th>
<th>Land Cultivated (Million ha.)</th>
<th>Irrigated Area (Million ha.)</th>
<th>Major Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South-South</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Suitable for development of marine life</td>
</tr>
<tr>
<td>2</td>
<td>South-West</td>
<td>4.06</td>
<td>2.4</td>
<td>0.03</td>
<td>Maize, roots and tuber tree crops, fruits and vegetables. Other oil seeds</td>
</tr>
<tr>
<td>3</td>
<td>South-East</td>
<td>5.80</td>
<td>2.8</td>
<td>0.035</td>
<td>Maize, roots and tuber tree crops, fruits and vegetables, oil seeds</td>
</tr>
<tr>
<td>4</td>
<td>North-West</td>
<td>14</td>
<td>9.5</td>
<td>0.15</td>
<td>Sorghum, millet, maize, wheat, cotton, cowpea, groundnut, fruits and vegetables, rice, roots and tubers</td>
</tr>
<tr>
<td>5</td>
<td>North East</td>
<td>7.9</td>
<td>3.5</td>
<td>0.142</td>
<td>Millet, sorghum, rice wheat, sugar cane, cotton, coffee, fruits and vegetables cowpea and tubers</td>
</tr>
<tr>
<td>6</td>
<td>North Central</td>
<td>24.7</td>
<td>6.6</td>
<td>0.10</td>
<td>Roots and tubers, maize, sorghum, groundnut, tea/coffee, fruits and vegetables, acha</td>
</tr>
</tbody>
</table>

Table 3: Comparison of Food Production and Demand with Shortfalls and Imports (Million Mt)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>86.70</td>
<td>89.25</td>
<td>93.35</td>
<td>95.64</td>
<td>98.74</td>
<td>100.41</td>
<td>102.12</td>
<td>103.86</td>
</tr>
<tr>
<td>Food demand</td>
<td>87.23</td>
<td>89.55</td>
<td>96.26</td>
<td>99.03</td>
<td>101.87</td>
<td>104.63</td>
<td>107.46</td>
<td>110.37</td>
</tr>
<tr>
<td>Shortfall surplus</td>
<td>(0.53)</td>
<td>(0.30)</td>
<td>(2.91)</td>
<td>(3.43)</td>
<td>(3.13)</td>
<td>(4.22)</td>
<td>(5.34)</td>
<td>(6.51)</td>
</tr>
<tr>
<td>Food import</td>
<td>0.67</td>
<td>0.58</td>
<td>2.95</td>
<td>3.47</td>
<td>3.24</td>
<td>4.48</td>
<td>5.59</td>
<td>6.91</td>
</tr>
</tbody>
</table>

Source: FOS, Review of the Nigeria Economy, Various Issues
Table 4: Summary of Agricultural Budgets and Expenditures of the Development Plans

<table>
<thead>
<tr>
<th>Development Plans</th>
<th>Budget Agric as % of Total</th>
<th>Expenditure Agric Export as % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962 – 68</td>
<td>0.15 0.1 11.6</td>
<td>0.10 0.13 7.7</td>
</tr>
<tr>
<td>1970 - 80</td>
<td>0.33 0.43 9.9</td>
<td>0.21 0.27 6.3</td>
</tr>
<tr>
<td>1975 – 80</td>
<td>3.09 4.05 7.2</td>
<td>2.10 2.74 4.8</td>
</tr>
<tr>
<td>1981 - 85</td>
<td>8.82 11.53 N.Av</td>
<td>N.Av N.Av NAv</td>
</tr>
</tbody>
</table>

Source: CBN, National Development Plan 1992 Dollar conversion is in 1984 constant factor.

Table 5: Summary of Agriculture’s Annual Budgetary Allocations 1990 – 2002

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Budget</th>
<th>Allocation to Agric</th>
<th>Per cent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N’ billion</td>
<td>US $ billion</td>
<td>N’ billion</td>
</tr>
<tr>
<td>1990</td>
<td>39.76</td>
<td>4.94</td>
<td>1.96</td>
</tr>
<tr>
<td>1991</td>
<td>38.66</td>
<td>4.80</td>
<td>0.67</td>
</tr>
<tr>
<td>1992</td>
<td>112.10</td>
<td>13.94</td>
<td>2.83</td>
</tr>
<tr>
<td>1993</td>
<td>110.20</td>
<td>13.71</td>
<td>3.71</td>
</tr>
<tr>
<td>1994</td>
<td>153.49</td>
<td>19.09</td>
<td>6.92</td>
</tr>
<tr>
<td>1995</td>
<td>337.21</td>
<td>41.95</td>
<td>5.71</td>
</tr>
<tr>
<td>1996</td>
<td>428.21</td>
<td>53.27</td>
<td>8.66</td>
</tr>
<tr>
<td>1997</td>
<td>487.11</td>
<td>60.60</td>
<td>9.04</td>
</tr>
<tr>
<td>1998</td>
<td>947.69</td>
<td>117.90</td>
<td>12.15</td>
</tr>
<tr>
<td>1999</td>
<td>701.05</td>
<td>87.21</td>
<td>13.60</td>
</tr>
<tr>
<td>2000</td>
<td>1,018.02</td>
<td>126.65</td>
<td>64.94</td>
</tr>
<tr>
<td>2001</td>
<td>1,018.15</td>
<td>126.67</td>
<td>44.80</td>
</tr>
</tbody>
</table>


Table 6: Food Shortfall and Import (1994 – 2001)

<table>
<thead>
<tr>
<th>Year</th>
<th>Million Mt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>0.53</td>
</tr>
<tr>
<td>1995</td>
<td>0.30</td>
</tr>
<tr>
<td>1996</td>
<td>2.91</td>
</tr>
<tr>
<td>1997</td>
<td>3.34</td>
</tr>
<tr>
<td>1998</td>
<td>3.13</td>
</tr>
<tr>
<td>1999</td>
<td>4.22</td>
</tr>
<tr>
<td>2000</td>
<td>5.34</td>
</tr>
<tr>
<td>2001</td>
<td>6.51</td>
</tr>
<tr>
<td>Shortfall (Deficit)</td>
<td>0.67</td>
</tr>
<tr>
<td>Food Import</td>
<td>0.58</td>
</tr>
<tr>
<td>1995</td>
<td>2.95</td>
</tr>
<tr>
<td>1997</td>
<td>3.47</td>
</tr>
<tr>
<td>1998</td>
<td>3.24</td>
</tr>
<tr>
<td>2000</td>
<td>4.48</td>
</tr>
<tr>
<td>2001</td>
<td>5.59</td>
</tr>
<tr>
<td>2002</td>
<td>6.91</td>
</tr>
</tbody>
</table>

Source: FOS, Review of the Nigeria Economy, Various issues
Table 7: Food Import Bill (N' billion and US $ billion) 1990 – 2001

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Naira</td>
<td>3.47</td>
<td>7.79</td>
<td>11.74</td>
<td>13.95</td>
<td>16.77</td>
<td>88.35</td>
<td>75.95</td>
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<td>102.16</td>
<td>103.49</td>
<td>120.05</td>
<td>195.81</td>
</tr>
<tr>
<td>US $</td>
<td>0.43</td>
<td>0.97</td>
<td>1.46</td>
<td>1.73</td>
<td>2.09</td>
<td>10.99</td>
<td>9.45</td>
<td>12.52</td>
<td>12.71</td>
<td>12.88</td>
<td>14.35</td>
<td>24.36</td>
</tr>
</tbody>
</table>

Sources: 1. CBN, Statistical Bulletin and Annual Report (Various Issues)
2. CBN, Annual Report and Statement of Account, 2000
Note: Dollar conversion is in constant 1990 factor
1 Introduction

Modern Oman has a rich cultural and social history. Under the dynamic and prudent leadership of H.M. Sultan Qaboos bin Said since the year 1970, Oman has established a modern economy with world-class infrastructure. Peace, economic and political stability are some of the important assets of Oman. The diversification strategy as enshrined provided greater emphasis to the private sector, non-oil exports, development of agriculture resources and value addition by promotion of industrial processing units. Omani entrepreneurs are getting equipped for adopting suitable technology to nurse the quality of the product and enhancing the export market. Government of Oman ensures favourable industrial climate for attracting foreign investments and agro-industrial growth with global vision. Financial incentives like soft loan facilities can play a vital role in boosting investment in agriculture, livestock and fisheries activities.

1.1 Location

The Sultanate of Oman is located in the South Eastern tip of the Arabian Peninsula. Its land border with Saudi Arabia and the United Arab Emirate in the West and by the Republic of Yemen in the South. The Eastern side of the Sultanate borders on the Oman Sea and the Indian Ocean with a coastline of nearly 1690 kilometres.

Oman’s territory also includes the strategically important Musandam Peninsular, which is separated by the United Arab Emirates from the Oman side. Oman’s geography also encompasses the Island of Masirah, off the eastern coast. Oman has an approximate area of 309000sq km. Northern Oman has a mountain chain with heights up to 3000m.

1.1.1 Topography

The Sultanate of Oman is composed of varying topographic areas consisting of plains, wadis and mountains. The most important area is the plains overlooking the Oman Sea and the Arabian Sea with an area of about 3% of the total. The mountain ranges occupy about 15% of the total, the most important of which are “Al Hajar”, extending in the form of an arch from Ras Musandam in the North to Ras Al Had and Al Qara in the South Western corner of Oman. The remaining is mainly sand and desert which includes part of AL Ryub Al-Khali occupying about 82% of the total area.

1.1.2 Climate

The climate differs from one area to another; it is hot and humid in the coastal areas in summer, hot and dry in the interior with the exception of higher mountains, which enjoy a moderate climate throughout the year. The Dhofar Regions is also moderate. Generally, the Sultanate has little and irregular rains, though heavy rains fall at times with the exception of Dhofar Region where heavy and regular rains fall between June and October because of monsoons.

1.1.3 Administrative Regions

The Sultanate is divided into nine administrative
regions. These are: i) Muscat Governorate; ii) Al-Batinah Region; iii) Musandam Governorate; iv) Al Dhahirah Region; v) Al Dhakhliya Region; vi) Al Sharqiyah Region; vii) Al Wusta Region; viii) Dhofar Governorate; and ix) Al Buraimi Governorate.

1.1.4 Population

Table 1 present the region wise population of the country.

1.2 The Vision 2020 Oman

In June 1995 the Vision Conference: Oman 2020 was held in Muscat with the aim of moving the economy into a new phase of development leading to higher growth and prosperity. The main aims have been:

i) Economic and financial stability;

ii) Reshaping the role of government in the economy and broader private participation;

iii) Diversification of the economic base and sources of national income;

iv) Globalization of the Omani economy; and

v) Human resource development and upgrading the skills of the Omani workforce.

By the year 2020, it is expected that the economy will no longer rely on oil, but will be diversified with higher levels of savings and investment and that other sources of national income from the non-oil sector will assume the primary role:

- The Industrial Sector is where the major change is envisaged with the non-oil sector’s contribution rising from 7.5% in 1996 to 29% in 2020.

1.2.1 Investment Incentives and Aim of National Development Plan

Poised at the entrance to the Gulf, the source of two thirds of the world’s oil exports, Oman is in the middle of the East-West Trade routes, ensuring easy access to markets in the Middle East, India, South-East Asia, Africa, and Europe. Memberships of various regional associations have further smoothed trade routes.

Oman is a member of the Indian Ocean Rim Association for Regional Cooperation, which opens up a potential market of over 1500 million consumers. In addition membership of the Arab Gulf Cooperation Council ensures duty free export of products within the member countries.

One of the most progressive countries in the Middle East, the Sultanate has worked at creating the right climate for new investments by developing a free, competitive economy with equal opportunities for all, and shaping laws and regulations that encourage enterprise.

1.2.2 The Right Policies

A stable and farsighted Government is behind all that Oman has to offer. The Omani Rial is pegged to the US Dollar and is freely convertible. Liberal investor-friendly policies have been implemented, while procedures for clearances and approval have been simplified. Education and vocational training have been given priority, to ensure that a professionally trained workforce is being developed.

In addition, investors have easy access to a skilled and disciplined external workforce. Apart from the advantages of Oman’s strategic location,
political stability and excellent infrastructure, there are number of incentives offers to the investor.

1.3 Economic Review

Oman remains heavily dependent on oil revenue, which account for 80% of the country export earning and 40% of gross domestic product (GDP). Oman has emphases on privatization and diversification of its economy top policy priority. Its economic reform program stressing three keys which are: The Omanization of the Work Force, Economic Diversification and the Expansion of the Private Sectors. Also Oman has put a great effort to attract foreign investment particularly in light industry, tourism, and electric power generation. The economic development priority laid out a program designed to shift economic development from government to private sector initiative.

As regards the infrastructure built-up relevant to industrial development, Oman’s modern seaports and other utilities compliment the industrial sector as they act as export points for the national products.

The Sultanate has four ports which are Sultan Qaboos port, Salalah port, Sohar port and Duqm port. The Sultan Qaboos port has already been modernized. Salalah port is also being developed as a free Trade Zone. The port, which to major international container traffic route between Europe and the East, is aimed at making Oman as international reshipment location, Duqm port is under development.

2 Importance of Agriculture

2.1 GDP at Glance (2009)

- The Gross Domestic Product of the country is to the tune of R.O. 23 (year 2008). Agriculture, livestock and fisheries resources in Oman are one of the key resources to develop non-oil sector growth and attract foreign technologies and investment as shown in Table 2.
  - This sector contributes over 2% to the GDP of the country. Out of the total population of 2.32 million almost 40% is still clutching on to agriculture activities.
  - The dependence and importance of agriculture activities in Oman thus cannot be over emphasized.

2.2 Agriculture Production

- Oman has nine distinct agricultural regions viz. Muscat, Al Batinah, Musandam, Sharquiya, Dhakaliya, Interior, Al Wusta, Al Buraimi and Dhofar. Recent estimates indicate that Oman is self-sufficient in fruits (dates and bananas) and in vegetables when they are in season. The production of fruits is to the tune of 319,141 tons (year 2008) and that for vegetables it is to the tune of 141,073 tons (year 2008). As regards live stock, over 50% self-sufficiency in milk, 46% in beef, 44% in eggs, 27% in poultry meat and 23% in goat/sheep meat is attained.
  - This provides an opportunity to would be entrepreneurs to set up projects to bridge the demand gap as well as enhance exports. Some of the leading projects in poultry activities are already come up. There is potential to attract FDI in Oman on setting up sustainable projects in agri-activities. In Oman nearly 8 million date palms are under agricultural holdings occupying about 60% of the cultivable land. Annual production of the date for the year 2009 was 298602 tons. This provides large potential for establishing even regional processing and exports oriented units based on dates. In Dhofar region one of the important cash crops is coconut having 1025 feddan area and production of 4470 tons.

3 Food Security

Sultanate of Oman is an oil based economy. Over
the years due to the prudent policies adopted by the Government, there is notable growth in the other sectors like building construction, infrastructure, ports, tourism and industries not leaving the priority sector “the development of sustainable agriculture”. Oman Food Security is a great concern of the Government and this is being studies to develop the suitable strategy for the coming years.

Oman heavily depends on food imports. There is separate Organization known as “Public Authority Food Supply Distribution” working under Ministry of Commerce and Industry in association with The Ministry of Agriculture. The authority mainly confined to maintain food stocks enough to meet the requirements for essential commodities like rice, wheat, wheat flour, milk powder, vegetable oils, corn, and tea/coffee. However now the major focus in tune with the food security is on the following factors:

i) Enhancing local production and productivity in agriculture and improve quality of food and yield;

ii) Investment outside the country in agriculture activities in suitable countries;

iii) Rationalization of water use in agriculture sector and ranking it as a basic element and important measure for assessing the economic efficiency of the agricultural projects;

iv) Value addition by promoting processing units in live stock and agriculture;

v) Green house cultivation and introducing high-tech agriculture;

vi) Protection of human and livestock health from diseases and safeguarding food security; and

vii) Improvement of natural range lands productivity and creation of alternative food resources.

3.1 Self-Sufficiency Rates for Some Goods and Agricultural Products

The data from the Ministry of Agriculture illustrate that the Sultanate has achieved rates of self-sufficiency for some agricultural products and commodities in 2008, such as, 0.8% of the grains, about 51% in vegetables, 70% in fruit, 12.6% in red meat, 24% in white meat, 52% in eggs and milk about 58%. However, these ratios do not satisfy the ambition of officials in the Sultanate. Table 3 shows the details of self-sufficiency for some agricultural commodities and the products. The data shows that the percentage of sufficiency in cereals, for example, does not exceed 1% which means that to achieve self-sufficiency from local production. Oman will have to increase local grain production by 99%. In addition, to produce a ton of wheat you need 1,000 tons of water (1,000 cubic meters (m3)) and a ton of rice you need 3,400 cubic meters (Tony Allan, 2001), the amount of water that Oman does not have. On the other hand, Oman is 12.6% self-sufficient in red meat. To achieve full self-sufficiency from own production Oman needs to increase current production by 82%, this is also next to impossible given that 16,000 cubic meters of water are needed to produce a ton of red meat.

3.2 Threats to Food Security

Very high prices for agricultural commodities in 2007-2008 raised concerns worldwide about the availability of basic foodstuffs and the plight of the poor. Arab countries are particularly vulnerable to fluctuations in commodity markets as they are reliant on imports for most of their requirements. This has raised food security concerns despite their above average ability to pay the higher prices, more so than price is at the heart of these concerns.

The recent commodity crisis is generally attributed to the convergence of a number of factors of both a cyclical nature and longer-term structural factors
that lead to more permanent shifts in supply and demand. Short-term cyclical factors would include things such a drought or a crop failure due to an unusual climate change. There is evidence to suggest that although the crisis has passed, the underlying factors remain and volatility of markets is likely to increase. The reasons for this are set out as follows:

i) Agricultural commodity markets have always been the most volatile. This is because only a small proportion of production enters world trade; most of the world’s production is consumed where it is produced. These markets are referred to as “thin markets” wherein any small upsets in either demand or supply greatly magnify the quantity of the residual surplus available to be traded, and hence a volatile price profile. The thinner the market the more volatile prices are only 6% of rice and 5% of sugar enter world trade;

ii) Both supply and demand for agricultural commodity are inelastic, i.e. no rapid changes in response to high prices are possible. Households cannot quickly change their consumption patterns for basic staples, and farmers cannot quickly ramp up production when prices are high;

iii) Agricultural productivity has kept pace with demand from population growth. Expenditure on R&D has been declining for a very long time. This is contributing to commodity markets remaining thin;

iv) World stock levels have been declining, partly as the result of policy reform in OECD countries where price support schemes and the stockpiling of surplus production have been declining, and partly to the long drought being experienced in many countries. Stocks are a buffer to supply and demand fluctuations, and hence a price calming mechanism;

v) World demand continues to grow with both population growth, and with increasing incomes. Growth in population in Arab countries has been faster than for the world, and is expected to continue to outpace global growth;

vi) Most Arab countries have very limited prospects for increasing their domestic food production. Oman produces a higher proportion of its food than other GCC countries, but may also be reaching the limit with respect to resources endowments it has;

vii) Bio-fuel subsidies continue to divert agricultural production resources away from food, resulting in even thinner commodity markets. Most countries have provided subsidies and other incentives for green energy projects which continue to put pressure on crop resources;

viii) Historically, food prices have been correlated with oil prices, which mean that oil producers are largely insulated from increases in food prices. However, recent research has shown that when oil prices fall below $50 per barrel, oil and food prices decouple. This could be a likely shock scenario for Arab countries in the future—low oil prices coupled with a major drought will cause difficulties for oil producers to pay high food prices; and

ix) Climate change is expected to make markets even thinner even time as disruptions to supply increase. The concern for Arab countries is the increasing probability of droughts and floods in key cereal producing regions.

There are other concerns that also impact on the availability of commodities. In recent times there have been problems the supply of chickens and eggs for breeding due to Avian Influenza, and the disruptions to shipping due to the Somali hijacking crisis.

### 3.3 Most Important Challenges to Agricultural Development

Water scarcity is the most important determinants
of agricultural development in the Sultanate. Water is the primary determinant to increase local agricultural production, which led to reduced plantings in a limited number of crops.

Based on FAO (2003) by 2030 developing countries (such as Oman) would require an average production of 3,000 kcal/capita/day. Assuming that 20% of this is animal protein, an estimated 1,300 cubic meter per capita per year of freshwater would be needed (Rockström et al., 2007). As indicated Oman will have by 2050 between 0 and 500 cubic meters per capita per year of freshwater available which a serious water deficit since the amount required is 1,300 cubic meter per capita per year.

Land suitable for agriculture is also seriously scarce. The arable land in Oman is about 2.2 million hectares which is equivalent to 7% of the total area of Oman (31.4 million hectares). The actual cropped area in the Sultanate was 62,000 hectares or 2.8% of the total arable land and 0.2% of the total area of the country.

This indicates that irrigated land in the Sultanate of Oman is below 1%. If only 2.8% of the 2.2 million hectares of arable land can be supported by available water, it is therefore impossible for Oman to achieve self sufficiency from local production (MoA, 2010).

Significant expansion of local production to meet food security needs is realistically impossible. It will put more pressure on the scarce water resources that the country has and most importantly domestic production may not be sustainable. Marginally however it might be possible to increase local production through improvements in land and water productivity. Otherwise there may be other sustainable ways to attain food security than attempting to increase local production. For that, the Sultanate developed many policies to promote and ensure food security, whether through the development of a clear strategy to increase agricultural production, with water conservation and ensure their survival for future generations, in addition to providing food from other sources.

Under the circumstances the areas in which Oman can enhance its local production can be green house cultivation, modern irrigation with high yielding varieties of seed, livestock production. All this need suitable policy framework and budget.

3.4 Some Policies that have contributed to Achieving the Food Security

Over the successive five-year plans, the Sultanate adopted many policies and programs that have contributed in one way or another in agricultural development, which in turn achieved a degree of self-sufficiency for some commodities.

It is through constant progressive efforts that the Ministry of Agriculture is undertaking to promote possible way of sustainable agriculture. These efforts include: undertaking suitable research and agricultural extension and livestock.

i) Support farmers in the establishment of modern irrigation systems (and over 25% now is under modern irrigation);

ii) Dissemination of modern technologies in various fields of agricultural and animal (seed/fertilizer/practices/breeding etc.);

iii) Distribution of improved varieties of some crops;

iv) Conducting research on some varieties of wheat and make them suitable for environmental conditions of the Sultanate;

v) Development of the production dates and processing;

vi) Expansion of environmentally controlled agriculture (green houses);
vii) Encourage the private sector to invest in agricultural development and animal projects with some incentives like soft loan facilities;

viii) Creating awareness on quality, packing and domestic markets cold storages and post harvesting methods like grading;

ix) Use of biological control; and

x) Promoting local livestock base productions in poultry, meat and dairy activities.

3.5 Mechanisms for Achieving Food Security

The Sultanate government has always emphasized the need to undertake agriculture in a sustainable fashion. Sustainable and ecologically sound agriculture guarantees the ability of farmers to continue producing food indefinitely in harmony with the biodiversity.

Achieving sustainable agriculture in Oman would require policy makers (the government) to make choices—whether to expand domestic production while knowing that such a choice may put strain on scarce resources (land and water) and is not sustainable; or whether to invest on improving land and water productivity in addition to taking advantage of opportunities presented by the world market. Following below is a list of issues that the government might need to address:

i) Increase investment in new technologies and innovations to increase water availability including water desalinization and waste water recycling;

ii) Create conducive environment for foreign investors so as to attract more Foreign Direct Investments (FDI). More FDIs will help create jobs and improve the incomes of the people and hence the capacity to afford/access imported food commodities;

iii) As highlighted before food production in Oman is limited by land and water scarcity. The emphasis should be directed towards increasing land and water productivity in terms of yields and value per unit of land and water;

iv) Since land and water resources are scarce, there is a need to come up with a national strategy stipulating priority crops that should be grown in the country in order to conserve water, instead of the current situation where everything is grown with no clear focus. For example the list could be established based on water and land use efficiency and profitability. The focus should also be on crops that can be grown sustainably without compromising the country’s scarce water and land resources;

v) Invest in buying or leasing land in land-abundant countries to secure food supply. This strategy has already been adopted by other GCC countries such as Saudi Arabia and UAE. The two countries currently hold more than 2.8 million ha. mostly in Indonesia, Pakistan and Sudan (World Bank, FAO and IFAD, 2009); and

vi) Provide Oman people with family planning services and promote nutrition education. Promoting nutrition education will go a long way towards increasing food security by reducing demand for cereals. Currently for example, while the average global per capita consumption for wheat is 100 kilogram per annum, the average per capita consumption in Oman is 115 kilogram. It could be possible to reduce this to global average.

The issues highlighted above needs to be addressed in combination with the following three mechanisms for ensuring food security which is also covered in chart indicates limitation, concepts and measures marching for food security.

These three mechanisms are:
3.5.1 Formation of National Food Trading Company

Land and water scarcity seriously limits agricultural production in Oman, it has no other options but to continue importing its food needs especially grains and red meat (Table 3). One possibility is to establish a National Food Trading Company (NFTC) that will operate independently with minimal government oversight.

The NFTC will deal with food commodity trading internationally and domestically with the mandate or responsibility to make sure that there is enough supply of food commodities in the country during the time of crisis.

3.5.2 Setting up Efficient Strategic Grain Reserve System

Oman has what is known as the Public Authority for Stores and Food Reserves (PASFR). The PASFR is responsible for maintaining reserves of rice, sugar, milk powder and edible oil. The PASFR was established in 1980 to maintain strategic food reserves to meet the essential requirements of the population in an emergency.

PASFR could be transformed into a Strategic Grain Reserve system (SGR) and restructured to operate much more efficiently. This will however, depend on the Government objectives. A SGR can be used as an instrument to stabilize price at times of crisis like the recent one in 2008. At its simplest, a SGR that seeks to stabilize prices builds up substantial reserves of food grains during periods of surplus and releases them when prices start to rise.

3.5.3 Promotion of Private Sector Participation

Promotion and strengthening of the private sector capacity to participate in the importation of food commodities is another way to ensure availability of food for food security. To achieve this, the government needs to create enabling environment to attract private sector participation.

3.6 Model for Food Security

For Oman in the context of food security, there are two issues:

i) To enhance the local production and productivity; and

ii) Investment in the agriculture activities outside Oman.

3.6.1 Limiting Factors

i) Soil and water within country so limit to enhance, however, great scope to introduce new technologies (Hydroponic, etc);

ii) Capital cost of investment within and outside Oman;

iii) Trade relation and importing partner to continue supply; and

iv) Capacity building and technical expense.

This is presented in the Model 1.

4 Conclusion

With land and water scarcity seriously limiting agricultural production in Oman, increasing agricultural production through expansion may not be feasible. Sustainable marginal increase in output might be achievable through improvements in land and water productivity. In this point of view, therefore, the alternative means for Oman is a food import to meet its food needs especially grains and red meat (Table 3).

Moreover, appropriate measures and policies needs to be developed to achieve food security at the local level to focus on further research on the preservation of water resources, and conduct more tests on crops resistant to salinity and aridness.
Finally the establishment of a national company dealing with agricultural development and investment within and outside the Sultanate and provide food to members of the community, especially during crises are considered to be a good concept.

References

1 Ministry of Agriculture, Department of Statistics.
2 Ministry of Agriculture, Department of Investment and Marketing Development.
3 Ministry of Economics, Directorate General of Social Statistics.
4 The Public Authority for Stores and Food Reserves, Study to Develop Food Security Strategy and Master Plan for the Sultanate of Oman.
Model 1: Oman Food Security Analysis Model
### Table 1: Total Population in the Sultanate by Nationality, Governorate & Region Wilayat, Mid-Year Estimate

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Region</th>
<th>Omani</th>
<th>Expatriate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Muscat Governorate</td>
<td>434.403</td>
<td>400.357</td>
<td>834.760</td>
</tr>
<tr>
<td>2</td>
<td>Al- Batinah Region</td>
<td>616.296</td>
<td>144.158</td>
<td>760.454</td>
</tr>
<tr>
<td>3</td>
<td>Musandam Governorate</td>
<td>22.408</td>
<td>13.065</td>
<td>35.473</td>
</tr>
<tr>
<td>4</td>
<td>Al Dhahirah Region</td>
<td>120.996</td>
<td>33.158</td>
<td>154.154</td>
</tr>
<tr>
<td>5</td>
<td>Al Dhakhliya Region</td>
<td>257.051</td>
<td>51.679</td>
<td>308.730</td>
</tr>
<tr>
<td>6</td>
<td>Al Sharqiya Region</td>
<td>287.665</td>
<td>80.301</td>
<td>367.966</td>
</tr>
<tr>
<td>7</td>
<td>Al Wusta Region</td>
<td>18.270</td>
<td>10.156</td>
<td>28.426</td>
</tr>
<tr>
<td>8</td>
<td>Dhofar Governorate</td>
<td>168.004</td>
<td>105.048</td>
<td>273.052</td>
</tr>
<tr>
<td>9</td>
<td>Al Buraimi Governorate</td>
<td>42.087</td>
<td>62.326</td>
<td>104.413</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>1,967,180</td>
<td>900,248</td>
<td>2,867,428</td>
</tr>
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</table>

### Table 2: Gross Domestic Product (GDP)

<table>
<thead>
<tr>
<th>Economic Activity</th>
<th>2008 (M.N RO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Total Petroleum Activities</td>
<td>11,705.10</td>
</tr>
<tr>
<td>1.1 Crude Petroleum</td>
<td>10,856.00</td>
</tr>
<tr>
<td>1.2 Natural Gas</td>
<td>849.1</td>
</tr>
<tr>
<td>2 Total Non Petroleum Activities</td>
<td>11,732.00</td>
</tr>
<tr>
<td>2.1 Agriculture &amp; Fishing</td>
<td>233.7</td>
</tr>
<tr>
<td>A – Agriculture</td>
<td>151.5</td>
</tr>
<tr>
<td>B – Fishing</td>
<td>82.2</td>
</tr>
<tr>
<td>2.2 Industry Activities</td>
<td>3,858.00</td>
</tr>
<tr>
<td>C – Mining and Quarrying</td>
<td>70.3</td>
</tr>
<tr>
<td>D – Manufacturing</td>
<td>2,458.50</td>
</tr>
<tr>
<td>- Manufacturing of Refined Petroleum Products</td>
<td>97.2</td>
</tr>
<tr>
<td>- Manufacturing of Chemicals and Chemicals Products</td>
<td>1,601.40</td>
</tr>
<tr>
<td>- Other Manufacturing</td>
<td>759.9</td>
</tr>
<tr>
<td>E – Electricity and Water Supply</td>
<td>187.2</td>
</tr>
<tr>
<td>F – Building and Construction</td>
<td>1,142.00</td>
</tr>
<tr>
<td>2.3 Services Activities</td>
<td>7,640.30</td>
</tr>
<tr>
<td>G – Wholesale and Retail Trade</td>
<td>2,108.50</td>
</tr>
<tr>
<td>H – Hotel and Restaurants</td>
<td>188.3</td>
</tr>
<tr>
<td>I – Transport, Storage and Communication</td>
<td>1,193.20</td>
</tr>
<tr>
<td>J – Financial Intermediation</td>
<td>829.3</td>
</tr>
<tr>
<td>K – Real Estate &amp; Business Activities</td>
<td>811.7</td>
</tr>
<tr>
<td>L – Public Administration &amp; Defence</td>
<td>1,241.20</td>
</tr>
<tr>
<td>M – Education</td>
<td>760</td>
</tr>
<tr>
<td>N – Health</td>
<td>269</td>
</tr>
<tr>
<td>O – Other Community Social and Personal Services</td>
<td>190.3</td>
</tr>
<tr>
<td>P – Private Household with Employed Persons</td>
<td>48.8</td>
</tr>
<tr>
<td>Financial Intermediation Services Indirectly Measured</td>
<td>-369.4</td>
</tr>
<tr>
<td>GDP at Basic Prices</td>
<td>23,067.70</td>
</tr>
<tr>
<td>Plus: Taxes less Subsidies on products</td>
<td>117.4</td>
</tr>
<tr>
<td>GDP at Market Prices</td>
<td>23,185.10</td>
</tr>
</tbody>
</table>

**Source**: Ministry of National Economics, Directorate General of Social Statistics
Table 3: Oman Self-sufficiency Ratio for Important Food Groups for 2008

<table>
<thead>
<tr>
<th>Food Groups</th>
<th>Domestic Production</th>
<th>Imports</th>
<th>Exports</th>
<th>Available for Consumption</th>
<th>Self-Sufficiency Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereal/grain</td>
<td>4.6</td>
<td>630.6</td>
<td>64.9</td>
<td>570.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Vegetables</td>
<td>141.1</td>
<td>163.6</td>
<td>27.6</td>
<td>277.1</td>
<td>50.9</td>
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Sources: 1. Ministry of Agriculture (MoA), Department of Statistics 2. Royal Oman Police, Directorate General of Customs
FOOD SECURITY - GLOBAL TRENDS AND PERSPECTIVE: EXPERIENCE FROM PAKISTAN

Mr. Sheikh Ghazanfar Hussain

1 Introduction

As per United Nations, the food security is “physical, social and economic access of all people at all times to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. Effective biological absorption of food in the body is also important for food security as it ensures nutritional security in the face of availability.

The Millennium Development Goals further highlight the importance of confronting the scourge of poverty and the despair of food insecurity. Under a very complex food commodities supply and demand situation, food security is becoming a formidable challenge, especially, when the main grain growing countries are resorting to bio-fuel production creating a divide between countries striving for food security and countries ensuring energy security through bio-fuel production. Resultantly, the food grain and livestock products prices have experienced unprecedented increments, placing food importing countries at disadvantageous position. This situation has further been aggravated by continuing rising trend in the fuel prices. The two major components i.e. (a) International dimensions of Food Security issue and (b) Pakistan’s country experience of Agro-based economy and the challenges it poses to its people.

2 International Dimension

2.1 Defining Poverty and Food Security

Food Security has been defined by the World Food Summit (1996), as a situation “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food, and to meet their dietary needs and food preferences for an active and healthy life”. The three underlying ideas are adequacy of food (effective supply), ample access to food (i.e. the ability of the individual to acquire sufficient food or effective demand) and reliability of both supply and access. A minimum level of health status that converts food intake to support a healthy body is another essential condition for the achievement of food security.

International prices of major food commodities reached, in the first three months of 2008, their highest level in nearly 30 years. Projections suggest that food prices are likely to remain high in the next few years. Rising food prices are provoking social unrest across the developing world, resulting in a number of short term policy responses from government in both exporting and importing countries, which risk exacerbating instability in world markets. In the short run, net food buyers in urban and rural areas would be pushed deeper into poverty.

It is the agriculture sector where the battles for long term economic development will be won or lost. Thus, the main burden of development and employment creation will have to be borne by the agriculture sector and it would be harbinger of change and improvement in the living standard of teeming millions.

The Heads of State and Government, gathered at the World Food Summit of the United Nations...
reaffirmed “the right of every one to have access to safe and nutritious food, consistent with the right to adequate food and the fundamental right of everyone to be free from hunger”.

According to United Nations the global price tag to overcome the food crisis would be $15-20 billion a year and that food supply has to rise 50 percent by the year 2030 to meet the climbing demand of explosive population growth. Some countries have taken action by limiting exports or by imposing non tariff barriers, which distort markets and force prices even higher. Secretary General of UN has rightly called upon the world community to eliminate such measures and help boost food production in the deficient areas according to their true potential.

2.2 Declines in Agriculture Production Growth

There is a visible declining trend in agriculture growth. According to the estimates prepared by Food and Agriculture Organization of United Nations, agriculture output is expected to fall to 1.5 per cent over the next twenty years and is likely to be around 0.9 percent by 2050, compared with 2.3 percent registered since 1961. All major sectors are bound to suffer from deceleration of growth. The cereals sector is expected to continue to have the lowest growth rate of the major Commodity Sectors during the next fifty years.

Policies that under invest in agriculture are to blame, reflecting a situation in the political economy in which the interests of urban population have the upper hand. Latest estimates released by UN shows that contribution of agriculture in GDP of developing countries is cumulatively about 29% whereas public spending on agriculture sector is around 4%. This situation translates into transfer of resources from rural to urban areas, which does not augur well for the future of agriculture sector. There is a strong case for stepping up public expenditure on agriculture and related areas to enable this sector to play its due role in economic development and prosperity of food deficient countries.

According to World Food Summit (WFS) declarations (1996), more than 800 million people mainly in the developing countries don’t have enough food to meet their basic nutritional needs. Short-fall in food grain production can lead to peace upsetting in the world. According to some experts, the food grain shortfall of 105 million tonnes was at the highest level during 2003. It was 5% of the annual world consumption. FAO assessed a shortfall of 16 mm tonne in wheat production during 2007-08, mainly because of shift in area from wheat to maize to meet bio-fuel needs in America, Australia and Canada. Concerted efforts are needed to enhance food grain production in the world and to investigate problems that stand in the way of meeting food needs of humanity so as to avoid upsetting peace and famine occurrence in the world. Several countries have constitutional provision on the rights of citizens to adequate food and Pakistan is also one of them. Article 38 of the Constitution of Pakistan states that, “the State shall provide basic necessities of life such as food, clothing, housing, education and medical relief”.

3 Pakistan’s Scenario

During the early 1980s, the country was almost self-sufficient in wheat and was a leading rice exporter. Ever since, domestic demand for food increased steadily because of rapid population growth. The growth in food grain production fell behind demand because of the consistent decline in world prices of food grains and a shortfall of investment in agricultural infrastructure and technology to improve production. As a result, domestic demand for food grains exceeded the domestic supply, and annual imports rose to 2.5 million tonnes in the late 1990s. Even with these imports, food security is a growing concern in Pakistan, given inequitable access to food and the declining purchasing power of the poor.
What is Pakistan's overall aggregate food security situation, and what effects has structural adjustment had on food security? There is a general consensus among economic commentators on Pakistan's social and economic performance that food insecurity and poverty are twin problems that have emerged since the early 1990s. The crucial issue to be considered is why the situation has worsened. The demand for food in Pakistan has often exceeded supply, especially of wheat, the main staple diet. Domestic production of wheat is about 80% of requirements, and between 1992 and 1997, 2-2.5 million tonnes were imported annually. During 1997 and 1998, the volume of imports totalled four million tonnes. However, Pakistan is not a food-insecure country from the perspective of "availability of food," given its ability to import the shortfall of food grains.

Pakistan imported wheat throughout the 1990s, albeit of differing quantities, depending on the harvest from year to year. Loans received under the structural adjustment programme did not contribute to the increase of wheat production. In fact, wheat imports increased during this period. The situation changed entirely in 2000, when the government hiked the procurement price of wheat. As a result, production increased to a record 22 million tonnes, and Pakistan became a net exporter in 2001. The year 2001 was, however, the only year that Pakistan had an exportable surplus. The country is back to a net import expectation of around 3 million tonnes this year.

Table 1 explains the situation of food poverty in Pakistan. For example, in Punjab province, there were overall 22.8% persons of the total population who faced food poverty in 1993-94, out of which the 24.5% were in rural areas and 19.8% in the urban areas of Punjab. The overall figure rose to 33.5% in 1998-99. The country-wide picture figures were 23.6% of the total population living below the food poverty line in 1993-94 and the situation worsened to 32.6% in 1998-99.

4 Food Security Analysis (FSA) 2003-04

Food availability, the 1st pillar of food security, was assessed on the basis of food production and consumption. Out of 120 district settings in Pakistan, 74 (62%) were found to be food deficit in terms of net availability. This deficit varies ranging from low through high to extreme degree. Wheat, a staple, catering for 48% of caloric needs in Pakistan, was found deficit in terms of net availability and the shortage was estimated at 3.2 million tonnes annually. Out of 120 districts, only 48 (40%) were producing surplus or enough to cater to the needs of these districts. In other words, 72 districts (60%) were deficient in wheat availability.

Among 29 wheat surplus districts, 69 percent were in Punjab, 21 percent in Sindh and 10 percent in Balochistan. FSA 2003 ranked, in terms of availability, Khyber Pakhtunkhwa (KPK), Northern Areas (NAs) and AJK as net food insecure. This state of insecurity, translated into caloric supply at provincial level, revealed that in KPK caloric poverty in terms of its incidence was the most prevalent as only 1106 cals per capita were available from the provincial resources. This caloric shortfall leads towards hunger, as defined by FAO.

FSA 2003 also indicates that mega cities pitted against mounting population pressure are also being adversely affected. For example, even in wheat surplus province of Punjab, the provincial capital Lahore, home to 81 percent of the district population, was among the net food insecure zones in terms of availability.

In Sindh, 6 out of 17 (35%) districts were wheat surplus and only 8 (47%) were in self-reliant...
bracket as against 9 (53%) wheat insecure districts. It suggests that even Sindh, the 2nd largest wheat-producing province, was deficit in terms of wheat availability. In Balochistan, only 3 (12%) out of 26 districts were production surplus as against 18 (69%) wheat deficit districts. In KPK, there is no wheat surplus district and only 2 (8%) out of 24 districts were self-reliant in wheat production.

In case of rice, the 2nd staple food, only 37 (31%) out of 120 districts were found to be production surplus. Of these, cereals meet one-half of caloric needs in developing countries. On net cereal availability basis, out of 120 districts 31 (26%) had surplus production.

On overall crop-based food availability (exclusive of livestock products) out of 120 districts, 39 (32%) had surplus production, 6 (5%) were self-reliant while 35 (29%) were extremely insecure and 40 (33%) experienced deficit of low to high degree. This suggests that net crop-based food availability, compared to net cereals or wheat/rice availability was better.

Availability of livestock products, contributing 7 to 16 percent in daily diet of rural people, presents altogether different picture compared to crop-based food. In this case, the marginal land areas such as Balochistan, Gilgit-Baltistan, FATA and part of KPK, that are otherwise acutely deficient in crop-based food, generate production surplus in case of livestock products. Out of 120 districts 43 (36%) have surplus production and another 37 (31%) have sufficient livestock-based food production. In total, out of 120 districts, 80 (67%) are self-reliant and only 40 (33%) encounter some degree of deficit in livestock-based food.

On net agro-livestock products basis, including both key sources of food availability, 34 (28%) out of 120 districts were found surplus. These figures, translated into net food availability, suggest that 74 (62%) out of 120 districts faced deficit of varying degree.

In terms of economic access to food, as against the physical access food availability affords, FSA 2003 revealed that income inequality factors especially land, and access to opportunities such as education and employment have led to a wide range of disparities. Consequently, women, labour, landless and small farmers are being adversely affected in terms of access to food, as the above-mentioned inequality factors impact income opportunities.

Effective biological utilization or food absorption, the 3rd pillar of food security, was assessed on the basis of parameters including access to safe drinking water, immunization cover and infant mortality, access to medics and paramedics and rural health infrastructure. It revealed that out of 120 only 11 (9%) districts of Pakistan performed reasonably well while 45 (38%) experienced extremely low rate of food absorption.

The contributory factors to this state of affairs include inter alia the poor access to potable water, for example in 113 (94%) out of 120 districts, safe drinking water was available to less than 50% percent of the population. It implies that 50 percent of the population drinks unsafe water which contaminates food. The food-borne diseases perhaps are the most widespread health problems in the contemporary world and are important cause of reduced economic activity. Similarly, on disease control front, primarily a function of effective immunization programmes, FSA 2003 revealed that 108 (90%) out of 120 districts had immunization cover of less than 80 percent. Resultantly, infant mortality rate was above 80 per thousand in 34 (28%) districts out of 120.

**5 Recent Initiatives of Government of Pakistan for Food Security and Poverty Alleviation**

Government of Pakistan has initiated many programmes to provide relief to the poor masses to ensure Food Security. Towards this end following initiatives have been launched:
5.1 Procurement and Storage of Food Grains

Provincial Governments are purchasing food grains e.g. wheat and rice and storing them to ensure that there is no shortage of good grains during the year. This step will help to control the price of these essential food items.

5.2 Benazir Income Support Programme (BISP)

Under this programme, the poorest of the poor women under a well laid down system are paid Rs. 1000 per month. This programme was launched in 2008 and 2009 with an initial allocation of Rs.34 billion. So far 8 million families have been brought under the net for the support. Under various schemes like Waseela-i-Haq (Right Source) vocational training programme, health insurance, capacity of the poor people is being developed. The financial help enables the families to increase their income and enables them to set up small projects thus enhances their purchasing power. This financial safety network helps in the food security of the poor masses. BISP also helps to provide emergency relief packages to the bomb blast victims, displaced persons, of Malakand, Sawat, Bajore, FATA and South Waziristan. The financial support helps the victims of these areas to sustain themselves and provides food security during the crises.

During the financial year 2010-11, Rs.70 billion have been allocated for the programme. This will help to bring a larger segment of poor society into the safety net of the programme.

5.3 Sasti (Cheap) Roti in the Punjab Province

The Government of the Punjab has been running Sasti Roti in different cities to provide Sasti Roti to the poor masses. This programme provides relief to the poor as through subsidies the cost of one loaf is reduced by more than 50% (from Rs. 5 to Rs.2).

Government of the Punjab has allocated Rs. 7.5 billion for the fiscal year 2009-10 for the programme through which the network of ovens will be increased manifold. Thus a large number of poor people will be benefitted by the programme.

6 National Programme for Food Security and Productivity Enhancement (Crop Maximization Project)

National Programme for Food Security & Productivity Enhancement (Crop Maximization Project) is special move for help to small farmers. It is reported that 83% of Pakistan’s farming community is ranked as small farmers and there is considerable gap between the yield per acre of a progressive farmer and a small farmer. The small farmers lack access to credit, technical know-how, farm implements, etc, which results in low productivity at the small farms. The credit to these farmers is provided by middlemen (Arhties) who give the farmer rate of their choice for his produce. The project envisages enhancement of farm productivity and sustainability of agriculture for food security. It will establish collective institutions, i.e., beneficiary owned and managed 1,012 Village Organizations (VOs) in 1,012 villages of 27 districts of all the four provinces, AJ&K and FATA for procurement of critical inputs / services, marketing of outputs and diversification of income generating activities. It will be a technology-led project with main focus on small and resource poor farmers having land holdings below 25 acres.

7 Benazir Tractor Scheme for Farmers of the Federal Government

The Federal Government has allocated Rs 4 billion for providing 10,000 tractors on reduced price during 2010 and 2011. The provision of tractors to the poor will revolutionize the agriculture sector and help to develop mechanized farming adding productivity of food crops thus adding to food security.
8 Research Work in the Ministry of Agriculture

Ministry of Agriculture is undertaking research for the production of good seeds for mechanized farming by providing refined manure and improved system of irrigation through recycling of domestic water. These steps will increase the production of food grains, vegetables and fruits.

Production of hybrid seeds and improved system of drip irrigation and improved system of storage of water in rural areas will also help to increase production. Similarly, as a result of research, poultry products and development of kitchen garden scheme will also help in development of food production during the years ahead. There has also been lot of advancement in the quality of seeds of wheat and rice that will help to improve the yield per acre.

9 Recommendations

Pakistan has spent huge amount on research and on spread of advanced technology to the rural areas. A set of recommendations to address the issues related to food insecurity in Pakistan are as follows:

i) Productivity should be enhanced through intensive investment in research, technology and extension of services;

ii) Safety nets should be developed for poor;

iii) Pakistan should develop National Food Security Policy covering all the aspects of food security. For this purpose a directional effort is required to put in place an equitable and cheap system of food security network;

iv) Regional trade in food should be developed through better infrastructure and concessions;

v) Trust among all the neighbouring countries should be built, especially between Pakistan and India. This will allow diversion of funds from Defence to Food Security and Poverty Alleviation.

vi) An important step which should receive top most priority is to stop smuggling of food crops especially the wheat grain and flour to other countries. Even wheat movement within districts should be restricted. Wheat milling should be according to the need of the areas. Some influential persons have established flour mills and the milling capacity is much more than the need of the area. The policy of issuing milling license to flour mills should be reviewed by the Govt. According to Siddiqui (2008) as much as 1800 mm tonne of wheat flour is being smuggled to Afghanistan every month through tribal areas.

vii) Reducing post production losses by 5% would mean saving more than one million tonnes of wheat for consumption besides maintaining the quality of the produce. Containment of these losses can be achieved by creating awareness among the general public particularly in the rural communities with regard to basic strategies for sound grain storage management on small farms, making farm granaries and containers water proof and weather proof, storing clean grains only, strictly observing storage hygiene, reducing initial moisture content of grain to the level of 10-12% and during storage keeping the grain cool and protecting from large scale changes of out-door temperature, avoiding direct sun light effects on grains, controlling insect infestation and fungal infection and regularly inspecting grain for unsafe storage conditions and pest infestation, etc.

viii) Pakistan’s food insecurity is not just the result of poor agricultural production, but also a byproduct of structural factors such as unequal land distribution. Land is Pakistan’s “single-most important asset”—yet millions of Pakistanis are landless. “Broad-based”—and not simply
“cosmetic”-land reform is essential for strengthening food security and reducing poverty, because improved land access reduces food prices for families.

Footnotes
1 FSA Report 2003-04. FSA is a joint initiative of the Sustainable Development Policy Institute (SDPI) and the United Nation’s World Food Programme (WFP).
3 As mentioned by the Federal Finance Minister in his Federal Budget Layout Speech for the financial year 2010-2011.
4 As mentioned by the Punjab’s Finance Minister in his Provincial Budget Layout Speech for the financial year 2010-2011.

References
2 Dreze and Sen, Hunger and Public Action.2.
4 Federal Finance Minister’s Federal Budget Layout Speech for the financial year 2010-2011.
11 Punjab’s Finance Minister’s Provincial Budget Layout Speech for the financial year 2010-2011.
**Table 1**: Situation of Food Poverty in Pakistan, Incidence of Food Poverty by Provinces and Rural/Urban Areas (1993-94 & 1998-99)

Head Count Ratios (Percentage)

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**Source**: Pakistan Human Condition Report, 2002
FOOD SECURITY - GLOBAL TRENDS AND PERSPECTIVE IN SUDAN

Eng. Isameldin Ibrahim Abdalla and Eng. Manawara Abdelhafiz Babiker

1 Introduction

Sudan is one of the largest countries in Africa with area of 2.5 million km² where the arable land is 84 million ha, with huge natural and agricultural resources. Sudan's population is about 40 million (2010) and the population growth rate is 2-6 percent during 2000-2008. The annual per capita income is US$ 600, with an outstanding economic growth 9.2%. In term of production agriculture is the main sector in Sudan's economy and dominate the livelihoods of the majority of Sudanese, between 65-85% of the population live in rural areas, offer 50% of the raw material for agro-processing industry and provides employment for more than 70% of the labour. The share of agriculture in total GDP is given in Table 1.

There are four major farming systems: i) Irrigated agriculture; ii) Mechanized rain-fed; iii) Traditional rain-fed; and iv) Extensive livestock production. The country endowed with largely untapped arable land 84 million ha, large amount of underground water and seasonal rivers. The share of Sudan in Nile water is 18 milliards cubic meters.

The majority of livestock production is in the traditional sector and largely under nomadic and agro - pastoralists system. Grazing on natural lands which cover about 170 million fed. The total number of animals is about 140 millions head. The fisheries stocks about 120 thousand tons. Forests with gum Arabic as a major output contribute about 120 millions fed, with annual degradation 0.8%.

2 Development Priorities and Millennium Development Goals

Despite of the huge and diverse agricultural resources potential in Sudan, successive plans and strategies to develop agriculture have been implemented but they had a limited success in achieving their objectives. The economy of Sudan faces tremendous challenges, hinder its unlimited resources and opportunities to achieve the MDGs and target. Over the last 20 years, the country has been subjected to cyclical drought, civil war, conflict over resources, lack of stable institution, traditional agriculture, poor rural infrastructure, etc.

3 Current Situation of Agricultural Sector

This section explores the strengths and weakness of the sector.

3.1 Strength

i) Huge and diverse agricultural resources and improvement of infrastructure, dams, roads and electricity;

ii) The advent of the oil era in Sudan (60% of the public revenue and 85% of the foreign exchange;

iii) Comprehensive peace agreement (CAP) induces a good situation to develop the sector and maintain food security, the adoption of the federal system of government, 25 states encouraged local communities in national development programmes;
iv) Accession of the Sudan to the WTO necessitates increasing productivity and improving competitiveness and utilization of WTO concession to support agricultural sector through rural development, food security and poverty reduction laws. On the other hand, the developed countries, according to WTO, have subsidies agriculture production and hence the production in the developing countries is no longer competitive;

v) With all these facts and development, the government of Sudan declared the “Green mobilization” in 2006 and adoption of 5 year strategic plan i.e. 2007-2011. The agricultural revival programme (ARP) as the continuation of the previous plans and the political commitment for equitable and sustainable socio - economic development.

3.1.1 Objectives of Agricultural Revival Programme

i) Achieving food security and poverty reduction (15% by the end of 2010);

ii) Transformation & modernization of traditional sector;

iii) Stability, sustainability of growth of the sector by increasing, diversifying agriculture export;

iv) Maximizing value added – through agro-processing; and

v) Empower the role of the private sector in agriculture.

3.2 Weaknesses

i) Traditional systems of production resulting in low productivity to all factors of production;

ii) Land tenure system especially for the small farmers;

iii) Lack of stabilization and coordination of policies between the various resources user; and

iv) Poor accessibility of finance for small producer and absence of insurance specially those in the rained sector.

3.3 Opportunities

i) Strategic location of Sudan in Africa (9 African countries share border with Sudan) and Arab world, it created potential centre for agricultural trade;

ii) Economic stability & realization of peace & security;

iii) The membership of Sudan in African, Arab & international organization; and

iv) The international demand on the organic food product lead to economic partnership offer to invest in agriculture.

4 Food Security and Insecurity

Food insecurity as defined by the World Food Summit (FAO, 1996), as a state of food scarcity that leads to lack of physical and economic access to safe sufficient and nutritious food to meet the dietary needs and food taste preference for an active and healthy life (Prof. Kamil). That means food Security is the other way round.

4.1 Factors Affecting Food Security

Global factors: i) Population growth leads to global demand of food; ii) Climatic change; iii) Financial crisis; iv) Soaring food price-in 2007-2008; and v) Rise of oil price lead to use of bio-fuel as substitution which increased the demand for crops (sugar cane, maize).
4.2 Main Causes of Food Insecurity in Sudan

Natural hazards: i) Drought, flood and other climatic extremes as the major factor contributed to vulnerability; ii) Conflict and civil strife resulted in internally displaced persons (IDPS); iii) low productivity, poor rural infrastructures, poor supporting services (credit, market); and iv) Instability of policies.

Food insecurity in Sudan is predominantly rural, but is rising in the peripheries of large towns especially among IDPS. The development strategies bias toward the urban sector, forming the root causes of rural poverty and food insecurity. The majority of population draws their livelihood from largely subsistence based economy in the predominant low productivity in both crop and livestock.

5 Implication of Food Supply and Demand

As the result of strong global economic growth food consumption expanded rapidly by the contrast, the supply of food and agriculture products slowed due to many factors like: Stagnation in area under cultivation, low investment in agriculture, high oil price resulted in higher food production cost etc.

In this context (supply and demand), the policies should consider three main groups:

i) Consumer-orient policy such as direct support to vulnerable groups in form of food subsidies, tax reduction, price contract etc.;

ii) Producer oriented policy, support farmer to increase production. e.g. the input subsidies. This support programme stimulates supply response and hence ensures food security at the house hold level and targeted poor and vulnerable small holders; and

iii) Trade- oriented policy: Such as reducing tariffs and restricting export to reduce price and increase domestic supply.

6 Solution for Attaining Food Security

To achieve food security, the government should take it into consideration the following aspects:

i) To give attention to food insecurity issues;

ii) To enhance scientific understanding of poverty and its impact on food security;

iii) Establish linkages between environment, poverty and food insecurity;

iv) Better co-ordination and sharing information on availability of food among government, civil society and development partners; and

v) Establishment of clear and transparent rules on shaping well-functioning market and timely response to ensure food security.

7 Policies

7.1 Production Policies

i) Inputs subsidies - it play an important role in increasing productivity and hence the profitability;

ii) Expansion of areas under irrigation to minimize the risk of rainfall;

iii) Strengthening the strategic food storage by building up of buffer stock to stabilize fluctuation in grain supply, price for sustainable production;

iv) Development of crop issuance policy;

v) Provision of government support to infrastructure, roads & commit social services e.g. drinking water, food safety, etc.;
vi) Enhancement of private sector to invest in food crop and livestock;

vii) Value added agro-processing;

viii) Empowerment of women to contribute to production of food through the accession to assets; and

ix) Sustainable resources management & conservation of environment.

7.2 **Macro Economic Policies**

i) Liberalization of goods, services and factors of production;

ii) Institutional reform and privatization of agricultural and public enterprises; and

iii) Tax reduction- no taxes imposed on agricultural product and zero import duties on imported agriculture inputs.

**7.3 Economic and Financial Policies**

i) Allocate at least 20% of public expenses for agriculture sector;

ii) Upgrade the capacity of the specialized bank such as Agricultural Bank of Sudan (ABS), Animal Resource Bank and Small Credit Finance for Small-Holders;

iii) Build financial capacities and insurance companies; and

iv) To adopt Sustainable Investment policies, to encourage the private sector to invest in the agriculture services.

**7.4 Marketing Policies**

i) The government should give attention for functioning market and timely responses in order to ensure food availability;

ii) Timely, market assessment and provision of information on the availability of food;

iii) Establishment clear and transport rules for the intervention of government in the market; and

iv) Price stabilization polices.

**7.5 Land Use Policies**

i) Ratification of land commission law;

ii) Building institutional capacities for land management; and

iii) Participation of communities in resolving land issues.

**8 Climate Change**

According to the World Bank study in 2009, Sudan considered as the most vulnerable, due to the effects of the climate change on agriculture. (www.oneworld.net 6/16/2010). In the first climate change report (2003), Sudan government predicted a significant long term decline in the yields of staple food (sorghum & millet), due to shorter growing seasons imposed by higher temperature. While other studies relating to winter crops in the River Nile state (1995-2005) lead to the same prediction.

**9 Desertification and Deforestation**

Due to the unsound agriculture and environmental strategies which prevailed throughout the second half of the 20th century, agriculture was given the top most priority at the expense of forest and livestock with emphasis on export rather than subsistence (Badi 2004). As UNEP estimated that the land classified as desert has extended southwards by 50-200 kilometres since 1930s and that 25% of the country’s land is at risk. Desertification during the last decades leads to a chronic and complicated social and political
fractures, especially in Darfour region. (www.oneworld.net/6/16/2010).

10 Bio-fuel

Sudan with its vast agricultural recourses, recently gave more attention to sugar industry with its by-products, mainly the ethanol. There is strategy to increase the sugar production from 850 000 Mt. to 10 millions Mt. by 2015. This will create around 700000 jobs. As a leading African country in exporting ethanol, Sudan has sent its first ship of the bio-fuel to Netherlands by the end of December 2009. The total ethanol production was 65 million litters with a plan to reach 200 million litters by 2012. (Bio pact)

11 Transformation of Farmers' Communities in Sudan and Adoption of Modern Technology

So many efforts were there since the beginning of the 20th century. Agriculture research, education, extension, veterinary services, etc. Beside, the implementation of Gezira scheme and other irrigated projects and introduction of mechanized farming systems by the mid 20th century. The modernization in agriculture sector, lead to an increasing usage of pesticides, chemical fertilizers, improved and certified seeds and agriculture machineries in land preparation and harvesting. But there are lot efforts to be done, especially at the traditional agriculture sector.

12 Rural-Urban Migration and Its Impact on Agriculture Production

The application of mechanization in agriculture practices lead to abundant rural labours that led to increasing rural-urban migration and this aggravates the urban poverty and contributes to the complicated national socio-economic situation.

13 Government Role in the National Perspectives

The government previously was playing an important role in agriculture planning and management. The public agriculture schemes did a very good job up to the 1980, in direct agriculture production and food security. Recently, due to the structural reform & privatization policies, was fall apart for the benefit of the private sector. But the Governments till now, is dominating the formulation of strategies and macro policies.

Beside the federal and state agencies, a National Food Security Council was established this year. This council is representing all relevant ministries and stakeholders. The main functions of these agencies are to adopt the appropriate strategies, follow-up and coordinate the various activities related to food security.

The Government Institutions, Ministry of Agriculture and line Ministries, beside the United Nations Organizations and NGOs, all these partners work together to combat the food insecurity situation. WFP is planning to present food aids to around 11 millions of Sudanese, mainly in Darfour, the southern region and other pockets.

References

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3 Christian Webersik, Sudan Climate Change and Security Fact-Sheet series 2008/2 www.las.unu.edu

4 Widad Abdelrahman Abdalla, WTO Unit, Ministry of Agricultural (Information sheet).

5 Prof Kamil Ibrahim Hassan, Climate Change and Its Impact on Agriculture and Food Second National Communication Project (SNC),
Training Workshop on Vulnerability and Adaptation  

6 Bio-pact, Warn-torn Sudan to become Major Sugar & Ethanol Producer – www.biopact.com

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8 Kamal Hassan Badi, Changing Forest Cover and Rainfall in Central Sudan, 1930-2000 (Thesis), Faculty of FORESTRY, University of Khartoum

9 Annual Report (2008), Food Security Department, Ministry of Agriculture, Khartoum

**Table 1 : Share of Agriculture in Total GDP**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture Sector</th>
<th>Irrigated</th>
<th>Mechanized</th>
<th>Traditional Rain-fed</th>
<th>Animal Resources</th>
<th>Forest</th>
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<tr>
<td>2004</td>
<td>40.0</td>
<td>11.0</td>
<td>0.9</td>
<td>4.5</td>
<td>20.9</td>
<td>2.7</td>
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<tr>
<td>2005</td>
<td>39.6</td>
<td>10.9</td>
<td>1.4</td>
<td>5.4</td>
<td>19.4</td>
<td>2.5</td>
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<tr>
<td>2006</td>
<td>35.9</td>
<td>11.5</td>
<td>1.2</td>
<td>6.9</td>
<td>17.0</td>
<td>2.3</td>
</tr>
<tr>
<td>2007</td>
<td>33.6</td>
<td>9.9</td>
<td>0.9</td>
<td>4.7</td>
<td>16.0</td>
<td>2.1</td>
</tr>
<tr>
<td>2008</td>
<td>36.2</td>
<td>11.0</td>
<td>1.0</td>
<td>5.2</td>
<td>16.7</td>
<td>2.3</td>
</tr>
<tr>
<td>2009</td>
<td>36.5</td>
<td>10.8</td>
<td>1.0</td>
<td>5.5</td>
<td>17.0</td>
<td>2.2</td>
</tr>
</tbody>
</table>

*Source: Food Security Department, Ministry of Agriculture and Forestry, Khartoum.*
## 6. PROGRAMME SCHEDULE

### 12 July 2010  
**Monday**

- **10.45 – 12.00**  
  *Inaugural Session:*
  - Briefing on the Programme
  - Welcome Address by Mr Miyazaki Kenjiro, Managing Director, IDACA
  - Address by Mr. Fujii Akihiro, Manager International Cooperation Office, JA Zenchu
  - Inaugural Address of H E Dr Abdalla Yahia Adam, Secretary General, AARDO (Delivered by Mr Abdul Waheed Anwar, Executive Secretary, AARDO)
  - Self-introduction by the Participants
  - Group Photograph

- **12.00 – 13.30**  
  *Lunch Break*

- **13.30 – 16.00**  
  *Presentation of Expert Papers:*
    - **Chairperson:** Dr Yukio Abe, Seminar Coordinator, IDACA  
      **Expert Paper 1:** "Food Security: Global Trends and Perspective with Special Reference to Asia", by Prof. R.K. Sharma, India
    - **Chairperson:** Mr. Sheikh Ghazanfar Hussain, Federal Secretary, Pakistan  
      **Expert Paper 2:** "Food Security: Trends and Perspective in Africa with Emphasis on Livestock", by Prof. Babo Fadlalla, Sudan
    - **Chairperson:** Mr. Mohammad Nazrul Islam, Director General, Bangladesh  
      **Expert Paper 3:** "Food Security: Global Trends and Region Perspective with Reference to East Asia", by Dr (Ms) Ching-Cheng Chang, R O China

### 13 July 2010  
**Tuesday**

### 14 July 2010  
**Wednesday**

- **9.30 – 12.15**  
  *Presentation of Country Papers:*
  - Bangladesh, R.O China, Egypt, Ghana and India
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>12.15 – 13.30</td>
<td>Lunch Break</td>
</tr>
<tr>
<td>13.30 – 16.00</td>
<td><strong>Chairperson:</strong> Dr. Yukio Abe, Seminar Coordinator, IDACA</td>
</tr>
<tr>
<td></td>
<td><strong>Expert Paper 4:</strong> “World Food Security-Global Challenges and FAO’s Activities”, by Mr Mitsuhiro Yokoyama, Director, FAO Liaison Office in Japan</td>
</tr>
<tr>
<td>15 July 2010</td>
<td><em>Thursday</em></td>
</tr>
<tr>
<td>9.30 – 14.30</td>
<td><strong>Chairperson:</strong> Prof. Babu Fadlalla, Sudan</td>
</tr>
<tr>
<td></td>
<td><strong>Presentation of Country Papers:</strong> Iraq, Jordan, Malawi, Nigeria, Pakistan, Oman and Sudan</td>
</tr>
<tr>
<td>14.45 – 16.00</td>
<td>Briefing on Japan’s Agriculture, Agricultural Cooperatives and the Study Visit”, Dr. Yukio Abe, Seminar Coordinator, IDACA</td>
</tr>
<tr>
<td>16 July 2010</td>
<td><em>Friday</em></td>
</tr>
<tr>
<td>9.30 – 12.00</td>
<td>Group Discussion and Preparation of Group Report</td>
</tr>
<tr>
<td>12.00 – 13.30</td>
<td>Lunch Break</td>
</tr>
<tr>
<td>13.30 – 16.00</td>
<td><strong>Chairperson:</strong> Prof. R.K. Sharma, India</td>
</tr>
<tr>
<td></td>
<td><strong>Presentation of Groups Reports and Recommendations</strong></td>
</tr>
<tr>
<td></td>
<td>Valedictory Session and Presentation of Certificates</td>
</tr>
<tr>
<td>18.00 – 20.00</td>
<td>AARDO Dinner</td>
</tr>
<tr>
<td>17 July 2010</td>
<td><em>Saturday</em></td>
</tr>
<tr>
<td>18 July 2010</td>
<td><em>Sunday</em></td>
</tr>
<tr>
<td>9.00 – 20.00</td>
<td>Sight-seeing of Tokyo city</td>
</tr>
<tr>
<td>19 July 2010</td>
<td><em>Monday</em></td>
</tr>
<tr>
<td>9.00 – 12.15</td>
<td>Departure from IDACA for Study Visit to Kobe</td>
</tr>
<tr>
<td>20 July 2010</td>
<td><em>Tuesday</em></td>
</tr>
<tr>
<td>8.45 – 12.15</td>
<td>Visit to the Hyogo Government Office</td>
</tr>
<tr>
<td>12.15 – 13.15</td>
<td>Lunch Break</td>
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</table>
13.15 – 16.00 Visit to the Hyogo Agriculture Life Center
(Government – Private Collaboration Project)

21 July 2010
Wednesday
9.00 – 12.00 Visit to The Agricultural Forestry & Fisheries Technology Center
12.00 – 13.00 Lunch Break
13.00 – 16.00 Visit to Farming Groups Assisted by the Kasai Extension Office

22 July 2010
Thursday
8.30 – 12.00 Visit to Hyogo Minami Primary Agriculture Cooperative
12.00 – 13.30 Lunch Break
13.30 – 16.00 Visit to Farming Supports (Fostering of Farm Successor)
Observation of Facilities of JA (Direct Sales Shop, Vegetable Seedling Nursery,
Low Temperature Agriculture Warehouse, Agriculture Machinery run
by Farming Group)

23 July 2010
Friday
9.30 – 12.00 Sight-seeing of the Great Akashi Bridge
12.00 – 13.30 Lunch Break
13.30 – 15.00 Visit to the Disaster Reduction and Human Renovation Institute
15.00 – Leave Kobe for Kyoto

24 July 2010
Saturday
9.00 – 12.00 Sight-seeing of Kyoto City
12.00 – 13.30 Lunch Break
13.30 – Departure for Tokyo

25 July 2010
Sunday
Departure
7. LIST OF PARTICIPANTS

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Bangladesh
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   Email : khurshidsanaie@yahoo.in
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    Fax : 249-183-774988
    E-mail : isamgamaledin@yahoo.com
### B. RESOURCE PERSONS

#### R.O. China

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
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<th>Contact Information</th>
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</table>
| 15     | Dr. (Ms.) Ching-Cheng Chang | Department of Agricultural Economics | National Taiwan University | Tel. : 886-2-23630231 (O)  
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<table>
<thead>
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<th>Address</th>
<th>Contact Information</th>
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</table>
| 16     | Prof. Ramesh Kumar Sharma | Centre for the Study of Regional Development | Jawaharlal Nehru University | Tel. : 91-11-24100475/26877783  
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#### Sudan

<table>
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<tr>
<td>17</td>
<td>Prof. Dr. Babo Fadlalla Mohamed</td>
<td>Livestock/Range Development Expert</td>
<td>Faculty of Forestry and Range Sciences, Sudan University of Science and Technology, Soba, Khartoum</td>
<td>E-mail : <a href="mailto:babo_f@yahoo.com">babo_f@yahoo.com</a></td>
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#### C. AARDO SECRETARIAT

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| 18     | Mr. Abdul Waheed Anwar | Executive Secretary and Head, Programme, Policy and Planning Division | Afro-Asian Rural Development Organization (AARDO), 2, State Guest Houses Complex Chanakyapuri, New Delhi 110021, India | Tel. : 91-11-24100475/26877783  
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E-mail : anwerw_20020@yahoo.com |
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| 20     | Mrs. Suman Dhingra | Technical Officer III | | E-mail : sumandhingra@rediffmail.com |
32nd RECA Seminar on
“Food Security – Global Trends and Perspective”
held at IDACA, Japan, 12-25 July 2010

Opening Ceremony

Closing Ceremony

Caption p.2