FOOD SYSTEMS UNDER STRESS *IN* EASTERN AND SOUTHERN AFRICA

Proceedings of a Round Table
held in
Nairobi, Kenya,
12 October 1993

Edited by
Luis A. Navarro
Muthoni M. Mwangi

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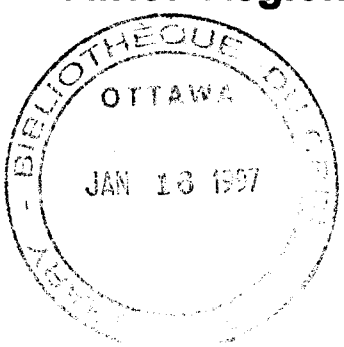


For additional information about this document, please contact the editors at the following address:

INTERNATIONAL DEVELOPMENT RESEARCH CENTRE
EASTERN AND SOUTHERN AFRICA REGIONAL OFFICE
P.O. BOX 62084
NAIROBI, KENYA

TELEPHONE: 713160/1
FAX: 711063
TELEX: 23062 RECENTRE

July 28, 1995

Food Systems Under Stress in Eastern and Southern Africa

Contents

Foreword

A series of consultations between IDRC and its research and research results-user partners around the world were held from 1992 to 1994. Through these exchanges, IDRC wanted to test its own assessment of the progress and contributions made by research to knowledge and development in different regions of the world, and to discuss potential new avenues, methods and partnerships that could enhance the Centre's support to research and development in particular fields. Consultations covered research and development in information/communications, health, education, economic policy, technology and the environment. They were held throughout Africa, Latin America, the Caribbean and Asia. One of those events was a round table on Food Systems Under Stress in Eastern and Southern Africa, which is documented here. It was held on 12 October 1993 at the Eastern and Southern Africa Regional Office of IDRC in Nairobi.

The thirty-four participants in this round table represented institutions and groups from government, education, the private sector and civil society from nine countries in the region. Other donor institutions also participated. One-third of the participants were women.

As usual, the work reported here is the result of the contributions of many, foremost the round table participants, including the authors mentioned here. Efficient secretarial support was provided by Ms. Francesca Odero and Ms. Hilda Khadija. Form and English editing were the contribution of Ms. Lisa Lawley.

Luis A. Navarro
Round Table Coordinator
July 28, 1995

The Eastern and Southern Africa Regional Round Table on Food Systems Under Stress (FSUS) was held at the Eastern and Southern Africa Regional Office (EARO) of IDRC in Nairobi, Kenya, on October 12, 1993. The thirty-four participants represented governmental and educational institutions, the private sector, NGOs, and donor institutions from nine countries of the region, as well as the EARO's professional staff. Eleven women and twenty-three men participated.

The discussion covered areas related to the production, processing, distribution/ trade, and consumption of foods in the region. The IDRC strategy, general programme structure, and details of the FSUS theme were provided as background and context for the discussion. Although the discussion ranged fairly widely, this summary details aspects of food systems stress directly related to the round table agenda.

Agroecologies

Besides the priority agroecologies already embedded in the FSUS theme (ASALs, fragile highlands, and fragile coastal areas), the round table suggested attention to pressured high-population semihumid environments. In general, participants advocated attention to any fragile environment, regardless of the contributing causes.

Populations

The round table made a strong recommendation for careful handling of the gender dimension and, in general, for better knowledge of target groups, whether producers or otherwise. This concern evolved into the suggestion that any effort to help people should start from where those people are and with what they currently know and practise. The round table also called attention to an apparent contradiction, in the concepts of participatory research and related interventions, centred around the question of who participates in whose activity. The group suggested that interventionists should participate in the activities of the local populations they

want to help, rather than the reverse. These concerns also seemed to underline questions about why farmers do not use available technologies, despite aggressive transfer efforts.

Food Systems

EARO indicated that it was presently attending to food systems based on oilcrops, sorghum, and millet in ASALS; rootcrop-based food systems in both ASALs and highland areas; and banana- and fish-based food systems in highland areas. The round table called attention to mixed-crop or tree- and animal-based food systems, particularly "indigenous" food crops and food systems.

Physicobiological Production and Postproduction Research

The review of physicobiological research on production and postproduction processes was exhaustive. The most significant guiding indicator was the reminder that agriculture (and, for that matter, food-systems stress) is site-specific. This makes stating general priorities difficult, since priorities are also site- and time-specific. Still, some areas of concern received greater attention. Notable were concerns about soil-moisture conservation, efficient utilization of available moisture through early-maturing crops, and soil-fertility management, as well as pest and disease management in intensive production systems. The concern for complementary rural postproduction technologies and support from a developed agribusiness and policy environment was also clear.

Institutional and Policy Research

The round table conceded that production, technology, and policy concerns are not mutually exclusive, and that they should not be treated in isolation. The round table agreed that most contemporary policies related to food security reflect a short-term view and tend to focus on crisis handling and facilitation of coping strategies. In this manner, they tend to limit opportunities for constituencies to progress beyond simply coping. Beyond conceptualization of proper policies, food systems' limitations are associated with the skills, capabilities, and motivations of policy makers and their organizations. These limitations not only affect the public sector, but the private sector and most nongovernmental organizations, which are

particularly prominent at the moment. There is an all-around need to enhance capacity for policy analysis and policy definition that is wider than the needs of the FSUS concern. In defining this priority area, the round table also insisted on the need for a bottom-up approach to both analysis of the situation and definition of interventions, including policy. Crucial in this is the need for more specific and focused attention on the household as a social, economic, and decision-making unit. One farmer representative noted that farming units usually are not comprised of a he or even a she alone, but of a couple or even more individuals. The round table also singled out land-tenure policies as crucial to food production and food security because of their impact not only upon the person making decisions about resource utilization, but also upon the size of the unit of decision, or farm size.

Provision of Technical Knowledge vs. Basic Capacity Building

The round table participants' beliefs about the merits of providing people with packaged knowledge (particularly technical knowledge) to facilitate their decisions and use of resources—as opposed to enhancing their intrinsic capabilities and ability to acquire and utilize knowledge through education and other means—were unclear. As part of the discussion, however, the correlation between education at any level and food production and security was clearly acknowledged. Even though education at the rural-household level was not discussed explicitly, participants considered the need for education and training at the policy-making and research levels crucial.

Other Issues Discussed

- The need for accountability in research and among researchers, particularly to the intended research results user/beneficiary (i.e., farmers, in the case of agricultural research). Related to this is the need for researchers to try to "market" their research results: "If this is not possible," said one participant, "probably we have no useful results."

- The importance of organization to help people solve problems and progress. In the opinion of one farmers' representative, "We can't do much in an unorganized society."

- The true measure of agricultural research is in its final impact on human nutrition. This implies problems not only in ensuring impact but also in measuring it, as well as the need for an appropriate, properly coordinated or motivated, and stable mix of disciplines.

- Participants also considered large economic farm units versus atomization of farm sizes and their effect on efficient food production, poverty entrenchment, and the splitting of families.

- The many factors that affect the effectiveness of agricultural research include 1) research-extension-farmer linkages, technology transfer, and linkages with the market; 2) existence of input delivery systems, particularly seeds; 3) explicit attention to natural-resources management; 4) respect for and utilization of indigenous knowledge; and 5) partnerships with beneficiaries, other stakeholders, or key players.

Welcome Address

Eva Rathgeber, Regional Director, IDRC

Good morning. Welcome to Nairobi, to IDRC's regional office, and to this meeting, which is so important to us. To start, I would like to express deep appreciation to each of you for your kindness in accepting our invitation, and for taking time out of your busy schedules to come and contribute your interest, knowledge, and experience for the purposes of this round table.

During the last two years, IDRC has undergone a painstaking reorganization. We know this reorganization has given rise to some speculation that we might discontinue attention to the agricultural sector and food security. I hope this meeting will dispel any doubts. It is true that the Agriculture, Food and Nutrition Sciences Division of IDRC no longer exists, but its staff became key members of the Environment and Natural Resources Division. This new division will continue attending to IDRC's concern for general food security and the well-being of the rural farming community. It also will work more explicitly than before to make food security and the benefits people derive from the use of natural resources permanent—that is, sustainable—and equitable.

The reorganization process confirmed for us that the many issues at hand are multifaceted, that there are no unique ways to approach and provide solutions to any of them, and that no one discipline could attempt to do so. Given that IDRC's resources are limited, its task was to select some key areas or strategic themes on which to focus attention and to think of the most effective and efficient approaches for doing so.

The logical evolution of our approach was toward multidisciplinarity. Usually it is necessary to utilize the expertise of various disciplinary fields (e.g., the social, natural, and applied sciences and experience gained on the ground during project development or other businesses) in confronting research-and-development problems. This concern, and also the concern for enhanced utilization and effectiveness of research results, has led IDRC to broaden its collaborations to include NGOs and individuals from the private sector. For the same reason, IDRC is working with groups that have closer links with target groups (e.g., producers, consumers, other grass-roots groups, and stakeholders).

IDRC has moved toward an approach in which the following six themes will receive about 60 percent of its funding during the next three years:

1. Integrating Environment into Social and Economic Policies,

2. Technology and Environment,

3. Health and Environment,

4. Information for Sustainable and Equitable Development,

5. Biodiversity, and

6. Food Systems under Stress.

The theme Food Systems under Stress provides two major entry points for the Eastern and Southern Africa region:

- desertification and

- fragile highland areas.

Desertification

In this area, IDRC is working on

- Food systems under stress: an integrated approach to food production, processing, distribution, and consumption for selected food systems (e.g., rootcrops, oilcrops, sorghum, and millet),

- The relationship between food production, desertification, state policy, and political institutions, including the impact of structural adjustment programmes on household food security and environmental sustainability, and

- Sustainable small-scale resource-management solutions with emphasis on communally owned and managed plant and water resources.

Fragile Highland Areas

IDRC's concerns in this area include

- Policy options for increasing food security and reducing environmental degradation,
- Recovery of degraded lands and stable intensification of agricultural systems,
- Land tenure, and
- Communally based communal-property resource management.

In all of these activities, IDRC is anxious to help generate knowledge, provide opportunities and solutions to problems that are of interest to communities and farmers, and boost the direct involvement of grass-roots groups in the process. Today we are looking for ideas about how to rationalize these intentions, select specific topics and areas, and transform these into operational projects and activities that will provide effective results that are also attractive for policy makers and the private sector. This is why we have invited you here. We are looking for your advice, inputs, and ideas, which could help us be more beneficial to people by

- improving rural and urban lives,
- influencing policy makers to elaborate prudent policies, and
- encouraging the private sector to develop other useful products.

IDRC is not a big donor, but it certainly could lobby and leverage additional resources from other donors if you provide an attractive idea and commitment. The timing of this

meeting is not accidental: Soon several members of the EARO staff will depart for IDRC headquarters in Ottawa to participate in a one-day workshop to discuss the FSUS theme in a global context. We are very hopeful that the outcomes of our meeting today will be an important input to the meeting in Ottawa.

Thank you again for coming, for having accepted our invitation, for being willing to participate in the busy schedule set for today, and for contributing your interest, knowledge and experience.

Context and Expectations for the Round Table

Luis A. Navarro, IDRC-EARO

IDRC is attempting in several ways to deliver on its mandate for the use of Canadian taxpayers' funds to effectively contribute to improved welfare for poor people and conserve the integrity of the natural environment in the developing world, particularly in the Eastern and Southern region of Africa. Its present strategy and programmes, summarized in two documents given to you as part of your kit, reflect IDRC's commitment to the principles and recommendations of the Agenda 21 derived from the United Nations Conference on Environment and Development in Rio de Janeiro in 1992.

IDRC's common thread, preferred entry, and intent is to support research in strategic/priority subject areas by key groups/teams using promising approaches and partnerships. The objective is to provide knowledge that will help to mobilize and sustain environmentally sound decision making and action by key target groups, including target beneficiary groups/communities.

IDRC's ideal is to deliver on its mission to help the poor and conserve the environment in developing countries as effectively and efficiently as possible by supporting research and research-results-utilization efforts that promise to

strengthen and help consolidate the drive of all those concerned with the welfare of poor people of today and future generations,

- awaken the interest of and empower poor people to effectively participate in the betterment of their own welfare and self-reliance in a sustainable manner, and thus

- contribute to equitable and sustainable development, particularly in communities, countries, and regions that support such efforts and are willing to accept help and collaborate in the process.

IDRC's job is to search for and help shape opportunities in promising research ideas, groups, and approaches as close to its target populations as possible. To do this, we want to continue using our own experience and knowledge of different regions and the international development context, along with different types of consultation mechanisms within each region.

This round table is part of our consultation within the Eastern and Southern Africa region. We are grateful you have agreed to contribute your time, knowledge, and expertise to help us identify promising priority opportunities for one of our important programmatic thrusts, Food Systems Under Stress (FSUS). You have been recommended to IDRC because of your long association with and understanding of issues related to the subject; your knowledge of the needs, priorities, and opportunities for development in the region; and your commitment to contributing to such development.

Food Systems Under Stress in Eastern and Southern Africa

Food Systems Under Stress (FSUS) is one of six priority themes that constitute IDRC's research-for-development-support efforts. It directs attention to food systems that affect ever denser and poorer populations in fragile environments—i.e., environments under the most immediate stress.

So far, we have defined the following:

Goal

Improved and sustained nutrition and general well-being of people who depend on fragile ASAL, highland, and coastal agroecosystems.

Purpose

People's improved and secure access to and consumption of food, reducing produce wastage and environmental degradation in these habitats.

Intended IDRC Action

IDRC intends to support research and research results-based interventions that empower people to improve the social, economic, and environmental performance of key food systems in these agroecosystems, particularly among the poor.

A food system comprises people and the resources they command along the transect of processes that includes primary agricultural production, processing, and other transformations, movements and exchanges, up to the final consumption of food commodities. Performance in these food systems is determined by the nature and contribution of their participants and resources, as well as by the policy, organizational, technological, cultural, economic, and natural environments that affect these.

Performance measures include total production and productivity as well as contributions to nutrition and employment (social dimension), income, and foreign exchange (economic dimension), distribution of all these (equity dimension), and the system's effect on the natural environment (environmental dimension), for example. Stress limits or distorts performance. There are as many potential sources and causes of stress as there are determinants and modifiers of performance.

The assortment of determinants and dimensions of a food system's performance suggests the complexity of—and also the richness of opportunities for—research and research-derived interventions that aim to affect such performance.

Clearly, also, they include more than just technological knowledge (and, for that matter, knowledge in general), extending to the sociopolitical and economic context and factors that restrict or facilitate the use of such knowledge by the food system's constituents as well.

These opportunities fall in the fields of, and should motivate the participation among, many disciplines. How to tackle these opportunities effectively and efficiently is an additional question, which should help us select among methods available in each situation.

Regional Priorities

The present and projected state of natural resources and the potential food supply vis-à-vis population growth and food needs within the region, the international policy and economic framework, and the state of knowledge stemming from research and practical experiences cut the FSUS theme and its concerns in many different ways. Each of them is an incomplete view biased by the angle of interest.

Table 1 identifies more specific priority-research entryways. For presentation purposes, it unfolds from the pure physicobiological- and technological-knowledge dimension toward the sociopolitical and economic context/components of the food system. None of the identified dimensions can be isolated or treated without understanding of or reference to the others when studying or attempting to intervene in the system's final performance.

In general, all such dimensions and most of their components are important across the three focal agroecologies within the region: ASALs, fragile highlands, and fragile coastal areas. In some cases (marked with an x), such subdimensions may be more important in one agroecology than in others. This table, which analyzes the regional situation, also reflects the past experience, interests, and capabilities of IDRC, its partner institutions, and researchers in the region and elsewhere.

Another way to highlight priorities is in the form of issues and questions of relevance to EARO. These include

- The usual linkage between the rural poor and environmental degradation, which implies decreased food productivity in agriculture:

  - How much of this is a consequence of external (greater society) forces/influences, and how much is due to the poor people themselves (their activities, motivations, culture/beliefs, knowledge, local organization, and institutions)?

  - Who should pay for the environmental conservation practices and infrastructure needed for sustainable agricultural production by resource-poor farmers

(and, for that matter, by any farmer)? Should consumers subsidize this? Some may feel that prices already contain this subsidy. Do they? How about prices at farm level?

- Is it possible, and what will it take, to motivate resource-poor farmers to use available and known environmental-conservation practices and technologies (traditional as well as "modern") as part of their routine agricultural production? Is cost sharing (through subsidy) enough?

Table 1. Priority Research Avenues into the FSUS Theme in EARO

Research Areas/Ecoregions	ASALs	HL	CA
Environmental Degradation	x	x	x
Desertification	x		
Soil (physical/fertility) erosion	x		
Water pollution, siltation, floods		x	
Farming Systems	x	x	x
Animal production	x		
Intensive agriculture		x	
Mixed			x
Biodiversity	x	x	x
Conservation	x	x	x
Biotechnology	x	x	x
PCS of Main Commodities	x	x	x
Production potential/motivation			
Value adding process/storage			
Export/foreign exchange			
Income/employment			
Finances			
Environmental impact			
Policy environment/setting	x	x	x
Gender consciousness			
Producers'/consumers' organizations			
Resource tenure and property/use rights			
Structural adjustment			
Trade/pricing policies (active)			
Infrastructure/services			

Table 1. (continued)

Research Areas/Ecoregions	ASALs	HL	CA
People's knowledge/preferences/habits/gender specificities	x	x	x
Production/enviroment management			
Community organization/leadership			
Policy/law adherence/enforcement			
Food consumption			
Access			
Knowledge			
Motivation/preferences			
Information/communication systems	x	x	x
Infrastructure/service			
Internalization in decision making			
By producers			
By processors			
By marketers			
By consumers			
Search for sustainable solutions (interaction with the theme)	x	x	x
Participatory (gender, stakeholder, authorities)			
Collaborative			
Championship mechanism			
Networking			
Population issues (interaction with other themes)	x	x	x
Family planning			
Migration/refugees			
Health			
Education			

- How to create opportunities for and engage poor people who are alienated from any resource sharing to access food under the present and projected economic and social system in Africa? Could a welfare system (paid for by those who have, and hopefully temporarily) of food and related compensations for work in infrastructural development and environmental conservation and cleanup fit the system?

- How to recover traditional know-how (including information/communication systems) and reincorporate it in means and ways of improving food production, access, and consumption at community level.

- How to assess, foster, and support local-level participation and collaboration in improving community food production, accessibility, and consumption—this with attention to household and grass-roots organizations' and institutions' development and participation.

Still, resource limitations and the need to produce results quickly suggest the need for more focused and strategic selection of fewer research entries, objectives, partners, and approaches. IDRC expects that this round table will help narrow the range of choices and provide strong reasons for it to foster and support efforts in recommended areas.

EARO Contribution

Some of IDRC's past experiences and achievements, and its present portfolio of projects and opportunities for development of its regional work, are consistent with the priority landscape above.

At the moment, projects and plans focus in an integrated manner on specific food systems such as 1) oilcrops and vegetable oils (Kenya and regional) and sorghum and millet food/feed systems (Kenya, Tanzania, and regional), which are of primary importance for a majority of the poor rural population in ASALs; and 2) banana (Uganda and regional), mixed crop/animal production systems (regional), and freshwater fisheries (Uganda) in fragile highlands.

These projects and others call attention to proper policy definitions and decision making that affect the participation and behaviour of different constituent groups and the resulting performance of key food systems (e.g., by promoting production-to-consumption-systems approaches (Kenya, regional, through PTA/AGREF), other participatory approaches and networks (FSUS network), and small-grant strategies (Policy Analysis Initiative, SADC). One of the newest efforts is the FSUS network project, which focuses regionally on community coping and recovery mechanisms related to droughts and similar food crises.

The above review provides a general impression of IDRC's starting base, which we would like to begin reinforcing with your guidance.

Meeting Structure and Mechanisms

Our agenda for today is composed of 1) a series of opening statements by designated speakers, followed by discussion of several component subthemes (a participant has been asked to collect the thread and main conclusions from each section/discussion, to be summarized in the afternoon); 2) open discussion of issues that will require further attention later; 3) summary presentation; 4) closing discussion; and 5) closing ceremony. With your collaboration, we hope we will be able to release you at 17:30.

Food Systems under Stress in Eastern and Southern Africa

Bede N. Okigbo, United Nations University

The human food system consists of activities, processes, and events that occur at different stages of food production, harvesting, postharvest handling, storage, processing, disposal and distribution of produce, importation, preparation for eating, and, finally, utilization after eating. Food system stages are very similar in different parts of the world, but their complexity varies according to prevailing technological and socioeconomic conditions. The activities involved range from land clearing, soil preparation (including tillage and planting), and soil and crop management (including weeding and staking during the production stage) to such harvest and postharvest activities as drying, threshing, winnowing, spraying with insecticides or fumigants, bagging, processing, canning, distribution, sale and export , cooking, eating, digestion, and absorption.

Each stage of the food system provides an opportunity either to enhance or conserve the product as well as suffer quantitative and/or qualitative losses. Stresses in the food system are events or factors that cause changes in the food system or environment, result in reduction or variability in production, and culminate in less-than-expected qualitative and/or quantitative values. In Eastern Africa, stages of the food system subject to stresses of various types include production, harvesting, drying and handling, storage, threshing, processing, and food preparation. For example, drought, insect, or weed infestation during the growing stage result in reduced yields and productivity. Abnormal rains may delay harvesting and cause weathering and qualitative and/or quantitative losses. Similarly, during drying, rains, fires, rodents, and other pests pose problems, as do insects and moulds during storage. Processing may cause damage to the produce through various kinds of contamination, for instance, exposure to high moisture or high temperatures or microorganisms. Losses also occur when tiny particles of grain blow away during winnowing or sieving.

The different factors that constitute stress at various stages in the food system contribute to lack of sustainability in production, resulting in food insecurity. Measures to combat or eliminate the adverse effects of these factors include policies, strategies and programmes

for reducing losses, preventing the occurrence of some stresses, and ensuring adequate food supplies, even in the presence of stresses.

Components of the Food System and Effects of Principal Stresses

Economists tell us that the main factors in agricultural production are land, labour, and capital. Land, the resource base from which the food system takes off, consists of components of the biosphere relevant to agricultural production including soil; water in the atmosphere (including rainfall), in streams and rivers, and even underground; plants and animals; and, last but not least, time.

Water

Climate is a major determinant of the kinds of vegetation, crops, and animals found in any one location. Climatic factors include sunlight, temperature, humidity, wind, and rainfall. Water is of vital importance in agricultural production; in the absence of irrigation, water is obtained from rainfall. In Eastern and Southern Africa, the length of rainy periods determines the quantity and kind of agricultural production. Studies of Africa show that parts of the region with annual rainfall of 1,000 mm or more have net annual productivity greater than 2,000 g/m^2, while areas with less than 1,000 mm range from less than 2,000 to less than 500 g/m^2. Obviously, rainfall is a major limiting factor in terms of amount, regime, or pattern (i.e., monomodal or bimodal) and in the extent of its variability in onset and cessation (see tables 1 and 2). In Eastern and Southern Africa the probability of rainfall being higher or lower than normal ranges from 20 to 25 percent on the East Coast to greater than 40 percent in the Kalahari Desert and in parts of Somalia and Ethiopia. Exceptions are small areas of Cape Province in South Africa, the eastern half of Madagascar, and areas around Lake Victoria, where deviations from the norm are less than 15 percent.

Table 1 shows that up to 72 percent of Kenya's land area receives less than 500 mm of rain, compared with Uganda and Tanzania, where 72 and 47 percent of the land area respectively receive 750 mm or more of rainfall annually. Table 2 shows the extent of variability in annual rainfall for some East African stations. Rainfall certainty and patterns are highly variable across Eastern Africa. Some areas have a high probability of receiving more than 500 mm

Table 1. Percentage of Land Area in Uganda, Tanzania, Kenya, and East Africa that Receives Stipulated Annual Rainfall in Four out of Five Years

Rainfall amount	Percentage of land area			East
	Uganda	Tanzania	Kenya	Africa
Less than 500 mm	12	16	72	35
500-750 mm	10	33	13	20
750-1,250 mm	72	47	12	41
1,250 mm+	6	4	3	4

Table 2. Summary of Rainfall (in mm) over Selected East African Stations

Station	Maximum	Mean	Minimum
Wajir	513	249	74
Nairobi	1,570	879	437
Tabora	1,303	866	391
Dar es Salaam	1,499	1,057	437
Gulu	2,035	1,544	1,004
Entebbe	2,261	1,506	998

Source: Brouillete *et al* .(1974)

or even more than 760 mm, compared with areas that sometimes receive 500 mm and those with very little chance of receiving as much as 500 mm a year. The rainfall pattern or regime in East and Southern Africa ranges from monomodal in places such as Dodoma to bimodal in areas such as Nairobi, Mombasa, and Entebbe. The bimodal rainfall pattern presents a different planting problem compared to that experienced in monomodal areas. Figures 1 and 2 show that in a bimodal rainfall area, farmers have two planting periods, each of which varies in the time of onset with the rains. In monomodal rainfall areas, farmers do battle with the variations of only one planting period. Furthermore, in bimodal rainfall areas, farmers either choose crops that mature in the earlier, higher-rainfall period as their first crop or a perennial, longer-duration crop planted early in the year, in addition to a late crop that will mature during the shorter second rainy season. Farmers in monomodal rainfall areas plant either a perennial crop or one that matures at the end of April or, at the latest, in June.

Drought is said to occur when the period of moisture deficit or lack of rain is prolonged to the extent that no crops can be grown to maturity or wither before harvest. Drought occurs in cycles that are not very easy to predict. Figure 3 gives a good idea of periods of deficit and water availability in relation to the prevailing rainfall regime.

Temperature

Apart from deficits in moisture, other stresses during the production or growing period associated with climate include

- high temperatures, which injure seedlings and adversely affect growth and such processes as nitrogen fixation,

- frost or very low temperatures, which kill seedlings and have detrimental effects on many physiological processes, and

- cloudiness, which reduces the amount of sunlight, and duration of sunlight of average or greater-than-average intensity. (Higher yields in oil palms in Malaysia, compared to those in West Africa, reportedly may be due to Asian producers' higher average number of hours of sunlight.)

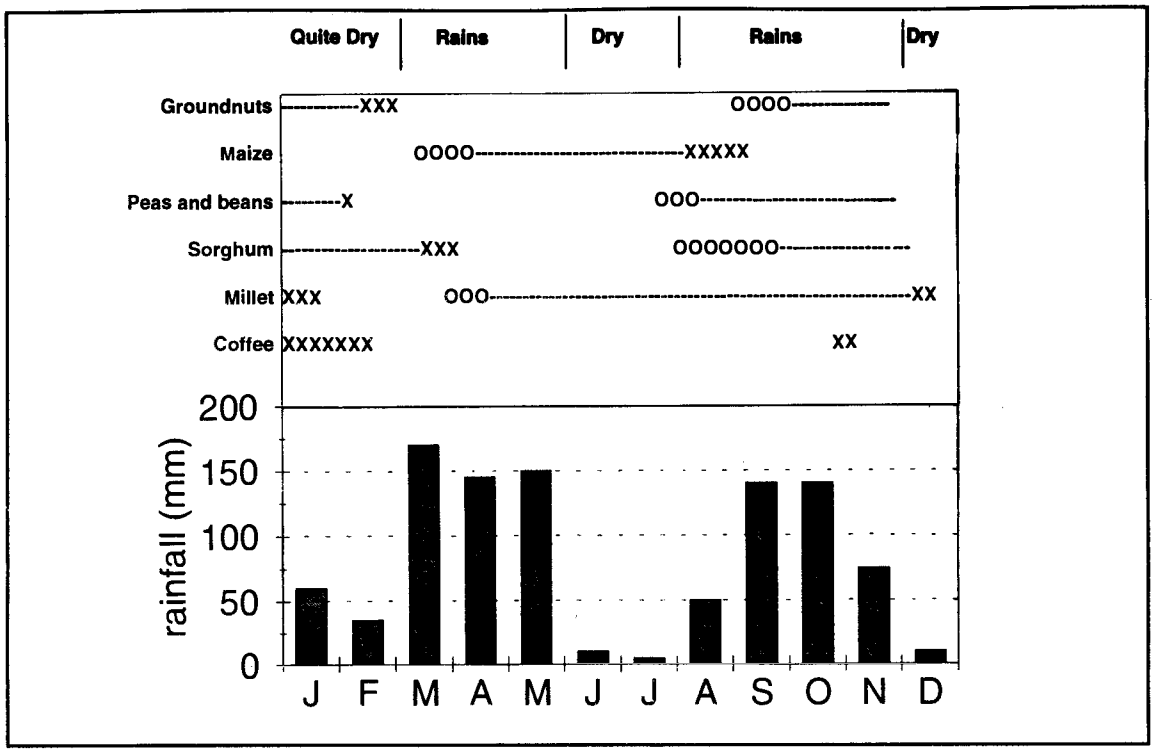


Figure 1: Weather and cultivation, Ankole, Uganda
Source: Hickman (1986), as cited by Okigbo

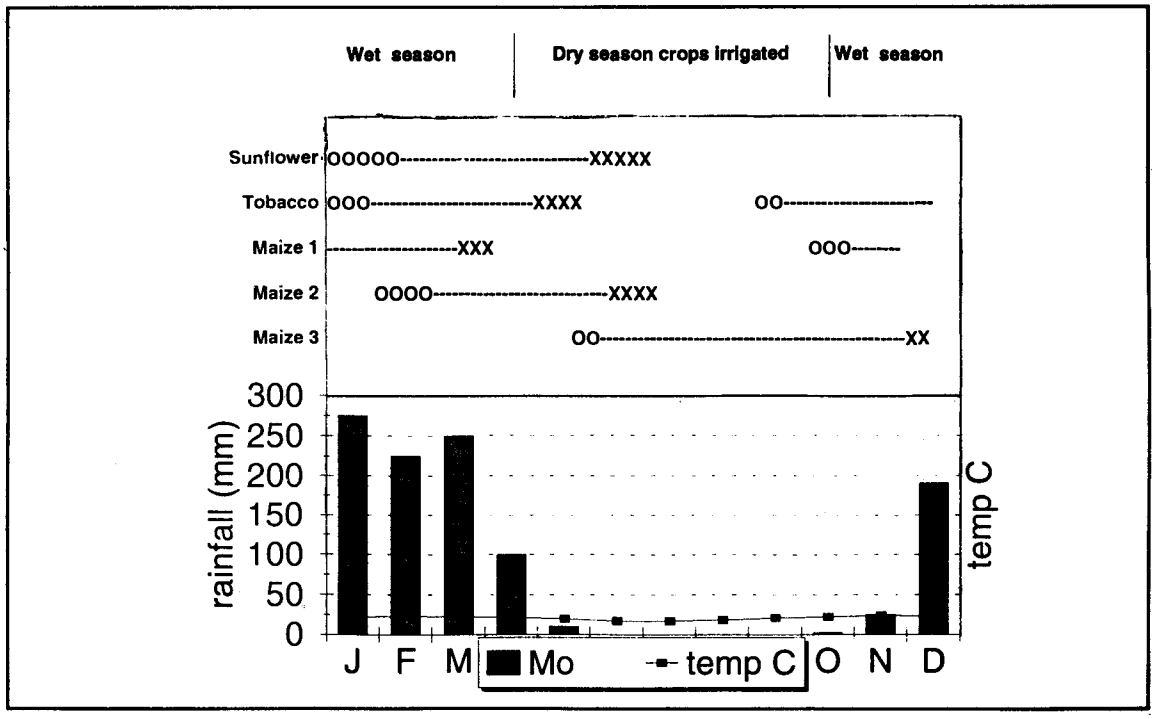
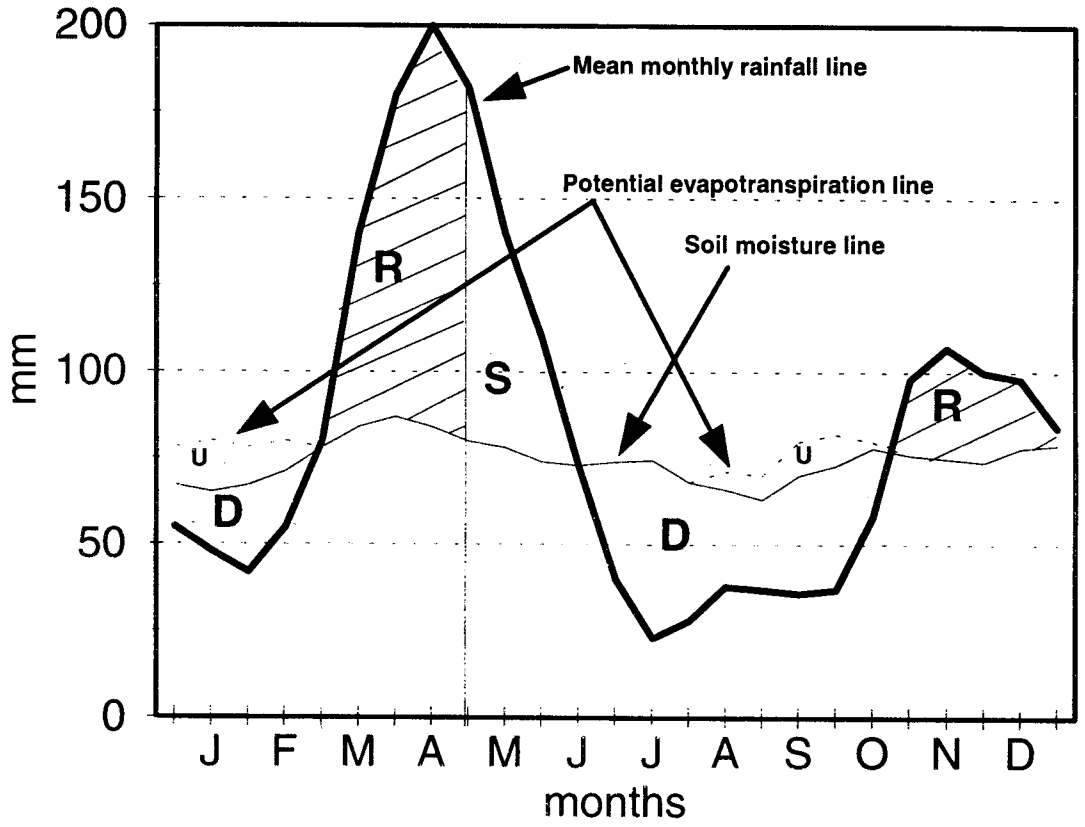


Figure 2: Weather and cultivation, Songea, Southern Tanzania
Source: Hickman (1986), as cited by Okigbo



R = recharge: the rains arrive. In these months more rain falls than plants can use, so this results in a
S = surplus: the rainfall exceeds the amount plants need, and the soil is saturated and cannot absorb any more water. There is an excess of water called the moisture reservoir.
U = use: in these months moisture is taken in and used by plants from the soil-moisture reservoir, i.e., the water already in the soil. But rainfall totals are low, and plants use more rain than falls. Gradually, the soil dries out.
D = deficiency: little or no rain falls in these months. Soil moisture is used up, and plants die unless they are supplied with irrigation water.

Figure 3. A water balance diagram for Nairobi
Source: Hickman (1986), as cited by Okigbo

Soils

Soil stresses include moisture deficits, physical factors such as soil compaction, high bulk density, limited pore space and aeration, waterlogging, and the presence of concretions that make root penetration or even water penetration difficult. Lack of organic matter in the soil may cause it to dry quickly or harden excessively, making it difficult for roots to penetrate. Other soil-related factors include adverse chemical properties related to very low or very high soil acidity, nutrient toxicities (e.g., of aluminium and iron), nutrient deficiencies (e.g., of nitrogen or potassium), etc. Soils of the tropics in Southern and Eastern Africa are mainly alfisols, oxisols, and ultisols, which have low inherent fertility. Consequently, these soils must be fertilized in order to obtain high yields.

Biological Factors

Various organisms found in soil have beneficial effects on crops and animals. For example, nitrogen-fixing bacteria add nitrogen to soil, enriching it and reducing the need for purchased nitrogen fertilizer. Where chemical or physical conditions make survival of rhizobia difficult, nitrogen fixation declines, and foods harvested from them are deficient in nitrogen. Some important biological stresses include pests, diseases, and weeds that attack crops and cause losses in quantity and quality. A special case is parasitic diseases (such as trypanosomiasis) that attack man and animals, making large areas unsafe for farming and livestock production. Still, today, in several areas of tropical Africa parasitic diseases adversely affect man and domestic animals. Although progress in eradicating some of these has been made, disease continues to hamper food production and land use in some areas.

Vegetation is a component of environmental resources. Usually, apart from the multifarious uses of forests, the crops produced in any one area are related to its climax vegetation. Eastern and Southern Africa has 1) tropical rain forests and mangroves (found in patches near the coasts and in some inland areas), 2) moist savanna and subhumid savanna woodland, 3) dry forest savanna woodland, 4) *Brachystegia julbernadia (miombo)* woodland, 5) *Acacia combretum* woodland, 6) dry forest savanna mosaic, 7) tropical thickets, 8) savanna grassland, 9) grass savanna steppe, 10) desert, etc. Table 3 shows that crops and land-use systems related to these zones consist of farming systems for production of

sorghum, millet, maize, some rice, cowpea (especially for the leaves), *Phaseoulus* bean, Bambara groundnut, cassava, Irish potato, sweet potato, Livingstone potato, fruits (such as pineapple, mango and orange), vegetables (such as tomato, lettuce, carrot, cabbage and their relatives), and cash crops (such as tea, cashew, groundnut, cotton, coffee, etc.). Introduced crops such as maize have displaced indigenous sorghum in some areas.

A line from northern Ethiopia on the Red Sea coast to Luanda in Angola separates areas of highland savanna to the east that grow subtropical and some temperate crops from lowland areas to the west that grow mainly tropical crops. Otherwise, the whole region is more or less an area of pastoral peoples who raise cattle, camels, sheep, goats, and some poultry, especially in Somalia, parts of Kenya, Uganda, Ethiopia, Tanzania, and the Southern Africa Development Cooperation (SADC) countries. Fishing and hunting of wildlife, which in many countries support thriving tourist industries, complete the picture. Apart from environmental and climatic stresses and pests, diseases, and weeds that affect crops, diseases of livestock, problems of overgrazing (especially in the dry season under increasing livestock numbers), and pressures on pastures resulting from agriculture, industry, mining, human settlement, etc., all tend to concentrate nomadic pastoral peoples in restricted areas.

Sociopolitical Stresses

Political instability, civil wars and strife, and deficiencies in infrastructure (roads, railways, and waterways) present problems that limit production, distribution, trade, and export of produce. The stage and stability of democratization is still variable across all of Africa, where last year natural disasters and human-made political and social unrest contributed to the most serious stresses on the food system. Related to these are social problems dealing with land tenure, division of labour between the sexes, and labour shortages at peak periods of production and harvesting.

Major Constraints to Increased Agricultural Production

Production constraints are physical, biological, and socioeconomic in nature (see Table 4). A major socioeconomic problem is lack of appropriate technology for various production systems and deficiencies in human-resources development and institutional capacities.

Harvest Stage

Stresses and losses at harvest are related to

- climatic conditions and timing,
- the condition of the crop,
- method of harvesting,
- technology used, and
- care, experience, etc.

Postharvest Stage

Problems at postharvest are related to problems of handling, drying, primary processing such as threshing and winnowing, transportation, packaging, conditions under which produce is handled, food preparation conditions (health, socioeconomics, etc.) of the consumer, extent of balance in diets, and various factors affecting consumption, digestion and absorption.

The many other sources of leakages and losses in the postharvest stage constitute stresses on the system. These include

- spoilage due to several factors;
- demand by those who are not farming, including the sick, public workers, prisoners, etc.;
- export production;
- nutrients taken by parasites, etc.; and

- nutrients lost during various operations.

All of these contribute to the idea of the "stolen harvest" consisting of various factors that reduce the amount of food available from what is produced.

Ways of Combatting Stresses or Losses

There is no room here for detailed discussion, but the following should be considered:

- Improved soil, water and natural-resources conservation to minimize environmental degradation and loss of sustainability;
- Improved water conservation and management and increased efficiency of use:
- Increased production per unit of land or input;
- Decreased emphasis on expansion of area for increasing production;
- Improved cropping systems with emphasis on integrated production systems (agroforestry, agrosilvipastoral systems, etc.);
- Genetic improvement to achieve several objectives, including adaptation to environmental stresses and postharvest handling;
- Use of appropriate mechanization and technologies, including integration of traditional, modern, and emerging ones (e.g., biotechnology and computer technology);
- Use of integrated pest management (IPM) strategies;
- Improved pasture management and animal nutrition;

- Better management and utilization of 1) forest resources, including more use of wild or neglected indigenous species, and 2) aquatic resources, including aquaculture and processing of produce from them;

- Better management of climatic resources, including weather forecasting;

- Better management of natural disasters, including preparing for them;

- Improved postharvest technologies and agribusinesses;

- Improved linkage of education, research, extension, and the farmer, including use of on-farm participatory approaches in which farmers are involved in technology and systems design and testing;

- Improvement of agricultural and food policies backed up by research, including addressing of gender issues and policies in the food system. Research should be of sufficient scope (basic, strategic, applied, adaptive maintenance, developmental, testing, and demonstration); and

- Effective human-resources development and institutional capacity building, including training of women at various levels and in many disciplines so as to also ensure that some gender issues are addressed and equity attained.

The above list is by no means exhaustive, but it is achievable if sustainable agricultural systems are introduced as a component of sustainable development that includes better management of the environment and its resources, conservation of biodiversity, and changes in lifestyles, attitudes and behaviour to ensure greater equity and access to materials, including food, for all. This calls for the development and use of preventive and remedial measures in a balanced manner.

Table 3: Main climatic zones, Vegetation and land use in the humid tropics of Sub-Saharan Africa (Source: FAO 1986)

Climatic zone and area (million ha)	LGP (days) and moisture availability	Climate	Natural vegetation	Land Use	Specific problems
Humid (Southern Guinea) 409.0	More than 270 Excess	Humid virtually throughout year; often with bimodal pattern. More than 1,500 mm rainfall	Tropical rainforest	Tree crops - oil palm, rubber, cacao, shifting cultivation based on root crops (yams, cassava, etc.). Also some sorghum and maize, bananas, pineapples, sugar cane and rice. Few livestock mainly Taurine cattle, sheep and goats, and poultry. Tropical hardwoods are a valuable resource where forest remains.	Bimodal rainfall distribution may cause problems with cereals cultivation
Moist Subhumid (North Guinea) 584.0	180 - 270 Adequate	Up to 8 months humid. Winter rainfall in north is twice as effective as Summer rainfall elsewhere	Forest. Southern Congolian evergreen forest and woodland and so-called "derived savanna"	A transition zone for agriculture. Generally too wet for seasonal arable crops and too dry for tree and shrub crops. Maize and cassava grown extensively in tropical zones. Also yams, bananas, pineapples, sugar cane and rice. Wheat and barley grown in the winter rainfall zone and the East African highlands.	Severe tsetse infestation limits the exploitation of livestock potential
Dry subhumid	150 - 170 Adequate	5 - 6 months humid 9 - 1,200 mm rainfall	West Africa: *Parkia-Butyrospermum-Khaya* woodland, tree and shrubs grassland, and *Andropogon* grasses. Central/Southern Africa: *Brachystegia* and *Julbernadia* woodland (miombo) with tree and shrub grassland. Perennial grasses. East Africa: *Combretum-Acacia* woodland.	Zone of arable crop production, traditionally used by nomadic pastoralists (zebu cattle, goats and sheep) in dry seasons and drought years. Many pastoralists now partially settled; major influx of nomads occurs in wet season. Tsetse used to limit access to some areas, but this problem largely removed through increasing destruction of fly habitats. Main crops millet, sorghum, maize and groundnut; also cassava and cowpeas, cotton. sweet potatoes, tobacco, rainfed rice, soya, mango and cashew nuts. Grazing of Zebu and Taurine Cattle, sheep and goats. Fodder crops and sown pasture possible (e.g., *Stylo*).	Declining yields and land degradation result from considerable pressure on the available land resource and consequent disruption of traditional cultivation patterns. Fuelwood deficit or acute scarcity is widespread.

Summary: Constraints to Agricultural Production in Tropical Africa

Physical Constraints

Unfavourable*climatic* conditions include

- rainfall that is unreliable in onset, duration, and intensity;
- unpredictable periods of drought, floods, and environmental stresses;
- reduced effective rainfall in sandy soils and steep slopes;
- high soil temperature for some crops and biological processes (N fixation);
- high rates of decomposition and low OM level; and
- cloudiness and reduced photosynthetic efficiency.

Most *soils* of the humid and subhumid tropics

- are intensely weathered, sandy and low in clay;
- have very low CEC and thus also less active colloidal complex;
- have very low inherent fertility (except on hydromorphic and young volcanic soils);
- have very high acidity and sometimes high surface temperatures;
- are extremely subject to multiple nutrient deficiencies and toxicities under continuous cultivation;
- have very high P-fixation;

- are extremely leached, and thus at high risk of erosion under prevailing rainstorms; and
- have serious salinity problems under poor irrigation management.

Biological Constraints

- Unimproved crops and livestock.
- Low yields and low potential.
- Susceptibility to disease and pests.
- High incidence of disease, pests, and weeds owing to environments that favour these phenomena.
- Drastic environmental changes, brought about by human activities that have adverse effects on ecological equilibrium.

Socioeconomic Constraints

- Small farm size, more drastically reduced by population pressure.
- Unfavourable land-tenure systems, often resulting in fragmentation of holdings.
- Shortage of labour.
- Lack of credit and low income.
- Poor marketing facilities and pricing structure.
- High cost and extreme scarcity of inputs.

- Poor extension services.
- Illiteracy and superstition that sometimes hamper the adoption process.
- Poor transportation.
- Inappropriateness of inputs.
- Lack of package approach to technology, development, and use.

Technical Priorities for Research and Development of Food Production

C. G. Ndiritu, Kenya Agricultural Research Institute

The food crisis is primarily a problem of the developing world. As a serious social problem in its own right, it includes not only difficulties of production and supply but those of demand and income levels, in addition to those of the productive, quantitative, qualitative, and economic aspects of food production.

The quality and quantity of land and water resources available; economic variables such as investments, sources of financing, and markets; institutional support such as administration and service institutions; infrastructure such as roads and transport; social and human aspects; and levels of applied technology are factors that hinder breakthroughs in food production. These factors have to be considered in determining priorities for research in food production.

Natural Resources, Population Growth, and Potential Food Supply

Eastern and Southern African countries are endowed with a wide range of physical characteristics that provide a variety of natural vegetation, land and water resources, and land uses within their large area. Within this vast region, climates range from desert in the Kalahari and the Horn of Africa to perpetual snow on Mount Kilimanjaro and Mount Kenya. The diversity of ecological and climatic conditions limit the availability of good-quality agricultural land. This has far-reaching implications in the generation, testing, and adoption of improved technologies for increased food production.

The rapidly increasing population in the region (estimated at 3 to 4 percent per annum) has resulted in

- a high level of self-sustenance in food and raw materials production,

- subdivision of land in high- and medium-production areas into smallholdings for which appropriate production technologies are not available,
- expansion of agriculture into marginal areas for which little or no research has been carried out in order to generate appropriate technologies
- destruction of vegetation and catchment areas, and
- decline in soil fertility due to continuous cropping, overstocking, and soil erosion.

The issues to be addressed are

- increasing food and raw-materials production to meet the demands of the rapidly increasing population,
- declining land productivity and dwindling water resources, and
- sustainable utilization of land and water resources.

Agricultural Food Producers/Handlers

The bulk of the farming population (about 75 to 90 percent) in the region is largely small-scale farmers who grow staple food crops and keep livestock to meet household food requirements and produce a little surplus for sale. Small-scale farmers account for 75 percent of total agricultural production. Women head 40 to 60 percent of smallholder farms, while women actually operate about 75 percent of smallholder farms.

The majority of small-scale farmers have inadequate capacity for agricultural production due to

- limited labour,
- limited funds to purchase agricultural inputs,

- poor postharvest facilities, and
- poor marketing infrastructure.

In addition to these poor structures, appropriate technologies are not readily available.

Knowledge from Research and Practical Experience

Agricultural research has produced high-yielding crop varieties and animal species and improved production technologies for both crops and animals. Yet the gap between research yields and farmers' yields is very large. For example, in Kenya an ordinary small-scale farmer growing hybrid maize gets 1 ton/ha, compared to the research yield of 12 tons/ha and the biological potential of 20 tons/ha.

On-farm research and surveys have revealed the following to be the major limiting factors to increased agricultural production:

- low soil fertility,
- inappropriate crop varieties and animal species,
- inadequate and low-quality animal feeds,
- pests and diseases of both crops and livestock,
- lack of agricultural credit and high cost of inputs, and
- poor pricing and marketing.

Research aimed at increasing food production has to focus on these factors if it is to produce results.

National and International Policy and Economic Frameworks

The realm of national and international policy guides the direction of agricultural development by establishing courses of action and goals at the national level. Priorities are set, resources allocated, and rules elaborated to create an environment in which technological progress is either made or restricted.

The issues to be considered here are

- governments' financial commitments to agriculture,
- investments in research in relation to the Agricultural Gross Domestic Product (AGDP),
- availability and utilization of agricultural credit,
- pricing policies, with emphasis on comparing farm-gate and world-market prices, and also on comparing the farm-gate price of a staple food grain to the price of required inputs such as fertilizer, and
- farmer participation in the technology system.

Problems that Require Immediate Research and Research-based Interventions

- Sustainable improvement and maintenance of soil fertility.
- Adapting crop varieties and animal species to the limitations and opportunities of the environment and to fit into the farmer's system.
- Introduction, management, and utilization of fodder crops and crop by-products, particularly among small-scale farmers.

- Integrated pest and disease control for crops and livestock.

- Socioeconomic research into factors that limit adoption of improved technologies.

- Research on cultivation methods for soil and water conservation, backed by adequate soil and climatic surveys, and research into ways of impressing the need for soil-conservation measures on peasant farmers.

- Studies to produce precise quantitative descriptions of the many diverse agricultural environments in the region to make it possible to fit agricultural systems more efficiently to environmental conditions.

- Improvement of land utilization through competent ecological land-use survey.

- Research into small-scale, on-farm postharvest storage and processing of commodities, particularly perishable commodities such as vegetables, fruits, and milk.

- Research into the processing and utilization of crop and livestock products to promote increased production.

- Crop/livestock production storage.

It is important to stress that economic research should be closely associated with technical research in the production of food. Technical bias in research is at times reflected in too exclusive a preoccupation with maximization of output per unit area without regard for all the necessary related inputs and the farmer's capacity to provide them. In this regard, it is important to emphasize the farming systems approach to research and development, with emphasis on the systematic constraints analysis process (SCAP).

Organizational and Institutional Factors Affecting Food Systems: Approaches and Issues

Chris P. Tapscott, University of Namibia

Namibia's emerging experience with food security that pertain to food systems and the stresses on their performance is a wide topic that impinges upon many matters, from how households allocate resources for food acquisition to the money market at national level. In terms of the influence of organizational arrangements on food security at local level, it is important to distinguish between short-term stresses and more endemic longer-term stresses, and between strategies to strengthen and support the evolution of existing food systems and strategies to support those systems when they are faced with external shocks (e.g., sudden drought and crop failures). These two approaches are mutually interactive, but they require different considerations. Unfortunately, in the context of endemic stresses in the region, most of the time these approaches tend to be of a short-term nature, neglecting the necessary long-term perspective.

Perhaps to start with, researchers should consider how to approach the issue from a historical perspective. By understanding how food systems have operated historically, discovering their vertical and horizontal linkages and the strategies rural households traditionally adopted to protect those systems, researchers might gain an understanding of why many food systems have collapsed in the past and which factors have placed additional stress upon them.

Historical Sources of Stress

Historically and at community level, probably three processes have contributed to the undermining of household security systems:

Rapid Population Increase

Population increase has reduced individuals' access to primary resources such as land and water, vegetation, trees, etc. Today, it is not possible to solve this problem by moving to a new piece of land, as was done in the past.

Extension of the Market

Access to wider markets has fuelled communities' reorientation of production and exchange away from local systems of reciprocity or redistribution. This, in turn, has affected household and community coping mechanisms and undermined their food-security systems. Many self-tailored systems that communities used in the past have been undermined or changed or have disappeared. Today, commoditization of local labour and resources and reliance on wages and other sources of income, which have diminished rural households' self-reliance, are common.

The traditional "moral" economy also has been undermined. Through their mutual-help systems, local communities used to keep each other afloat in times of drought or other emergencies. This is rapidly changing as more people come into these systems and these extended systems come under increasing pressure. As a consequence, economic relations have been separated from social and political relations. This transformation of the structure of rural society has obviously affected its food-security mechanisms.

Extension of State Power

The increasing monopolization of power and administration by the state has also affected food systems and food security at the household and community levels. The effect, however, has not been consistent. On the one hand, states have brought more in the way of services (education, roads, etc.). At the same time, they have undermined the responsibilities of local authorities and traditional structures, as well as local food-security arrangements. The increasing role of the state in rural production has therefore reshaped and influenced the former social organization.

The Role of Organization in Food Security

To discover and recommend the kinds of organizations and institutions needed to improve food systems and food security, governments should avoid the top-down, organigram approach common to many ministries and extension services. Rather, governments need to find out the needs at the local level and start structuring their organizations from the bottom up. In this way, the focal point will be the rural household, the primary institution at micro level, which also has a complex internal organization and a diverse micro-level set of linkages. Despite extensive research, we do not yet know or understand the complexities of rural households' economies.

IDRC should look precisely at this functioning of rural and household economies and their varied responses to different pressures. The lack of knowledge in this area has been clearly demonstrated in several cases of misdirected aid provided in the face of calamities such as drought.

While the abundant research conducted in recent years on coping strategies has advanced our understanding of the complexities of survival in rural economies, this approach has limitations. If policy is to be formulated on the basis of analyzing such strategies, there is a danger of constraining rural households at the level of coping, trapping them in poverty or at least limiting their possibilities. Instead, households and communities should be helped to move further into livelihood adaptation.

The coping-strategies research approach so far has built up understanding of how different forms of local food redistribution and local collective action against food insecurity function. From a research perspective, it is important that these mechanisms be clearly understood if relief and development interventions are not to undermine local capacity. Conscious strengthening of local institutions most likely would be an efficient and cost-effective way of improving food security.

The tendency is to view threats to food systems as the outcome of production failures at the household and national levels only. Quite clearly, however, such threats are also the product of institutional and policy failure. To some extent, household food insecurity and rural poverty

should not be viewed as short-term crises but as outcomes of long-term failure of policy to manage demography, the environment, productivity, and political pressures such as land distribution. If policy design keeps people at marginal levels, just surviving, they will be susceptible to famine as soon as drought or some other calamity hits—another reason to move them beyond coping mechanisms.

Constraints and Opportunities Facing Organizations for Food Security

Conceptual Constraints

Famine avoidance is technically easier to address than endemic poverty and thus gets a lot of attention (early-warning and food-stores programmes, lots of available information). Poverty requires a far more systematic approach that deals with various organizational mindsets that influence decisions. The following examples probably are more typical in the context of Southern than of Eastern Africa:

Household Food Security or National Food Security?

In Namibia, even though the main food contributors are a small elite of big producers while the mass of producers are small-scale farmers barely able to subsist, politicians routinely push for national food security. This pattern is also apparent in many other countries of the region. In Botswana, however, this national food security concept has been abandoned to attend, instead, to the household food system composed of food production that includes aspects of economic diversification through off-farm employment.

Food Self-sufficiency or Economic Diversification?

This issue also relates to a particular mindset, which may be determined by environmental and climatic conditions as well. One mindset holds that food security can only come from what the household is able to grow by itself. This is clearly impossible, as available land is

insufficient for everyone to do that. This should therefore promote a serious look at the means of economic diversification.

In Namibia and South Africa, for example, most people are not able to subsist on their land, and so they develop multiple income sources. The husband may move to an urban area to work in a mine or industry, while the wife and children remain home and work the land. This household strategy results in a split of the labour force and of the family. The woman's role is to raise the family and look after the farm. Productivity has ultimately decreased, as observed in field studies in the Kavango region. In Namibia, the problem was aggravated further when educational planners changed the school calendar from a four-term to a three-term system without consulting the agriculturalists, taking the children out of the harvest.

Availability of Complementary Services

Food security is also related to availability of services such as health, education, and sanitation. These services—for example, family planning—do not, however, provide for food security on their own. Similarly, increased production on its own will not achieve the desired food-security results but must go hand in hand with education, for example, to guide the utilization of funds earned.

Organizational Constraints

Recommendations, wish lists, and demands from meetings and studies stating what governments should be doing are not scarce. Governments, however, face many limitations including the influence of the mindsets discussed (and others) and can not respond properly. These limitations include

- the general weakness of extension services. In many cases, extension workers are most in need of extension training in order to help them fully understand the complexities of rural economies and adjust their own work;

- insufficient administrative capacity;

- inadequate skills; and

- weakness of finances.

All of these limitations should be taken into account when advising governments. Manifestations of the same weaknesses, which contribute to the deficient performance of governmental institutions, particularly extension services, are

- Lack of planning and clear vision of the role of the rural economy in the broader national economy;

- Gender biases. In southern Africa, women do most of the farming, and this one-sidedness is exacerbated as men leave the rural areas to work. Yet the prevailing mindset among extension workers is that the farmer is a he. Legal control of assets is a problem, including access to credit; technically, under the law, women are considered minors and can not sell cattle or plough land without the approval of a husband who may return to the farm very infrequently.

Nongovernmental Organizations (NGOs)

Even though this varies from country to country, local NGOs are usually weak. For example, in Namibia and South Africa, local NGOs have good intentions and a lot of support but lack real capacity and reach. A case in point is Namibia's Communal Farmers Union, which is troubled by financial difficulties, skills shortages, and competition for its constituency from the more able Commercial Farmers Union.

Local NGOs' main weaknesses are in management skills. However, they are well positioned and could become very important, if strengthened, in developing and maintaining proper organizational structures at the community level. NGOs could constitute an opportunity to strengthen food security, but they certainly need support and guidance.

Development Aid Agencies

These do a lot of good work, but in newly independent countries such as Namibia, they tend to fall prey to the demands of politicians. They end up giving a lot of aid but show little concern about how this aid is actually used or about its final impact. The tendency seems to be maximization of aid, with little attention paid to optimization, which can undermine all efforts to strengthen food systems and household food security. Even though a great part of this misdirection and misuse of aid is determined externally, local interest groups, corruption, and structures in recipient countries also account for a significant portion. Furthermore, development aid has been criticized for the following tendencies:

- Use of predetermined approaches: that is, application of models that have been successful in a certain country to a new country without sufficiently adapting them to local circumstances; and

- Relief-oriented aid. In recent years, priority areas have been determined on many occasions by the Western media. These decisions do not necessarily coincide with local sentiment. This manifests in both the choice of aid recipients and in the type of aid given. As a result, a lot of agencies that want to move beyond relief to development find that they cannot.

Political Factors

Politics in itself constitutes a whole area of research, especially after the dismissal of Marxism as an explanatory model and the subsequent realization that this area is much more complex. Elements to consider within this general area include the following:

Social Stratification and Determination of Priorities

Very often politicians are urban-based, educated, and relatively affluent. Their estimation of priorities in the rural areas is very different from what the rural people think their own

priorities are. This important element explains a lot and should be recognized as an area to improve on.

Political Will

In general, there is a lack of appreciation of the complexities of politics and the motivations of politicians and how they make decisions and select strategies. Researchers need to understand the milieu in which politicians operate and their motivations. In Namibia, politicians at present are committed to protecting the integrity of the big-farm land structure, but this position may not be stable. In the past, the tendency was to blame big, external imperial forces, but more and more the responsibility of local politicians and interest groups should be acknowledged. Many times politicians are torn between implementing proper policies and satisfying specific groups of people, including themselves.

Conflict and Social Unrest

In areas experiencing extensive social unrest, there is no serious planning, and there is food insecurity and considerable stress on the food system, regardless of how benign and productive the natural environmental and climatic conditions (e.g., as in the case of fertile Uganda until a decade ago).

Democracy

Even though democracy is not a precondition for development, its absence makes development more difficult, affecting not least the necessary flow of information for proper decisions by different actors. One reason why rural communities are traditionally neglected is their powerlessness to make their requirements, potentialities, and will known. To remedy this and similarly important situations, improvement in communications channels are a precondition. Open press and radio, for example, would allow for freer flows of information to decision makers

Strategies of Empowerment

There is today a big push for participatory research and development approaches in general. At the same time, however, the people who commission participatory research may expect it to be completed in as little as two months, not realizing that this is unrealistic or impossible. There is a clear need to look deeper into the mechanics of issues such as participation and empowerment, with attention to the required timeframes and processes. If researchers are able to fully understand these issues and the necessary mechanisms, then extension officers also will find it easier—indeed possible—to understand and implement them effectively.

Technical Information Generation and Its Transfer to Farmers

Ruth K. Oniang'o, Jomo Kenyatta University College of Agriculture and Technology

On Research

Considerable data have been generated by research, in Africa and elsewhere, on food systems. Researchers traditionally are found in institutions of research and higher learning. Their mandate naturally has been to serve the highly literate and academic communities. Even on the African continent, where problems are much more basic and different from those of the industrialized world, researchers have tried to follow a course similar to that of their counterparts in the north. The theme PUBLISH OR PERISH rings true even in Africa. Yet for professionals in Africa, remuneration packages are not commensurate with the training and efforts that attend their activities, hence the problem of brain drain.

Because of the need to compete internationally amid inadequate infrastructure (poor or no research funding, poor data-processing infrastructure, limited avenues for publication), professionals who choose to remain within the local employment sector become frustrated, demoralized, and disillusioned. Not surprisingly, their productivity goes down. In the final analysis, the resources invested in training do not produce the expected dividends.

Clearly, African scientists need to reevaluate their mandate and act accordingly if food crises are going to be tackled by Africans themselves.

On Technology

Technology transfer, development, and adoption have all been areas of concern. Years back, scientists and administrators realized that direct transfer of technology might not be the answer and that, contextually, environments of operation differ, causing problems of adaptability and acceptability. Then came the era of appropriate technology development,

which made sense at the time and over the course of time. Currently, a number of new and very appropriate technologies exist.

Low rates of technology adoption have meant limited expansion and delayed industrial takeoff. The need to investigate the problems that have created this kind of situation is urgent. Do they have to do with attitude, appropriateness, cost, dissemination? It is unlikely that data related to the above questions exist. Before developing new technologies or continuing blindly with the existing ones, African researchers need to evaluate what has gone on so far and then address the emerging issues.

There is certainly need to pay more attention to community-based technological needs, to ease pressures at that level by developing skills and creating demand within communities for developed technologies. For this to happen, communities should be involved at virtually all stages. Within communities, certain skills and talents often lie dormant for lack of resources to develop or advance them. Such resources, often external, may be minimal. Where transparency and accountability are applied, however, there must be total and unquestionable commitment on the part of the facilitators.

Issues to Address

Research

- What is the role of the various sectors: policy, researchers, extension, farmers?
- What kind of research should we conduct in Africa?
- Who should fund research?
- What kind of support should the donor community give?
- Which mechanisms should we use to ensure that the farmer benefits?

- Dissemination and sensitization are crucial to everything we do. How should we go about these tasks?

- How can we create effective linkages between the various sectors (policy, donors, researchers, extension, farmers)?

  What additional and new support do researchers/institutions require to fulfil the new expectations? Are they willing to go in this direction? Do they have a choice?

- What do we do with research findings already sitting in publications, libraries, and research institutions?

- How do we seriously implement the concept of people's participation?

Technology

In agricultural production,

- Farmers still do not fully adopt recommended packages for reasons of cost, unavailability, inadequate training, etc.

- Training and monitoring of farmers is often piecemeal, with a tendency to either spread resources too thin or concentrate on a few "contact" farmers.

Crosscutting Issues

Marketing

- Pricing and distribution issues for essential foodstuffs.

- Targeted subsidies are not easy, but with diminishing resources, they might be necessary in the short term.

Training and Research

- What is appropriate on both formal and informal fronts?
- What additional training and sensitization mechanisms are required?

Conclusion

There is dire need to take information and technologies to the people, to the farmers. Whoever does this job should have the skills to do it properly, and the methodology must be right.

Whatever we do, we have to start with the premise that the people are the most important resource a community has, and that the onus is on professionals to fully utilize that resource by starting with what the farmer knows and has. A word of caution: The transfer of technology is a slow and tricky undertaking. It requires commitment and patience—but it can be done.

Partnership in Research and Development of Food Production

Phoebe A. Bwembya, SADC Food Security Sector

In the Southern Africa Development Cooperation (SADC) region, agriculture is the most important activity, particularly for the rural areas (70 percent). Although the economic importance of agriculture varies from country to country, it provides a livelihood to 80 percent of the population. Women's labour contribution to this activity is estimated to be about 80 percent. The majority of women have limited access to health and nutrition care and lack information, necessary incentives such as credits, land, formal marketing channels, and a conducive environment in terms of national policies.

The region is characterized by agroecological zones that range from high potential to semiarid and desert. This ecological diversity is the main reason why there is such variability in agricultural systems. In many cases, land has not been properly utilized for human settlement and agricultural production. This has led to land degradation in some areas, and agricultural output has lagged behind the population growth of more than 3 percent annually.

The preoccupation of both governments and NGOs is to come up with initiatives that will ensure balanced development for both rural and urban areas. Regional efforts focus on increased agricultural production, raising health and nutritional status, reducing the effects of drought, gender issues, and implementing structural adjustment programmes (SAPs).

Agricultural Production

The main area of concern is encouragement of increased agricultural production. High-potential areas for agricultural production must be utilized and appropriate food systems identified and encouraged. Since many farming communities subsist in absolute poverty, promoting income generation is essential. Therefore, identifying produce with a market niche should be a priority and, where possible, establishing agroindustries close to areas of production and ensuring market access to markets for rural produce.

Considering that land is a constraint not only for women, but for small-scale emergent farmers, efforts that assist these groups' acquisition of land should be encouraged. For agricultural production to benefit the larger population, problems relating to remuneration of labour, credit, relevant extension services, and agricultural policies come to researchers' attention.

Economic Structural-adjustment Programmes

Almost all countries in the region are undergoing economic structural adjustment programmes through IMF and World Bank initiatives.

One impact of SAPs in the short term is inflation. Many households and emergent farms face competing demands on their disposable income. They would rather purchase household goods and services for day-to-day survival than invest in farming. For subsistence farmers, higher cash returns do not necessarily mean improvements in household food security. Extension services promoting increased cash farming in these hard times should be reoriented to provide advice to farmers on household expenditures as well.

During the economic structural adjustment period, a reduction in certain services to rural areas is inevitable due to reduced public expenditure and subsidies. Retrenched workers who find their way to rural areas will find it very hard to start farming in overstretched rural settlements. The loss of income and inability to produce food will mean increasing numbers of people will slip into food insecurity and, consequently, poor nutritional status. Research, in this case, should concentrate on finding out and suggesting appropriate survival coping mechanisms.

Most people do agree that SAPs are inevitable for survival and future prosperity. However, related research needs desegregated data showing benefits in the short and in the long term. Very often, explanations of SAPs are offered in terms of long-term macroeconomic growth or per capita income investment, and little is said about the short-term effects at the community and household levels before economic stability is attained.

Household Food Security and Nutritional Status

A number of factors contribute to nutritional status. Of particular interest are regional, national, and household-level food availability and implementation of health, nutrition, and social programmes and their accompanying policies.

The group most sensitive to nutritional imbalance is children. A 1990 comparative regional study using anthropometric measurements (figures on height for age are an indicator of stunted growth) indicated that the situation was worst in Malawi , followed by Zambia, where 63 and 59.4 percent of children respectively showed evidence of stuntedness. Whether SAPs have contributed to the decline of nutritional status in these countries or has just aggravated a preexisting situation is unclear. Inferences associating undernutrition with SAPs can not be made with certainty. On the other hand, those involved with nutrition monitoring may be especially sensitized to the potential effects of SAPs, reporting data more accurately to keep people informed about what needs prompt action. Information relating SAPs to nutritional status at household level still remains scanty in the SADC region.

Despite the paucity of data, food-insecure and resource-poor households are bound to experience the worst negative effects of SAPs. Data provided by UNICEF in 1990 indicated that the economic status of certain sections of the Zimbabwean population undermines food security. These groups include wage earners and semiemployed labour on large-scale farms; peasant households that lack adequate land, draught power, wage remittances, etc.; those below the poverty line; and those who are unemployed. Children in rural Zimbabwe were twice as likely to be stunted as their urban counterparts. In Zambia, a similar situation has been reported in Luapula.

A research study by Save the Children Fund U.K. looking at nutrition research along gender lines indicates that when women earn an income, the nutritional status of their households is better than in households of the same community whose wife/female has no income.

Households with the greatest economic insecurity appear to be least able to take advantage of social services directed at child development due to their real opportunity costs. In this

context, there is need for increased social development by directing resources toward the needs of the poorest.

In Zimbabwe, UNICEF documented in 1990 that access to and utilization of the health-care system is uneven. Inequities in the health-care system are exacerbated by private-sector concentration of resources, poor functioning of the referral system, and limited update of primary health care in large-scale farming areas. The challenge, therefore, will be to reach the socioeconomically marginal population in order to continue consolidating the recent gains of primary-health-care services.

Gender Concerns

Looking at the region, balanced development should be viewed as a process whereby both men and women are given equal opportunities. Therefore, an agriculture-based region such as SADC should aim to provide incentives that encourage increased production. This means that agricultural labour should be properly remunerated to enable women to work harder to produce or profit more from their labour. Bearing in mind that women are resource poor, ways for women to acquire the necessary knowledge, technology, and postharvest facilities to add value to agricultural products should be explored.

Considering that, in most households, provision of adequate food and nutritional security is the concern of females, research should be gender responsive when highlighting problems related to price, remuneration, land ownership, and monitoring systems, so that those adversely affected by various initiatives are not overlooked.

Agricultural research and extension also should be action oriented, gender sensitive, and focused on roles and benefits as they relate to increased production.

Since most women have been marginalized in terms of support at rural and grass-roots level, efforts always should be made to determine the real needs of the community before a project proposal is developed and implemented.

Research of various types becomes essential to identify how best to address different situations and issues of concern. The justification for research should be clearly understood in terms of benefits both to the researcher and the target group. To derive maximum benefit for all parties concerned, research objectives should be clear and properly timed. For research to be worthwhile, results and recommendations should be put in action at the level where the problem can be adequately addressed. Any research carried out should be ethical and should not undermine or embarrass those who have the least say in it but whose interests it is intended to serve. Researchers therefore must be careful about the type of sampling methods they choose. Before any study is conducted, researchers should attempt to find out what has been done, enabling new research to fill in information gaps.

In light of the above, needed food-security research topics include the following:

- improving the capacity of small and commercial farmers to increase production;
- identifying appropriate farm systems according to region;
- identifying and improving production techniques/methods for crops with a market niche (for small-scale farmers, crops that play a dual role as both a food and a cash crop);
- reviewing training needs (formal: universities, colleges, extension, etc.; informal: grass-roots);
- improving agroindustries;
- identifying SAPs' effects on different groups of people;
- identifying and indicating effective links between sectors (how resources can be mobilized, as well as move between sectors;
- addressing short-term hardships and targeting the vulnerable;
- sectoral analysis to improve the operating efficiency of various programmes;

- at regional and national level, food availability and expenditures on food and health services;
- determining those who are affected and finding ways of addressing their problems;
- food-consumption patterns: expenditures on food or own production?; and
- agriculture, food, and nutrition policies and their differential effects on various population groups.

The type of research and methods used for data collection (anthropological, economic, anthropometric, biochemical, etc.) will depend on the type of study, what it is intended for, and the resources available.

Collaborators

Various bodies try to address the issues raised in this paper. At regional and national level, various programmes in agricultural research (some in which IDRC participates) are well documented. The universities generate a lot of information, which needs to reach the policy level to be put to good use. Links can be strengthened with such institutions.

At regional level, the food situation is carefully monitored under the SADC/FSTAU Early Warning Unit, but supporting information that indicates the most food-insecure populations/individuals is lacking.

To develop a system of information whereby the most insecure households can be identified easily, SADC/FSTAU, in conjunction with the FAO (and funded by the Netherlands government), soon will implement a project on food and nutrition monitoring in response to current regional trends to mobilize food resources during drought to ensure that food (particularly cereals) is available. Indeed, the data reflect adequate figures at both regional and national levels, but very little is known about household consumption levels, while undernutrition figures seem to be worsening. The project is intended to provide timely

information on household food security, ensure that necessary action is taken at the appropriate level as soon as the problem is discovered, and target policy appropriately.

Various NGOs and United Nations agencies play an important role in addressing problems of increased agricultural production and related issues. Unfortunately, NGO efforts have been hampered by lack of adequately trained manpower and financial and other constraints. Many NGOs do not operate in rural areas, and their influence has been restricted to urban and periurban areas; consequently, their programmes do not address a large proportion of the population.

Partners for collaboration ideally should have a well-established programme and adequate manpower—or room to acquire it. Depending on the institution's involvement, it should relate its flow of activities both to the people it serves and to the policy-making body of the country or region.

Farmers' Problems and Their Solution: The Role of Research and Extension

Robinson L. Gapare, National Farmers Association of Zimbabwe

About 80 percent of the Zimbabwean population lives in the rural sector. Most rural land is in natural regions IV and V, which suffer very adverse climatic conditions including a high probability of drought and inconsistent rainy seasons often marked by midseason drought. Not only is the communal farmer exposed to the vagaries of weather, he/she is neglected in research and extension for the whole of the pre-Independence period. Thus in an uncertain economy, faced with declining man:land ratios and high birth rates, a scientific approach that will enable the communal sector to become food self-sufficient and contribute significantly to gross domestic product is sorely needed. The lack of a scientific approach has left the communal sector dependent on gaining experience through trial and error. No significant contribution to the production of food crops in the communal areas based on a continuous scientific database has been made, although recently the trend has begun to change.

Apart from scientific negligence in food production, many other areas need improvement, since these have a tremendous influence on food production:

- health facilities,
- housing,
- educational infrastructure,
- availability of water, and
- other money-making activities.

The only way the scientific approach can help increase food production in the communal lands is if the designers of food-production technology thoroughly understand farmers'

sociotechnical and economic environment. Data about communal farmers' economic and social environment is scarce. Economic facts such as on-farm input costs and marketing costs are lacking. Data such as the production functions farmers face in different localities is nowhere to be found. Social data such as farmers' attitudes toward innovation and their perceptions of risk is also lacking. With so little knowledge about the farmer's socioeconomic environment, how can the technology emanating from research and the message of the extension agent be expected to be appropriate—that is, capable of solving the farmer's problems?

If food production from the communal sector is to increase, it is necessary to highlight farmers' problems so that problem-specific research and extension can be designed.

Problems of the Farmer

Economic

Shortage of Capital

Many innovations require the farmer to spend money, but he or she is often short of capital and therefore unable to make maximum use of attractive technologies. Since the farmer has a very small capital resource, he is reluctant to commit it to any risky venture.

Thus the farmer's rejection of new technology in many cases appears to be an unwillingness to change. The fact is, however, that many new technologies are too risky in terms of the farmer's capital endowment.

Input Supply and Marketing of Produce

Problems encompass availability, timely delivery, and on-farm cost of inputs.

Planting time directly affects final yields. Usually, most farmers receive their inputs very late, and this affects the amount of produce they are going to put on the market. There is a need

to coordinate vigorously among various agencies the supply of inputs so that they are on time and final yields can be increased. Related to this are high farm-gate input prices for the communal farmer, who must deal with bureaucratic marketing arrangements that increase final prices by 50 percent over what his commercial counterpart pays. In such an unfair economic environment, it is not surprising that communal farmers do not take up some recommended crops. Research from the farmer's point of view on ways of introducing an efficient marketing system in terms of both cost and time could help farmers exploit the advantages of economy of scale.

When the farmer markets his produce, a fair amount of his return is consumed by transport. This is mainly due to the poor infrastructure in most communal lands, which results in overcharging by transporters. In fact, from the transporter's point of view, the poor road infrastructure is a good foundation for competitiveness. Thus overcharging and exploitation of the farmer escalates. Because of transport problems, an area with the "right" crop can see its comparative social and agronomic advantage turn to disadvantage. Any recommendations for market participation must be holistic in terms of infrastructure and technical backup.

Labour

The communal lands experience periods of both underemployment and labour shortage. In most instances, farmers' labour forces are restricted to family members. Bottlenecks therefore result in certain crops not being grown, as is the case with groundnuts. The labour shortage, which ties in with the farmer's lack of capital, has contributed to significant declines in the area allocated to this crop. Research into appropriate technology could help the farmer cope with these shortages.

Technical Factors

- Agronomic environment: The harsh agronomic environment within which the majority of farmers operate, the lack of data on soil types and the most suitable agronomic practices, and low levels of technology and education leave the farmer to operate on a trial-and-error basis.

- Education: Most farmers in the communal lands are illiterate for the purpose of apprehending the technology that is brought to them. Farmers are not fully conversant with the management aspects of technical packages, nor are these put in language that the farmer can understand. Adoption therefore is minimal.

Social Factors

The system under which the farmer operates does grant him freehold over his land, and this influences his attitude toward management and reinvestment of capital. The need for reform must be addressed before any technology can be introduced effectively.

The Role of Research and Extension

Communal farmers grow crops at their own risk, and some of the extension advice they receive is not appropriate to their locality. As a result, the communal farmer may not, for instance, use the appropriate seed or fertilizer. Research in communal lands should focus on the best crops for particular areas in terms of both agroecological and agroeconomic appropriateness. Many soils in communal areas lose organic matter and nutrients quickly if exposed or cultivated intensively, yet if food production is to increase, ways of making both a transition to a more commercial system of production and a change to environmentally and socially appropriate methods must be found.

Research

It is critical that research be focused on farm rather than on station and should take the following forms:

Understanding Local Farming Systems

An innovation must be thoroughly adapted, by research, before it can be introduced safely into a particular environment. Research must be carried out on farmers' fields in order to understand local farming systems and factors that limit output. This should include problems

of usage emerging from changing man:land ratios and farmers' management objectives. This is not only important for the design of technology that is compatible with farmers' values, education, and social environment, but also to train researchers to interpret and report farmers' problems correctly.

Considering the Farm as a Whole (Farming Systems Research)

Most results from past research efforts on individual crops in which all but one or two variables were controlled are irrelevant to the communal farmer. Adaptive research to support extension should relate to the farm as a whole. Under farm conditions, ideal management of each crop is rarely possible, since other enterprises may make equal or greater demands on farmers' land, labour, and capital resources.

Trials on Farmers' Field

Since there has been no research on communal localities, appropriate technology and recommendations can only evolve on farmers' fields. This will result in appropriate recommendations for seed, fertilizer, chemicals, etc.

Extension

With or without new mechanical technology, raising the rural sector's agricultural productivity depends heavily on improving agronomic practices by whatever means are available. Factors such as planting time, plant spacing, and so forth are important management factors necessary to achieve a crop of good quality.

Because many rural people have not had any formal education, they need to be educated and trained in new agricultural methods. The biggest problem in all developing countries is that developers and disseminators of new technologies use approaches that produce negative results and make the farmer suspicious of the programme the developer would like to implement. Before an extension programme is applied to local people, developers should identify people or groups at the village level, and then

- Work out what people need and shape policy from there.
- Learn from the people, and plan and work with them.
- Start with what local people know, and build on the skills they already have.
- Obtain full support of the people.
- Create voluntary acceptability in the minds of the people involved in the extension programme.
- Apply all programmes at the village level, where people know each other very well. This will help eliminate opposition.
- Look at what farmers are using and how they are doing that. Can anything be done to develop existing knowledge and resources?

Having obtained this information, you can then apply extension programmes.

Organization of Agricultural Research and Extension

It would be wrong to assume that suitable innovations will become readily available if and when an extension service is formed. Rather, it is the other way around: The extension message must be devised and tested locally before an organization attempts to extend it to farmers. Yet extension organizations often lack effective means to identify and develop these proper messages, test them and deliver them to farmers. Very often the solution lies in strengthening the links between research, extension and farmers locally, by allocating the necessary finance and manpower for the development of appropriate farm technologies.

The strength of these linkages will be in proportion to the double flow of information among the different parties. These local-farmer research-extension organizations must identify field problems, conduct farm-management studies, and respond to farmers' needs.

Involving the farmer in agricultural research and extension services will result in better production. With the arrangement above, the relationship between researcher, extension agent, and farmer is strengthened, and research results become locally relevant. Only with the cooperation of research and extension staff will it be possible to adapt innovations to the needs of local farmers.

Conclusion

Research and extension can be fruitful only if they solve farmers' problems—which can be known only if the farmer is involved in the decision-making process about research and extension programmes. Programmes adapted to the farmer's socioeconomic environment are the ones that will be adopted.

Research and extension are only two of the six functional components of an agricultural system. The other four are production, supply and credit, marketing, and regulation. Weakness in any one linkage can hold back development of the whole system.

In the communal lands of Zimbabwe, some of these linkages are weak or missing. Research and extension for the communal farmer must incorporate all linkages if the intended research results are to be realized.

The improvement of agronomic practices, however, implies major commitment of financial resources on the part of the government. Researchers must make sure these scarce resources are utilized in ways that will best benefit Zimbabwe.

Open Discussion: Summary of Issues for Future Consideration

Ruvimbo Chimedza, University of Zimbabwe

This session, chaired by Dr. Ruvimbo Chimedza, revealed that several issues related to the performance of food systems and agricultural research require further consideration by researchers. Specific issues touched upon and points made included the following:

NGOs and Their Participation in Research and Development

NGOs and other local organizations usually appear weak or uninterested in practising research and development of agricultural technologies. It is also true that NGOs are well positioned and have good access to and rapport with local populations, making these organizations potentially good partners for research. Probably their comparative advantage is in their ability to mobilize local communities, which could be instrumental for the testing and dissemination of technical knowledge.

An example of this type of participation and effectiveness was provided by Patrick Chimutu of the Christian Service Committee (CSC) in Malawi. A three-year-old project has been utilizing churches to link researchers and farmers more successfully than the extension approach of the Malawi government. The CSC's partners in the project have been the national research centres and several international research institutions.

Many NGOs are honest outgrowths and intrinsic parts of communities themselves. Their participation could help ensure better quality of information, especially that derived from interviewees and other means of surveying the knowledge, thoughts, and expectations of local dwellers. The challenge is how to approach them, convince and prepare them for the joint task, and facilitate their participation in the research. For this they must be approached on their terms—but do researchers know these terms?

Participatory (Research) Approaches

Expectations about these approaches are usually beyond the existing evidence of their effectiveness, as well as existing knowledge and guidance for their proper utilization. Questions such as who (should) participate(s) in whose activities, and with what objective(s), point to the range of expectations among different proposers, which may include 1) improved research data quality, 2) discovery and utilization of "indigenous knowledge," and 3) enhanced awareness, knowledge, and self-reliance among "participating" target communities. The answers also may have methodological implications. These research approaches deserve attention, especially since their utilization is becoming more generalized.

Research Impact and Its Assessment

About a decade ago, international agricultural research centres agreed that the success of new technology should be measured on the basis of its impact on nutrition rather than on the number of farmers adopting it. This has implications for how research is designed, organized, and implemented, and also for researchers' involvement beyond the research phase proper and for their interaction with other partners (participants) throughout the whole process. This is related to research accountability, i.e., recognition by researchers that the research responsibility goes beyond the preparation of a research report or publication. It was suggested that IDRC could be interested in supporting, on a test/learning basis, some of its research partners to stay engaged in the process of research-results utilization up to the realization of final effects.

Target Audiences

If they have a beneficiary target audience, researchers may be advised to identify other interested or influential audiences that could also contribute and participate in discovering ways and means of benefiting the first. These may include politicians, policy makers, and key members of the private sector.

Limited Utilization of Research Results

Research results may not be utilized for one or more of several reasons. Recommendations may not fit the availability of resources; the target recipients' management capability, interest/motivation, and support infrastructure (enabling environment) may be inadequate; or recipients may not be well informed about research results through demonstrations and support that facilitate implementation.

Policy Analysis and Research

Policies constitute and determine the enabling environment for research and utilization of research results. Policies, as well as policy analysis and definition, are weak areas in Africa, and they deserve more attention in research.

New Research Partners for IDRC and Its Current Research Constituency

The search for new opportunities in terms of partnership, approaches, and issues to address does not imply abandonment or rejection of what has been done well in the past. There are obvious opportunities to incorporate such underutilized resources as research departments in ministries into research as partners.

Research Networks

Strengths and weaknesses of networks were discussed, with the resulting suggestion that networks should become more transparent to the larger community (i.e., beyond their immediate constituencies) in relation to objectives and intended impacts on target populations as well as accomplishments and utilization of resources. They should be—and appear to be—more than closed research clubs. Their impact at farm level, for instance, has not always been obvious. The continued utilization of networks should be approached with caution, participants felt, with support offered in areas where they will have the greatest impact.

Short-term and Long-term Research Agendas

The requirement to demonstrate effect and impact from research was acknowledged as proper. However, IDRC was invited to be cautious in following this objective, particularly by avoiding full concentration on short-term, adaptive research yielding quick and visible impacts, as well as partners who practise it. The deeper research issues, usually associated with longer-term environmental consequences and their reflection in the sustainability of food production and people's well being, require greater persistence based on a more coherent vision of development and its enhancement. Examples include issues of desertification and maintenance of soil fertility in drought-prone regions. Attention to these issues with any expectation of results and impact will require a longer commitment, such as IDRC has made in the past, to support research groups and efforts that may require working with farmers for ten years or more.

Summary Review of Proceedings

Joe Wanjui, Unilever

In his introduction, Mr. Joe Wanjui said he felt honoured to be given the task of summarizing the proceedings, particularly because he was not a researcher but an entrepreneur and business manager. He acknowledged IDRC's mandate and the meeting's focus on ways of contributing to the welfare of the poor and the integrity of the natural environment. He also acknowledged the value of IDRC's philosophy—empowerment through knowledge—a requirement for the poor and also for policy and other decision makers. He offered as an example the progress in liberalization of the Kenyan vegetable oil and protein subsector that has resulted from the additional insight gained from efforts supported by IDRC. He also indicated that he felt comfortable with the insights provided by the different presentations and discussions related to the concept of food systems, the stresses they are being subjected to, and the sources of those stresses. In particular, he acknowledged the comprehensive presentation given by Professor Bede Okigbo and his insights into processes such as land preparation, primary production, storing, processing, wholesaling, distribution, and consumption that constitute the food system as a chain or transect, and the importance for the functioning of such systems of apparently minor elements such as essential rains and soil moisture. Other presenters and the ensuing discussions added elements that affect and many times stress the functioning of these food systems and highlighted the need to pay attention to them through research.

Specifically, Mr. Wanjui mentioned the following issues emerging from the presentations and discussions, which he also felt IDRC could address:

Civil Strife

This has been one of the biggest constraints to the development of Africa's agriculture in post-Independence times. Examples of places where this has occurred sometime during the last decade include Ethiopia, Sudan, Somalia, Angola, Mozambique, and even Molo in Kenya.

Land Subdivision

Extreme subdivision of land represents entrenchment of poverty. Wanjui suggested that perhaps this issue could be considered within the framework of policy analysis and proper design. It might be better to have large tracts of land owned by several people, a structure that has enabled countries that still retain it to some extent (e.g., Kenya, Zimbabwe, and South Africa) to be self-sufficient and even export some food. Extreme land subdivision forces the splitting of families. A family can not survive, much less prosper, on a 1/2- to 1-acre holding, and some members will have to leave the farm for complementary income opportunities, often for extended periods.

Land-tenure Policy Adjustments

Changes in this area may present a possible solution to the problem of male domination in land and farming matters. If women were given access to and tenure of land by themselves, this could be important both in "native" lands and in "white highlands."

Brain Drain

The solutions to the brain drain problem, highlighted by Professor Ruth Oniang'o, might lie in rewarding people better, both financially and with recognition, which is part of the proper personnel management-development process. Proper incentives also could help researchers move closer to where the problems are and work directly with those facing them while searching for solutions. Wanjui stressed the importance of retaining the best brains, since human beings are the most important resource for development.

Proper Marketing of Research Results

In many cases, valuable research results are lost because of improper "marketing." Researchers are not necessarily good marketers, and this could constitute an area of opportunity for research and support, possibly yielding greater benefits more quickly. Wanjui

felt there could be a role for IDRC to help better communicate research results to users and policy makers.

Women's Participation in Decision Making

Women provide 80 percent of agricultural labour, yet they are often not consulted in decision making and policy formulation. Besides being a priority from a gender-equitability perspective, this is a general management failure that should be changed.

Provision of an Enabling Environment

The lack of an environment conducive to conducting and implementing research has been a problem in sub-Saharan Africa, as it also has been in the development of the public sector. How IDRC can effectively help develop this environment is a question that researchers could help answer.

Closing Discussion

Joseph Mukiibi, National Agricultural Research Organization (NARO), Uganda

This session was chaired by Professor Joseph Mukiibi, Director General of the National Agricultural Research Organization in Uganda, who praised Joe Wanjui's summary and suggested the possible classification of the different suggestions emerging from the session as biological, physical, or socioeconomic in nature. He then challenged the audience to think hard again about the background information provided by IDRC and the different presentations, the objectives of the meeting, and the results of the discussions. Are we satisfied with the aggregated suggestions in terms of the ecologies to cover, the food systems to focus on, and specific priority research issues? A long and fruitful discussion ensued, and many areas were put forward as priority suggestions. In closing the session, Mukiibi suggested that the round table secretariat try to classify these suggestions within the three categories mentioned above. This was not easy, since most issues are multifaceted and do not fit well into any one of the three classifications provided. The best approximation follows:

Physicobiological Issues

Natural-resources Management, Including Soil and Water Management

IDRC needs to deal frontally with the threat of environmental degradation in the face of 1) pressure for continued farming; 2) desertification threats, particularly in marginal dry areas; and 3) careless activities such as many cases of charcoal making and burning. A particularly important subissue is desertification and environmental degradation. While there has been a strong emphasis on desertification, environmental degradation is occurring, even in wet ecological zones, due to increasing population pressure and a corresponding increase in the intensity of farming. Thus desertification is not the only form of environmental degradation. Other forms also should be combatted through improved resource-management techniques in farming.

Postharvest Systems

Minimization of significant postharvest losses of food and the consequent increased pressure on production and the natural-resources base is of great importance.

Socioeconomic Issues

Agricultural Policy Analysis and Proper Design

Regional capability in these areas is weak and the efforts of agricultural researchers scarce. This is a particularly critical area of concern during this transitional period when structural adjustment programmes are being implemented. In this regard, a combination of research and training is required.

Land Ownership (Control) and Per Capita Distribution Ratios

Initially, land subdivision seems to have a positive impact on production, but when subdivision continues, productivity and production begin to fall. In many places, subdivision appears to have gone beyond the beneficial range. Thus some argue for large estates and the introduction of private ownership and tenure; others indicate that private ownership is not necessarily appropriate for all situations, particularly in areas where it did not exist previously. This is certainly an area that raises questions and deserves attention. One particular subissue is land access and control by women (i.e., the gender dimension).

Marketing

This is an area of concern that has at least two dimensions: 1) how to improve "marketing" of research results to make it more effective and efficient (by researching with the final users of the results, for example?) and 2) how to improve the marketing dimension of the "enabling environment" for agricultural production and utilization of improved technologies.

Research Extension Linkages and Technology Transfer

There is a lot to be done yet in linking research with institutional groups that can multiply the effects of research results at the level of beneficiary populations. These include extension services and seed-distribution services. Areas for attention include methodologies and management as well as finance. There is a lot to do, for example, to free many seed companies from corruption, mismanagement, and inefficiency and help them evolve into strong private initiatives. This would transform them into strong components of the enabling environment for agricultural production and research.

Off-farm Complementary Income Opportunities

The effect of supplementary income opportunities on family income and family integrity (often leading to splitting) as a response to resource limitations is extremely important. A related issue is the lack of a sustained flow of quality information to farmers that would help them diversify farm production, derive optimum yields, and enhance on-farm income.

Partnerships and Their Participation in Research, Constituency, Objectives , and Types (Formal and Informal)

Partners emerge in the course of carrying out research, and options always should be left open, especially as a lot of new partners have been emerging. Attention to accessing indigenous knowledge, in this respect, was considered very important, regardless of the research topic, along with identification of research by farmers and participation of farmers in research. The methodology applied also should be gender sensitive.

Physicobiological/Socioeconomic Issues

Changes in Food Systems

What determines change, and how can this be steered to diminish stresses on the environment and on people? Change tends to occur, for example, in formerly very productive areas where productivity is on the decline due to degradation brought on by increased population pressure, or when people move from high-potential areas to marginal areas.

Development of Sustainable Farming Systems

There is a need to look into friendlier technologies for integrating crops and livestock in order to increase farm production without damaging the environment. Most farmers in the highlands already combine livestock, crops, and perennial crops or trees in their farming systems. Enhanced attention to the animal component of the farming system is a way to ensure higher on-farm income and improved cash flow for families.

Pest Management under Conditions of Intensive Agriculture

Pest management is a critical area of study since intensive agriculture is the only foreseeable scenario.

Agroecologies

The round table recommended that IDRC should also pay attention to high-population-pressured subhumid environments. These are fragile in relation to the high pressures to which they, and the food systems that prosper in them, are being subjected to. They require urgent attention.

Closure

Eva Rathgeber, Regional Director, IDRC

Let me start by acknowledging the quality of the papers presented during the day, the excellent chairing of each discussion session, and the generosity of your contributions to a set of suggestions that I anticipate will be very useful. Certainly, this has been a day of learning for us in IDRC.

The session has clearly emphasized that the responsibility and the capability of attending to problems of food security, and stresses on the food systems that sustain it, lie in a partnership of researchers, producers, and other stakeholders. Other important points made include:

- Researchers should see as important the responsibility to pursue objectives and outputs that really meet farmers' needs for enhanced and sustainable production, employment, and income. With a view to achieving this goal, they also should focus more attention on the final introduction and effective utilization of research results in the production system, instead of continuously turning to new research endeavours. Researchers should become accountable to farmers. Research should not be pursued for its own sake but because of its potential contribution to development. These ideas should be transmitted to researchers early in their formation and training at the university level.

- Producers are important partners, not only because they are the potential recipients of research results, but because they have and can contribute knowledge and experience to the process of research and development. The discovery and utilization of indigenous knowledge among farmers, and attention to the potential utilization of indigenous crops and crops that constitute mainstays for many people during periods of stress, are useful elements of agricultural research. Farmers have been coping with food stresses for a long time, and at least part of their accumulated knowledge and experience should be rescuable.

In approaching farmers and their knowledge, farmers should be well identified. Who are they? Are they primarily women? Are women and men working together? What constitutes a farming unit? Who makes decisions? How do farmers themselves identify their problems? Researchers should find answers to some of these basic questions before they embark on any kind of research.

Agricultural policy analysis and related work would be very useful in engendering a closer relationship between researchers in national research institutes and farmers, as the government frequently comes between the two. Farmers ought to be partners in research, contributing knowledge and not just being acted upon.

Other stakeholders such as policy makers also should be included in the research process from the beginning and not just in the final stages. There may be sacrifice associated with this, as researchers may be forced to adjust their approaches, methodologies, or even their research questions, but this will ensure that end results will be applicable to the development process.

Processors of agricultural commodities also require explicit consideration in regard to their links with farmers and their requirements in terms of quality and timing of production.

An important contemporaneous question is, How can researchers work more effectively with the private sector? A good answer probably could help researchers in Africa stop looking primarily to international agencies for support for their work and, instead, approach large food-processing and other companies in the region and offer their services to them. The impression given by representatives of the private sector present at this round table is that they are willing to support research if its results are marketable. Research also would have to be accountable to its private-sector partners.

Clearly, donor agencies such as IDRC should not dictate which technologies should be researched or adopted or how to organize farming systems. These decisions are the responsibility of producers, policy makers, and other decision makers and stakeholders, including research scientists, in each country.

Let me close by expressing appreciation to all who participated in the organization of this event, to the presenters and chairpeople, and to each of you for having taken the time to come here today, helping us to define what we should be doing to make our work within the Food Systems under Stress theme more effective and responsive to the needs of the region. Thank you very much.

Participants List

Round Table on Food Systems under Stress in the Eastern and Southern Africa Region

International Development Research Centre (IDRC)
Nairobi, Kenya
12 October 1993

ABATE, DR. TSEDEKE
Senior Entomologist
Institute of Agricultural Research
P. O. Box 2003
Addis Ababa, Ethiopia
Telephone: 612572 Fax: 611222

BALDWIN, MS. SANDRA L.
Health Sciences Division
Projects Officer
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax: 711063

BERTOLLI, DR. LORENZO J.
M. D. Fidea Ltd.
P. O. Box 45501
Nairobi, Kenya
Telephone: 212870 Fax 212908

BWEMBYA, MS. PHOEBE A.
Technical Advisor
SADC/Food Security Sector
P. O. Box 4046
Harare, Zimbabwe
Telephone: 736051/2 Fax: 751612

CHIMEDZA, DR. RUVIMBO
Lecturer
University of Zimbabawe
P. O. Box 8583
Causeway
Harare, Zimbabwe
Telephone: 303211, ext. 1583 (office),
732828 (hom)

CHIMUTU, MR. PATRICK
Head, Department of Agriculture
Christian Service Committee
P. O. Box 51294
Limbe
Blantyre, Malawi
Telephone: 642877 Fax: 642616

DE TREVILLE, DR. DIANA F.
Regional Representative
Winrock International
P. O. Box 45233
Nairobi, Kenya
Telephone: 720798

DUBE, DR. SERGE
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax 711063

EMOKOR, MS. MARGARET
Programme Administrator
EARO-IDRC
Nairobi, Kenya
Telephone: 713160/1 Fax 711063

GAPARE, MR. ROBINSON
Farmer
Grain Marketing Board
P. O. Box 5607
Harare, Zimbabwe
Telephone: 52141

HUNGWE, MR. SILAS
1st Vice President
Zimbabwe Farmers Union
P. O. Box 3755
Harare, Zimbabwe
Telephone: 737733/4

ISOE, MR. DAVID A.
Programme Administrator
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax 711063

KINYANJUI, DR. KABIRU
Social Policy
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax: 711063

KRUGMANN, DR. HARTMUT H.
Programme Officer
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax: 711063

LYNAM, DR. JOHN K.
Senior Scientist, Agricultural Sciences
Rockefeller Foundation
P. O. Box 47543
Nairobi, Kenya
Telephone: 228061

MAFUECA, MR. ANTONIO
Director
Inder-Rural Development Institute
Maputo, Mozambique
Telephone: 465041 Fax: 465407

MATATA, MR. JAMES B. W.
Assistant Director
Kenya Agricultural Research Institute (KARI)
P. O. Box 57811
Nairobi, Kenya
Telephone: 444029/30/31/32 Fax 444144

MILIMO, DR. JOHN T.
Rural Development Studies Bureau
P. O. Box 32379
Lusaka, Zambia
Telephone: 250708

MUCHENA, DR. SAMUEL C.
Managing Director
African Centre for Fertilizer Development
P. O. Box A469
Avondale
Harare, Zimbabwe
Telephone: 727987/8 Fax: 727989

MUKIIBI, DR. JOSEPH K.
Director-General, Research & Administration
NARO
P. O. Box 295
Entebbe, Uganda
Telephone: 20512 Fax: 21070

MUNTEMBA, DR. SHIMWAAYI
Earthcare Africa
P. O. Box 76358
Nairobi, Kenya
Telephone: 566428 Fax: 566428

MWANGI, MS. MUTHONI M.
Research Officer
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax: 711063

NAVARRO, DR. LUIS A.
Programme Officer
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax 711063

NDIKUMANA, DR. JOHN
AFRNET Coordinator
ILCA
P. O. Box 46847
Nairobi, Kenya
Telephone: 632013 Fax 631481

NDIRITU, DR. C. G.
Director, Kenya Agricultural Research
Institute (KARI)
P. O. Box 57811
Nairobi, Kenya
Telephone: 444029/30/31/32 Fax 444144

OGBU, DR. OSITA M.
Programme Officer
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax: 711063

OKIGBO, PROFESSOR BEDE N.
United Nations University
c/o UNESCO/ROSTA
P. O. Box 30592
Nairobi, Kenya
Telephone: 622308 Fax: 520043

ONGESO, MS. ROSA
Research Officer
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax: 711063

ONIANG'O, DR. RUTH K.
Director, Board of Postgraduate Studies
Jomo Kenyatta University College of
Agriculture and Technology
P. O. Box 62000
Nairobi, Kenya
Telephone: 0151-74597 Fax: 0151-217614

RATHGEBER, DR. EVA M.
Regional Director
IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax 711063

ROHRBACH, DR. DAVID D.
Principal Scientist (Economics)
SADC/ICRISAT
P. O. Box 776
Bulawayo, Zimbabwe
Telephone: 8311/2 Fax: 8253
E-mail: ICRISATZW@66NET.COM

SCHMIDT, MR. OZZIE G.
Consultant
EARO-IDRC
P. O. Box 62084
Nairobi, Kenya
Telephone: 713160/1 Fax 711063

SETSHWAEZO, DR. LOUISE L.
Project Manager
Agriculture Research Management
(SADC/ISWAR/ESAMI)
ESAMI
P. O. Box 3030
Arusha, Tanzania
Telephone: 8383

TAPSCOTT, DR. CHRIS P.
Head of Social Sciences Division
University of Namibia
Post Bag 13301
Windhoek, Namibia
Telephone: 42421 Fax: 3072436

WANJUI, MR. JOSEPH B.
Development Member, Africa & Middle East
Unilever
P. O. Box 49201
Nairobi, Kenya
Telephone: 337590 Fax 337577

ZANDAMELA, MR. CARLOS B.
Acting Director, INIA (Instituto Nacional
de Investigacion Agronomica)
Ministry of Agriculture
P. O. Box 3856
Maputo, Mozambique
Telephone: 460097/460100

Annotated Agenda

Food Systems Under Stress Round Table

EARO-IDRC
Nairobi, Kenya
12 October 1993

1. Registration

0830-0900 Registration

At the boardroom, IDRC-Nairobi office, Liaison House, State House Avenue, Nairobi

2. Opening Session

Chairperson: Dr. Eva Rathgeber

Rapporteur: Dr. Serge Dubé

0900-0915 Opening

Welcome by Dr. Eva Rathgeber, IDRC Regional Director
Brief introduction of participants

0915-0935 Introduction/context

Speaker: Dr. Luis Navarro

Context for the round table, the FSUS theme, and discussion. Meeting structure: 1) Series of opening statements and food for thought, by designated speakers, on each of several component subthemes, followed by discussion. A participant will be requested to collect the

thread and main conclusions from each section/discussion to be presented as summary in the afternoon. 2) Open discussion on issues that will require further consideration later. 3) Summary presentation. 4) Closing discussion on the summary. 5) Closing ceremony.

3. First Discussion Session

Chairperson: Dr. S. Muchena

Rapporteur: Dr. Hartmut Krugmann

0935-0955 Agroecologies, populations, and food systems priorities

Speaker: Professor Bede Okigbo

0955-1025 Discussion

Accounting for present and projected state of 1) the natural resources and potential food supply vis-à-vis population growth and needs for food within the region; 2) the resource endowment, gender, and general capability of the majority of agricultural food producers/handlers; 3) the national and international policy and economic frameworks; and 4) the state of knowledge stemming from research and practical experiences. Which agroecological settings, populations (considering gender), and specific food systems require immediate research and research-based interventions? In what ways? And why?

1025-1055 Coffee/tea break

1055-1115 Physicobiological-economic agricultural food production, storage, and processing technical priorities for research

Speaker: Dr. C. G. Ndiritu

1115-1140 Discussion

Accounting for present and projected state of: 1. the natural resources and the potential food supply vis-a-vis population's growth and needs for food within the region; 2. the resource

endowment, gender and general capability of the majority of agricultural food producers/handlers, 3. the national and international policy and economic frameworks; and 4. the state of knowledge stemming from research and practical experiences... Which are the agricultural food-production and post harvest storage and processing technological questions (physico/biological, environmental and socio-economic) that require immediate research and research based interventions? in what ways? and why?

4. Second Discussion Session

Chairperson: Dr. Louise L. Setshwaelo

Rapporteur: Dr. Osita Ogbu

1140-1200 ***Organizational, institutional, and political/policy context/factors for priority research and informed intervention at local, national, and international levels***

Speaker: Dr. Chris Tapscott

1200-1225 ***Discussion***

Accounting for present and projected state of: 1. the natural resources and the potential food supply vis-a-vis population's growth and needs for food within the region; 2. the resource endowment, gender and general capability of the majority of agricultural food producers/handlers, 3. the national and international policy and economic frameworks; and 4. the state of knowledge stemming from research and practical experiences... Which are the organizational, institutional and political/policy context/factors that shape the utilization of available agricultural resources and technical knowledge, and thus affect production, processing, movement, trade and consumption of food, which require immediate research and informed intervention at local, national and international levels? in what ways? and why?

1225-1245 Access to technical knowledge/information vs. general education and decision/action capability of poor people

Speaker: Dr. Ruth Oniang'o

1245-1310 Discussion

Research on food systems has traditionally focused questions of technical knowledge and its transfer to and/or use by practitioners. However, contextual factors (resource tenure, organizations, institutional/policy environment) may not only restrict the utilization of available knowledge, but also require special capabilities by the practitioner to adapt to and deal with the context first. This capability may be based on specific technical knowledge but also on general education, motivation, self-esteem, and abilities. What are the opportunities and priorities for research and research-based interventions in this respect within the region? In what ways? And why?

1310-1440 Lunch

5. Third Discussion Session

Chairperson: Dr. R. Chimedza

Rapporteur: Ms. Sandra Baldwin

1440-1500 Research partners and approaches (methodologies, type, linkages/ collaboration)

Speaker: Ms. P. Bwembya

1500-1525 Discussion

Effective and efficient research and research-results utilization in food systems are requirements of the day, given the urgency and multiplicity of the problems faced, as well as the restricted and apparently diminishing resources and support. They depend not only on the right selection of subject areas, but also on the capability and commitment of the

research teams and the approaches they use. Within the region, who are the right partners (or how could IDRC identify them)? Which are, or how could IDRC identify, the most promising (effective/efficient) approaches to support? Why?

1525-1555 Open discussion/issues for future consideration

Open discussion on pending issues from the meeting, or issues that should have been considered during it.

1555-1625 Coffee/tea break

6. Fourth Discussion Session

Chairperson: Dr. Joseph Mukiibi

Rapporteur: Dr. Kabiru Kinyanjui

1625-1555 Summary

Speaker: Mr. Joe Wanjui

Summary and main conclusions from the meeting.

1655-1715 Closing discussion

Brief discussion to correct omissions or clarify contentious passages of the summary presentation.

7. Closure Session

Chairperson: Dr. Eva Rathgeber

Rapporteur: Dr. Luis Navarro

1715-1730 Closure

Invitation for final expression or advice from participants.

Thanks from IDRC-EARO, and closure.