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UNITED NATIONS
ECONOMIC COMMISSION FOR AFRICA
JOINT ECA/FAO AGRICULTURE DIVISION

REPORT ON A MISSION TO GHANA
TO PARTICIPATE IN THE WEST AFRICAN FARMING SYSTEMS RESEARCH NETWORK
SYMPOSIUM ON THE
DEVELOPMENT OF IMPROVED TECHNOLOGIES
FOR DIFFERENT AGROECOLOGICAL ZONES IN WEST AFRICA

ADDIS ABABA
SEPTEMBER, 1989

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I. INTRODUCTION

A mission was undertaken to Accra, Ghana from August 26 to September 2, 1989 at the request of the coordinator of the West African Farming Systems Research Network (WAFSRN). The Coordinator requested the Economic Commission for Africa (ECA's) Regional Adviser in Food and Agricultural Policy and Planning to prepare a Keynote Address to be presented at WAFSRN's Second Regional Symposium on the Development of Improved Technologies for the Different Agroecological Zones of West Africa and to serve as Resource Person at the symposium. In this regard, WAFSRN's invitation to ECA specifically requested that the report by the Regional Adviser should focus on the role of agricultural research and African organizations in the attainment of sustainable agricultural production in Africa.

The mission therefore prepared a comprehensive report titled "Towards Sustainable Agricultural Production in Africa: the Role of Agricultural Research and African Organizations" which was presented as a Keynote Address at the symposium. A copy of the document is attached to this report as Annex I. The preparation of the report, its presentation at the symposium, and the contributions of the mission as a Resource Person of the symposium are in conformity with Programme Element 2.2 of the approved United Nations Regular Programme of Technical Cooperation (Section 24) which calls for the servicing of a subregional workshop on the administration of agricultural development.

WAFSRN's primary objective is to promote and facilitate cooperation among national, international and external researchers, research programmes and institutions working in the field of farming systems research in West Africa. This collaboration and cooperation is designed to provide support for agricultural researchers in the sub-region and to strengthen national agricultural research programmes through training, exchange of experiences and research methodology, comparison of research results, and increased access to available research information.

The main objective of the symposium was to assess the performance of Farming Systems Research (FSR) in the sub-region in terms of new knowledge generated, technical agricultural research results, research methods and techniques, multi-disciplinary practices, the participation of farmers and extension workers in the research process, and the degree of institutionalization of the approach itself. An additional objective of the symposium was to identify priority areas and themes for collaborative research projects and research funding requests in the sub-region.

There are presently a large number of FSR projects and programmes being implemented in several countries of the sub-region. These projects and programmes are, however, at various

levels of development and their achievements and experiences vary from country to country. The main thrust of the symposium was to review these achievements and experiences and use the lessons learnt to shape the development of improved technologies for the different agroecological zones of West Africa.

The first day of the five day symposium was devoted to the opening ceremonies and to the presentation of the invited Keynote Addresses. During the next two days, the symposium broke up into four working groups where presentations and discussions took place on the basis of the following zonation:

- inland valley and irrigated zone
- wet or forest zone
- savannah zone
- sahelian zone

These zonal presentations and discussions were then followed by a final plenary session on the fourth day during which the conclusions and recommendations of the four working groups were presented and discussed. The final day of the symposium was devoted to administrative matters of the General Assembly of WAFSRN.

The programme of the symposium which provides an indication of the papers presented and discussed is attached to this report as Annex II.

Over 100 participants, representing almost all countries in West Africa, attended and participated at the symposium. All the international organizations involved in agricultural research in the sub-region were also represented at the symposium. A number of people with considerable experience in African agriculture were also invited to present Keynote Addresses on the main themes of the symposium. A list of the participants at the symposium is attached as Annex III.

II. PROCEEDINGS OF THE SYMPOSIUM

In line with its stated objectives, the symposium addressed a number of issues pertaining to the generation and diffusion of improved agricultural technologies in different agro-ecological zones of West Africa as a means of rapidly developing the agriculture of the sub-region. In this regard, the main issues discussed included the following:

- (1) Has FSR facilitated and expedited the process of generating and diffusing improved agricultural technologies suitable for the various agro-ecological zones of the sub-region?
- (2) Has the implementation of FSR been carried out as planned in the countries of the sub-region? If not, what have been the

constraints to its successful implementation and how can these constraints be best removed?

- (3) On the basis of the experiences gained so far with the implementation of FSR in the sub-region, is there a need to modify aspects of the methodology? If so, in what areas are modification needed and how should these be carried out?
- (4) Collaboration and cooperation among researchers and research programmes in Africa is considered as an important means of improving the effectiveness of agricultural research in general and FSR in particular in the sub-region. What is the current situation? What role has WAFSRN in particular and other African organizations in general played in this regard? How can their performances be improved in the future?

The mission presented one of the Keynote Addresses at the symposium. The address examined measures for attaining sustainable agricultural production in Africa and the role that both African agricultural research and African organizations must play to achieve this important objective.

The address started by highlighting some of the prominent initiatives that have been taken during the last decade to increase agricultural production in Africa. These include:

- (1) The Monrovia Declaration of Commitment by the Heads of State and Government of the Organization of African Unity (OAU) of July 1979 on the guidelines and measures for national and collective self-reliance in economic and social development for the establishment of a new international economic order.
- (2) The Lagos Plan of Action (LPA) of April 1980 for the economic development of Africa, 1980-2000.
- (3) Africa's Priority Programme for Economic Recovery, 1986-1990, (APPER) of July 1985.
- (4) The United Nations Programme of Action for African Economic Recovery and Development, 1986-1990 (UNPAAERD) of June 1986.
- (5) A large number of structural adjustment programmes adopted by African countries (over 30 as of 1988) usually with the support of the International Monetary Fund and the World Bank.
- (6) The United Nations Economic Commission for Africa's African Alternative Framework to Structural Adjustment Programmes (AAF-SAP) of April 1989 for Africa's socio-economic recovery and transformation.

However, despite all the above initiatives, the African food and agricultural crisis continues largely unabated. The address drew attention to the fact that the distinctive climate and soils

of Africa and the traditional farming systems imposed on them have often resulted in reduced sustainability of the agricultural production systems under conditions of rapidly growing populations and in the face of the introduction of modern technologies. The fact is that the traditional farming systems in Africa were not designed to support existing and future levels of populations on their original resource base and, as modern interventions have attempted to force them to do so, they have broken down, as it were.

The most optimistic population growth rate projected for Africa during the period 1990 to 2020 is about 3.0 percent per year. This means that African agriculture must produce enough food to meet the needs of 15 to 20 million additional Africans every year from now on. When this challenge is considered against a background trend of depleting agricultural resources and possibilities of increases in drought prone areas resulting from long-term climatic changes and increased incidences of land shortages, the prospects for solving the food and agricultural crisis in the continent becomes even dimmer. In the face of these emerging trends, the challenge of food and agricultural production in Africa takes on two crucial but interrelated dimensions. The first dimension relates to the appropriate measures to be taken to ensure that the growth rate of African agricultural production is doubled over the next 20 years to keep pace with, at least, an optimistic projected population growth rate of 3 percent. The second dimension has to do with designing new farming systems that would ensure that the required growth rates of food and agricultural production in the continent, ones achieved, are maintained indefinitely. In other words how can optimal yields for sustained African agricultural production be best engineered and how can the ability of the preferred farming systems to maintain the desired productivity when subjected to the vagaries of the sensitive African environment be sustained? These are the challenges that will confront African agriculture in the next twenty-five years.

The address suggested that what is needed to meet these challenges are enhanced and imagined agricultural research and more functional and effective African organization charged with the promotion of cooperation and collaboration among African countries. The report then went ahead to outline how agricultural research in the continent should be organized and managed to achieve sustainable food and agricultural production.

The document concluded by examining the role that African organizations must play in order to develop the required African agricultural research to attain continental agricultural self sufficiency and sustainability. The problem, however, is that several existing African organizations currently suffer from a variety of problems and constraints which have prevented them from achieving their intended objectives. These problems and

constraints include but are not necessarily limited to the following:

- (1) Lack of commitment by governments;
- (2) Ill-conceived strategies by the organizations;
- (3) Lack of coordination and too much competition among the organizations;
- (4) Poor financial capacities of African countries; and
- (5) Language and psychological barriers.

The document drew attention to the fact that most African countries are aware and appear to be convinced about the need to establish ties among themselves as a useful means of achieving their individual and collective agricultural production objectives. This is an important pre-condition for the successful operation of African organizations in achieving African agricultural development, which appears to have been generally met.

There is, however, an urgent need to rearrange, reorganize, improve or strengthen existing African organizations at the sub-regional or regional levels in support of sustainable food and agricultural production in the continent. With regards to agricultural research, there is clearly a need for the creation at the sub-regional or regional level of an effective co-ordination structure so as to enhance the effectiveness of national and regional agricultural research and expand its results. A number of organizations such as the OAU's Scientific, Technical and Research Commission (STRC) and the Association for the Advancement of Agricultural Sciences in Africa (AAASA) are presently attempting to provide this function, although with considerable difficulties. The mission recommended that, in order to avoid these difficulties in the future, a number of important requirements would need to be met. These include:

- (1) The creation of more appropriate instruments and arrangements for regional cooperation in agricultural research;
- (2) The formulation of a more realistic regional strategy for agricultural research;
- (3) The development of suitable infrastructures for cooperation in areas of food and agricultural production; and
- (4) The implementation of monetary and payments reforms to facilitate the provision of material and financial support to African organizations involved in agricultural research.

III. MISSION ACHIEVEMENTS

The symposium provided a very effective forum for exchanging views among practical and "hands on" agricultural researchers

representing almost all west African countries on the status of improved agricultural technologies suitable for the principal agro-ecological zones of the sub-region by providing them with an opportunity for critical and detailed assessment of existing technical results and methodological issues.

The service provided by the mission to WAFSRN as a Resource Person of the symposium and the Keynote Address prepared and presented were very well received and were useful in arriving at decisions about the readjustments that would need to be made in the design and management of agricultural research in the continent in order to make it more effective and to meet and sustain the continent's agricultural production requirements.

ANNEX I

Invited Keynote Address
Presented at the Symposium

**UNITED NATIONS
ECONOMIC COMMISSION FOR AFRICA**

**TOWARDS SUSTAINABLE AGRICULTURAL PRODUCTION IN AFRICA:
THE ROLE OF AGRICULTURAL RESEARCH AND AFRICAN
ORGANIZATIONS**

**(Keynote address to the second West African Farming Systems
Research Network Symposium on the Contributions of Farming Systems
Research to the Development of Improved Technologies for
Different Agro-ecological Zones in West Africa).**

Accra, Ghana, August 28 to September 1, 1989

**Addis Ababa
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**TOWARDS SUSTAINABLE AGRICULTURAL PRODUCTION IN AFRICA:
THE ROLE OF AGRICULTURAL RESEARCH AND AFRICAN ORGANIZATIONS**

by

**G.O.I. Abablu
Regional Adviser
Joint ECA/FAO Agriculture Division
United Nations Economic Commission for Africa**

Keynote Address Presented at the West African Farming Systems Research Network Symposium on the Contributions of Farming Systems Research to the Development of Improved Technologies for the Agro-Ecological Zones of West Africa.

The views expressed in this paper are those of the author and do not necessarily reflect those of the ECA and/or the FAO.

I. INTRODUCTION

Following the advent of the economic crisis in most African economies over three decades ago, a number of initiatives were taken by Africans themselves as well as by the international community to eliminate or, at least reduce to the barest minimum, the symptoms identifiable with the historic patterns of production, consumption, and exchange in African economies which have constituted the most conspicuous manifestations of the crisis.

The manifestations of the economic crisis in the continent include: inability of domestic food supplies to keep pace with domestic needs because of rapidly rising populations; increased incidences of hunger; poverty and malnutrition escalating into persistent famine in the face of deteriorating environmental and financial conditions; rising world prices of grains and high petroleum prices, deteriorating balance of payments and worsening terms of trade; increasing and often inappropriate food aid etc.

Some of the more prominent initiatives that have been taken to eliminate the crisis include the following:

1. The Monrovia Declaration of Commitment by the Heads of State and Government of the Organization of African Unity (OAU) of July 1979 on the guidelines and measures for national and collective self-reliance in economic and social development for the establishment of a new international economic order.
2. The Lagos Plan of Action (LPA) of April 1980 for the economic development of Africa, 1980 - 2000.
3. Africa's Priority Programme for Economic Recovery, 1986 - 1990, (APPER) of July 1985.
4. The United Nations Programme of Action for African Economic Recovery and Development, 1986 - 1990 (UNPAAERD) of June 1986.
5. A large number of structural adjustment programmes adopted by African countries (over 30 as of 1988) usually with the support of the International Monetary Fund and the World Bank.
6. The United Nations Economic Commission for Africa African Alternative Framework to Structural Adjustment Programmes (AAFSAP) of April 1989 for Africa's socio-economic recovery and transformation.

What all these initiative have in common is the pride of place ach gives to the development of the agricultural sectors of

African economies. They also all recognize the important role that agricultural research must play in whatever recovery, adjustment, or transformation process that would be needed to move out of the crisis.

On the surface of it, it would appear as if some of these initiatives may have produced positive results although it would be hazardous to venture an exercise in apportioning credit. Table 1 reveals that the average annual rate of agricultural production between 1980 and 1986 has been positive in many African countries. The table also reveals that aggregate production of cereals in the 45 countries which are usually regarded as sub-Saharan Africa was a record 58 million tons, some 30 percent higher than in 1987 and above the long-term trend. This was due to good harvests in most countries including above average crops in all sub-Saharan countries, with record outputs in many of them.

However, any euphoria that the above figures may invoke is quickly dampened when they are examined against the rates of population growth in each of the countries and the long-term trend of per capita food and agricultural production. The fact is that Africa's distinctive climate and soils, the phenomena of rapidly growing populations and the attendant pressures on the land, and the introduction of new technologies, often interact to reduce the ability of the various agricultural production systems in the continent to meet the existing food and agricultural requirements of Africans not to talk of meeting the food and agricultural challenges of the future.

It is this predicament that prompted the World Commission on Environment and Development (1987) to recently warn that "the effort needed to increase production in pace with an unprecedented increase in demand, while retaining the essential ecological integrity of food systems, is colossal both in its magnitude and complexity."

TABLE 1 - Africa: Basic Agricultural Production Indicators

Region/Country	Population (thousands) mid 1987	GDP per capita U.S. dollars 1987	Arable land (ha. per capita) 1987	Average annual growth rate of agri. production	Average index of food production per capita (1979/81=100) 1983-1987	Cereal imports (kg per capita) 1987	1988 cereal production (000 tons)	As % of previous 5 years
AFRICA	132,000	1,125	0.278	...	...	142	-	-
Algeria	23,744	2,798	0.314	3.2	99.11	161	-	-
Egypt	50,740	533	0.048	1.9	106.66	184	-	-
Libyan Arab Jamahiriya	4,029	6,271	0.477	...	124.15	354	-	-
Morocco	23,054	610	0.358	3.9	103.08	98	-	-
Sudan	22,963	317	0.573	0.4	92.09	31	5,411	203
Tanzania	7,470	1,120	0.475	3.3	106.72	157	-	-
AFRICA	179,918	506	0.313	...	...	19	9,068	126
Benin	4,254	378	0.347	3.0	107.86	18	568	126
Burkina Faso	7,474	153	0.369	2.7	109.21	22	2,084	146
Cape Verde	353	262	0.107	...	98.27	154	16	204
Cote d'Ivoire	10,871	712	0.284	0.9	102.09	62	1,054	126
Gambia	777	245	0.221	...	113.37	90	110	130
Ghana	13,468	377	0.088	-0.2	103.14	17	995	127
Guinea	6,379	334	0.2470	0.3	93.39	32	667	92
Guinea-Bissau	893	178	0.338	...	125.59	36	177	123
Liberia	2,326	430	0.058	1.2	97.02	50	186	97
Malawi	8,524	144	0.256	-2.3	100.67	10	2,338	158
Mauritania	1,856	455	0.110	1.2	87.16	111	180	198
Niger	6,899	270	0.575	2.8	85.53	12	2,422	154
Nigeria	101,952	625	0.300	1.4	101.48	7	11,415	111
Senegal	6,926	370	0.795	2.3	103.07	62	847	100
Sierra Leone	3,797	238	0.446	0.5	99.50	40	314	89
Swaziland	3,169	250	0.455	1.7	87.98	27	490	134
L AFRICA	66,834	385	0.315	...	...	15	2,159	107
Burundi	4,910	231	0.241	1.3	98.45	3	491	119
Cameroon	10,743	870	0.581	2.0	95.61	27	916	105
Central African Republic	2,818	272	0.707	2.5	90.47	13	135	113
Chad	5,308	142	0.623	...	99.73	13	828	148
Congo	2,086	1,032	0.331	-0.6	92.84	47	10	119
Equatorial Guinea	429	200	0.316	...	...	18	-	-
Senegal	1,381	3,128	0.219	...	98.76	41	7	81

Region/Country	Population (thousands) mid 1987	GDP per capita U.S. dollars 1987	Arable land (ha. per capita) 1987	Average annual growth rate of agri. production	Average index of food production (1979/81=100) 1983-1987	Cereal imports (kg per capita) 1987	1988 cereal	
							Total 000 tons	production As % of average of previous 5 years
AFRICA (cont'd)								
Anda	6,552	290	0.118	0.9	88.69	2	276	92
Comore Islands	114	315	0.009	...	72.89	61	-	-
Comoros	32,493	161	0.196	1.7	99.47	13	1,091	109
SOUTHERN AFRICA								
Botswana	178,200	279	0.273	...	...	17	-	-
Botswana	9,163	644	0.339	-9.8	90.26	31	335	100
Botswana	1,167	845	1.252	...	77.04	118	97	570
Botswana	439	390	0.184	...	99.95	42	16	148
Botswana	383	952	0.017	-3.9	...	106	-	-
Ethiopia	45,846	117	0.304	2.8	88.54	13	6,810	129
Ethiopia	21,977	351	0.093	1.6	90.41	12	3,474	129
Ethiopia	1,583	226	0.199	2.1	81.84	59	235	168
Madagascar	10,568	255	0.253	2.1	98.89	13	1,478	101
Madagascar	7,495	160	0.335	2.5	89.07	1	1,509	110
Madagascar	1,057	1,280	0.098	5.3	100.79	186	10	189
Madagascar	14,548	210	0.207	-15.9	85.41	28	538	97
Madagascar	67	2,635	0.015	...	...	107	-	-
Madagascar	6,235	242	0.176	7.9	97.35	55	615	124
Madagascar	798	691	0.237	...	103.05	55	116	110
Madagascar	24,181	240	0.184	0.8	91.51	8	3,467	104
Madagascar	16,793	242	0.312	-0.1	95.59	2	1,598	146
Madagascar	7,185	320	0.784	2.8	95.42	21	1,748	157
Madagascar	8,715	696	0.326	3.4	82.88	8	3,002	142
AFRICA	556,952	565	0.292	...	...	47	-	-

Source: World Bank, 1988; and ECA, 1989; and FAO, 1989.

II. THE AFRICAN FOOD CRISIS AND AGRICULTURAL SUSTAINABILITY

Agricultural administrators and planners in Africa have often given the impression that the problem of African agriculture is first and foremost that of production. Available aggregate production data clearly supports this conclusion. Armed with this prognosis, the prescriptions have often sounded wonderfully simple. Berry (1984) describes the usual logic behind the preferred solutions as follows:

"If the source of the crisis is inadequate agricultural production, the solution lies in transforming the productive capacity of African agriculture. Since the international scientific community and its sponsors have been at work for some time on the vast project of agronomic research and technological development popularly known as the Green Revolution, they can claim a kind of comparative advantage in providing the material means, as well as the financial and organizational capability to achieve the breakthrough in agricultural output and productivity which African's have apparently failed to produce for themselves."

The continuing manifestations of the symptoms of the crisis today in Africa despite the concerted and widespread application of the above strategy to solve it, suggests that the solution may not be as simple as depicted above. As mentioned in the introductory chapter of this report, the distinctive climate and soils of Africa and the traditional farming systems imposed on them have often resulted in reduced sustainability of the agricultural production systems under conditions of rapidly growing populations and in the face of the introduction of modern technologies. The fact is that the traditional farming systems in Africa were not designed to support existing and future levels of populations on their original resource base and, as modern interventions have attempted to force them to do so, they have broken down, as it were. Oram (1989) vividly describes the situation when he says:

"Unable to increase productivity from their limited resources, the poor are driven to practices that amount to ecological suicide. Shortening restorative bush follows in shifting cultivation system; extending cultivation to forested areas that they need for fuelwood and storage; burning dung for fuel instead of using it to build soil fertility; planting annual crops on erosion - prone slopes; and grazing more animals than natural range lands can support."

Unfortunately, whenever the modern sector of governments and aid agencies have intervened with Green Revolution like approaches, they have failed to halt the fatal progression of the manner in which Africa's distinctive climate and soils interact with the traditional agricultural system under conditions of rapidly

growing populations and in many ways have instead, "intensified it by neglect, exploitation, and misguided attempts to introduce western approaches that were unsuited to Africa's very different conditions" (Harrison, 1987).

The most optimistic population growth rate projected for Africa during the period 1990 to 2020 is about 3.0 percent per year. This means that African agriculture must produce enough food to meet the needs of 15 to 20 million additional Africans every year from now on. When this challenge is considered against a background trend of depleting agricultural resources and possibilities of increases in drought prone areas resulting from long-term climatic changes and increased incidences of land shortages, the prospects for solving the food and agricultural crisis in the continent becomes even dimmer. In the face of these emerging trends, the challenge of food and agricultural production in Africa takes on two crucial but interrelated dimensions. The first dimension relates to the appropriate measures to be taken to ensure that the growth rate of African agricultural production is doubled over the next 20 years to keep pace with, at least, an optimistic projected population growth rate of 3 percent. The second dimension has to do with designing new farming systems that would ensure that the required growth rates of food and agricultural production in the continent, once achieved, are maintained indefinitely. In other words how can optimal yields for sustained African agricultural production be best engineered and how can the ability of the preferred farming systems to maintain the desired productivity when subjected to the vagaries of the sensitive African environment be sustained? These are the challenges that will confront African agriculture in the next twenty-five years.

Because the challenges are multifaceted, the strategies to meet them would have to be multi-pronged. There is, however, no doubt that more enhanced and imaginative agricultural research to increase and sustain food and agricultural production in Africa would be needed.

III. AGRICULTURAL RESEARCH AND AGRICULTURAL SUSTAINABILITY IN AFRICA

Agricultural research can be simply defined as an organized investigation undertaken to discover new and improved methods of production which result in increased productivity and efficiency. Agricultural research can be grouped basically into two types: basic and applied. Basic agricultural research seeks to develop new and fundamental knowledge that can be applied to solve real agricultural problems while applied research attempts to find the best way to utilize the new knowledge on offer to solve practical farm problems while adapting them to various conditions and circumstances.

The research effort needed to attain sustainable agriculture

in Africa needs to be characterized by imperatives that conform to the principles of stable agriculture and, will of necessity, have to be comprehensive and responsive in nature. Not only will it need to generate new and more appropriate technologies that are relevant to the conditions and circumstances in the different farming systems in which different African farmers operate, it will also need to focus on the interdependencies and interrelationships that exists among the elements of the farming systems and between these elements and the technical, economic, institutional, social and ecological environments.

The Farming Systems Research Philosophy and Methodology

Farming Systems Research (FSR) is a philosophy and methodology that is capable of accomplishing this task because it is predicated on the assumption that radical changes of the farming systems currently preferred by the majority of African farmers, are not necessarily possible or desirable, at least, in the short term, but that the farming systems in which they operate, can be prompted to evolve over time as new and improved inputs are tested and introduced if found to be appropriate.

The word "appropriate" needs some definition here because it takes the emphasis off the traditional criteria of designing and evaluating new agricultural technologies - technical feasibility and economic viability - and places it rather on farmers' reactions to the technologies. For example, although a farmer will certainly be interested in the economic profitability of a technology on offer, he is likely to be more concerned about the stability of his output and income from adopting the technology in the face of climatic and pest hazards, low fertility and sub-optimal management. The non-availability of labor at the critical time required by a new technology could also constrain its adoption. For some technologies, the capacity of the farmer to handle it may be the limiting constraint. For instance, there would be little future in advocating high-volume spray technologies in areas where water sources are far and dispersed. Technologies which depend on devices which are not robust and cannot be repaired in the village are unlikely to be easily extended. Nor can illiterate farmers be expected to handle technologies where very precise dosage is required unless that dosage can be standardized and a simple means of measuring it is made available.

The FSR philosophy is amendable to the development of sustainable agricultural production systems, because, if successfully pursued, it would result in a two-way interdependence of food and agricultural growth and sustainable flows of the resources needed to meet the basic needs of the farmers and produce a marketable surplus on a continuous basis.

FSR, viewed in this way, involve a critical examination and analysis of the interrelations of all the interacting components which make up the farming systems of definable zones in Africa: the land itself and the structure of farms and tenure systems imposed on it; the climatic soil and soil fertility influences which operate; the labour resources and how they are used; the capital available for farm improvement; and the provision of services such as marketing, credit, extension, the provision of farm inputs, etc.

The usefulness of FSR in developing sustainable agriculture in Africa lies in its ability to permit planning backwards from a new and improved technology scenario which takes into account the implications of modification of the existing systems, as well as forward from the existing traditional farming systems to the preferred new systems. The required sequence of events in this type of an FSR framework will include but not necessarily be limited to the following:

- (1) Identify the constraints operating to limit sustainable food production in a given area.
- (2) Evaluate on the basis of available information, possible technologies which might be used to overcome the most limiting of these constraints, not only from the viewpoint of their technical efficiency, but also from the view point of their economic and social efficiency, and their ecological integrity.
- (3) Test, usually on farmers' fields and in consultation with them, the technologies which appear to be appropriate and then either reject them and try something else, or modify them and try again, or accept them.
- (4) Propose the necessary policy actions to facilitate their adoption.
- (5) Monitor the adoption process and either;
 - continue to modify the technology as necessary, and/or;
 - propose additional policy options to ensure their sustainability, or;
 - identify and propose solutions for the next most binding constraints if any.

These sequence of events are often broken down into a number of key research stages in which different types of agricultural research activities are carried out. These usually include: the constraint identification stage, the design or planning stage, the testing stage, and the recommendation and transfer stage. These stages are now very familiar to any seasoned FSR practitioner, but they are worth emphasizing here since they remain basic.

Constraint Identification Stage

In this stage, exploratory or diagnostic surveys would be conducted relatively quickly to identify the key farming problems preventing farmers in the area from increasing their agricultural production to required levels and improving their welfare in the process. These surveys would last anywhere from a few weeks to a few months with the over-riding aim of quickly gathering information about farming problems and constraints in an area by visiting and talking to farmers right on their farms and in their homes.

The results of the survey are then used to come up with a tentative description of the farming practices farmers follow in a particular area and a good understanding of why the farmers in the area follow these practices. These results are then communicated to researchers at the research centers so that they can use them to design solutions to "real" and "identified" problems and constraints. Because the farming problems and constraints operating in an area are often complex, multi-pronged, and interdependent, the exploratory surveys would be undertaken by an interdisciplinary team of researchers. By the time the team finishes its work, it would be expected to pose practical suggestions about the types of research to be carried out to remove the problems and constraints that have been identified in the area. These suggestions together with a description of the identified problems and constraints would then be used by researchers at the research station in designing appropriate solutions.

The Design or Planning Stage

In this stage, the body of available research knowledge that is thought to be relevant for dealing with the identified constraints are collated. This body of knowledge would normally be derived from the following sources:

- (1) On-station experimental results;
- (2) Research-managed and implemented on-farm trials located on farmers' fields;
- (3) Knowledge obtained from farmers themselves.

Essentially, the on-farm research carried out here involves, ex-ante, evaluation of the available body of knowledge with respect to:

- (1) Its technical feasibility - whether the physical transferability of the technical relationship that the knowledge established is valid and thereby contributes significantly to increased production;
- (2) Its economic viability - whether the proposed solutions would

be economically viable under farmer situations and circumstances;

- (3) Its social acceptability - whether the proposed solutions are likely to be acceptable to the peasant farmer within his social context; and
- (4) Its ecological integrity - whether the proposed solutions conform to the imperatives needed to conserve and manage, in a sustainable manner, the land, water, fauna and atmosphere.

Even when the body of available knowledge points to the existence of a fairly reliable improved technology, provided that the performance of the improved technology is likely to be distorted by differences in local conditions in different ecological zones, research-managed and implemented trials (RM-RI) will be a prerequisite to any other type of on-farm trial. These types of trials would normally deal with the existing cropping systems. They are meant to emphasize, ex-ante, evaluation of any improvements in these systems so as to facilitate and ensure major shifts in their productivity under farmer conditions. They are expected to be up-to-date with regard to all new relevant research results and experiences and to be continuously on-going with a built in feed-back information system between the team working in the field and on-station researchers.

The Testing Stage

In this stage of research, the most promising technologies among those identified in the design stage are evaluated under farmer conditions. This stage can consist of two steps:

- (1) Research-Managed but Farmer-Implemented Trials (RM-FI) set up to determine whether the tested relationships involved in the available improved technologies are altered by farmers' management of variables not originally included in the on-station trials; and
- (2) Farmer-Managed and Farmer-Implemented (FM-FI) trials carried out when the research team is confident that the available improved technology will achieve its intended objectives but needs to evaluate the technology under the socio-economic and ecological environments in which the farmer operates.

The Recommendation and Transfer Stage

In this stage, the agricultural extension workers begin to play a more active role in directly assisting farmers to adopt the technologies that have been demonstrated to be feasible and sustainable under farmers' conditions and environments into recommendations that will result in the mass adoption of the technologies by the majority of the farmers.

It should, however, be emphasized that the sequence of FSR events described above or their related research stages often overlap and are often multi-directional. The ultimate aim, of course, of the agricultural research process described above is to evolve a production system that is able to increase and maintain its productivity even when subjected to the environmental stresses and shocks peculiar to the African continent. FSR provides a useful methodology not only for developing new technologies suited to the resource situation of the majority of African farmers and the more difficult ecological conditions in which they operate, but also for understanding these difficult conditions and constraints.

FSR and Sustainable Agriculture

The introduction of new and improved agricultural technologies to African farmers is bound to produce stresses and stocks on the environment which may remove some of the classic advantages of the existing ways of growing crops in the continent. For example, the traditional methods of growing crops in mixtures not only maximizes the use of environmental factors such as light, water and nutrients, but can also result in supplementary and complementary symbiotic relationships between different crop species. Mixtures are also known to reduce the incidence and severity of pest attack and to control the incidence of weed. Because many crops overlap in terms of the time they are in the ground, the growing of crops in mixtures is also said to extend the period of the year in which the soil is protected by leaf cover and root systems (Norman et. a., 1981).

It is also likely that changing the existing cropping systems in Africa would change the existing ecological balance there. For example, the present pest and disease situation is relatively low and has been kept so because inputs with natural built-in checks are being used and because, over the years, a balance has been struck between production and pest and disease resistance. Changing the existing cropping systems is bound to disturb this balance. The balance would be affected in two ways. Firstly, since the new varieties being introduced do not have the advantage of having evolved over the years, they are more likely to be pest and disease prone. Secondly, since the new systems would also involve more sole and intensive cropping, their susceptibility to attack would be greatly increased.

The advent of the green revolution in Asia has demonstrated the vulnerability of having genetically uniform species. The potential, however, of loss from disease pest and drought attack will vary from ecological zone to ecological zone. The possibility of a breakdown of the existing ecological balance when the old system is modified or a new one introduced means that a protection umbrella involving increased use of crop production and protection

chemicals must be provided if the new system is to be sustained. There are a number of critical issues here for the sustainability of African agriculture.

Firstly, if current trends continue whereby access to and the benefits of new technologies accrue mostly to large and more wealthy farmers (Abalu, 1984), the tendency would be for farm sizes to increase rapidly. This in turn, would lead to massive land clearing. The more widespread this tendency becomes, the more serious the problem of desert encroachment is bound to be.

Secondly, while the amount of chemicals currently being used on farms in Africa is relatively low, the introduction of new sole crop varieties would eventually result in significant increases in the use of chemical inputs. Their use would conceivably become quite high as the preoccupation with sustaining increased levels of agricultural production continues. This could, however, prove to be quite dangerous as careless storage of the chemicals used could pose hazards to life. There is also the possibility of contamination of food and water systems through negligent use of chemicals. When one considers the fact that most farmers in the region can neither read nor write, the dangers involved become very real and should not be under-estimated.

The achievement of sustainable agriculture in Africa will depend on appropriate policies with regards the development and dissemination of new and improved technologies as well as on the conservation and sustainable management of land, water, flora, fauna, and the atmosphere. FSR can provide the necessary information about the most appropriate new technologies to promote and about the environmental implications for the widespread use of these technologies. Such information will be useful in carrying out macro-analysis and formulating macro-policies and processes. FSR could also play a useful role in providing the conceptual framework for creating and maintaining the institutions and structures that would be needed to protect the environment from degradation.

In this regard, the FSR framework for achieving sustainable agriculture in Africa can usefully be characterized along agro-ecological zones (Oram, 1989) comprising groups and sub-groups of countries. The type of agricultural research (both basic and applied) that is appropriate for each zone will depend on the unique technical, socio-economic and ecological conditions that operate there and the financial resources and personnel available. It will also depend on the amount of basic research results that are already available, and how much of these can be beneficially applied or adapted to given situations in different agro-ecological zones. In this regard, both basic and applied agricultural research are complimentary.

Each African country must, however, attempt to evolve an appropriate National Agricultural Research System (NARS) consistent with the research requirements of the agro-ecological zones relevant to its agriculture. The NARS should be responsible for both generating and adapting the technology required to meet its sustainable agricultural development challenge in a coherent and systematic manner and in conformity with the wider sustainable agriculture imperatives of the relevant agro-ecological zones.

The appropriate NARS for each African country will also need to be centered around an agricultural technology generation and transfer process based on farmers' needs and circumstances; sensitive to the peculiar climate, soils, geology, and patterns of diseases in the continent; serviced by an extension system that responds quickly and effectively to farmers' reactions, and serving farmers who can beneficially utilize the technologies on offer and whose response to extension and research workers are promptly taken into consideration in further research efforts.

The process of attaining sustainable agriculture in Africa will, therefore, involve many participants in a two-way process which begins at one end with agricultural scientists carrying out their research at research stations and extends to include the farmers themselves. The range of activities involved in this process includes basic or fundamental investigations, research on experiment stations, adaptive experiments on farmer's fields, and experimentation by farmers themselves. These range of activities must also be accompanied by a strong and consistent national extension system as well as other agricultural support services.

IV. PRECONDITIONS FOR A SUCCESSFUL NARS

A solid tradition of agricultural research and extension has still not evolved in Africa after three decades of independence. Today, agricultural research in the continent suffers from a multitude of weaknesses and still lacks some of the basic preconditions for the evolution of viable National Agricultural Research Systems. Some of these weaknesses are discussed below.

Problems of African NARS

Lack of Effective Systems for Delivery of Research Results

The effectiveness of any NARS depends on the extension system that serves it. Extension is a social service which assists farm people, through formal and informal education procedures, to improve upon their farming methods and techniques, increase their production efficiency and incomes, better their level of living and lift the social and educational standards of their lives. The major objective of agricultural extension services is to help the farmers in particular, and rural communities in general, to become self-reliant and primarily dependent on their own initiative,

potentialities and resources.

Agricultural extension efforts in most African nations owe their origins to pre-independence colonial efforts devoted to crop extension in line with an agricultural policy based on the production of export crops. As the needed technology became available, separate extension programmes were developed for farmers involved in the production of each of the main cash crops.

The underlying philosophy of the currently preferred extension process in most African countries is to convince farmers to increase agricultural production by adopting the recommended agricultural production techniques on offer from the NARS or the International Agricultural Research Centers (IARC). While all farming families are supposedly targeted for extension education, primary emphasis in many African countries is placed on the so-called "progressive" farmers. The assumption is that by getting extension advice to early adopters, a trigger mechanism will be set into motion and the diffusion as well as the intended innovation will spread to most of the other farming families in the communities. This face-to-face contact and other persuasive techniques in the extension effort are expected to usher in an era of positive adoption behavior by minimizing the obstructive effects of resistance to change by farmers.

There are several problems with this type of an approach. Unavailability of adequately trained extension personnel, poor work attitude, complicated extension packages, lack of co-ordination with agricultural research and other extension services and structural rigidities have prevented the system from functioning properly in most African situations. At the core of these problems is the fact that, the successful extension programmes of the developed countries around which this approach is modelled, was created to provide answers to problems and aspirations of farmers who already had access to land, social status and political and economic power. The average African farmer does not live much above a culturally determined subsistence level and is faced with a decision-making process hampered by limited access to economic and political institutions.

Extension workers must be trained on the workings of the new technology being introduced, and farmers must be trained to become more productive and to use the new inputs involved. With the low extension worker-farmer ratio that exists in many African countries today, doubts must be raised as to whether the current method being pursued is appropriate. While it is not necessarily true to say that the higher the extension-worker/farming family ratio, the higher the adoption rate by farmers, it is nonetheless necessary that a reasonable ratio should be achieved if effective contact is to be made with farmers. Agricultural extension assumes a fundamental role especially when farmers who are predominantly

illiterate are to be encouraged and trained to use new inputs. If extension contact is negligible, then it becomes difficult to expect farmers to adopt new practices.

Another problem with the existing extension effort in Africa has to do with the misconception by agricultural administrators and extension officials alike as to the nature of the extension problem. Quite often, the problem is viewed simply as concerning the transfer of new knowledge and techniques to backward farmers. This in turn has resulted in a situation in which farmers have come to place a high degree of dependence and reliance on agricultural extension officials. The farmer looks upon the extension worker not as a helper, guide and communicator of new skills and practices, but as a source of tangible gains in the form of subsidies and easy distribution of inputs. The expectation that the extension worker is there to play this role has proved to be a big hurdle in his acceptance and in the legitimization of his extension programme as well as to his participation in development activities. In addition, ineffective and inadequate extension contact further minimizes the farmers' response to innovations. Many extension workers are also saddled with regulatory duties which often adversely affect the necessary confidence relationships between the farmers and extension staff.

It is obvious that effective agricultural research must be accompanied by strong systems for delivering research results to the farmers for whom they are intended. The process of technology delivery involves agricultural administrators, agricultural scientists, extension personnel and farmers alike. Unfortunately, in many African countries the dividing line between where agricultural research activities end and extension activities begin is often not well defined. This problem is further confounded by the fact that in many of these countries the research and extension systems are often under different ministries which emphasize different goals. As a result, the researchers at the research centers feel that their work ends once an improved technological package has been designed and that its adoption is entirely the business of the extension system. The extension people, on the other hand, wait for new research results to be delivered at their door steps and feel that their job is simply to persuade farmers to adopt these researchs. The result is that the gap between the creation of new agricultural technologies and their successful delivery to farmers in Africa has continued to widen.

There is need, therefore, for the national extension systems to be fully integrated into the NARS of each African country and for the links between research and extension to be strengthened.

Inadequate Research Funding

Funding limitation is one of the most binding constraints against the evolution of effective NARS in Africa. In many cases,

financing of agricultural research in Africa has been poor and erratic. Funds are usually not released on time to carry out trials and experiments and when the funds finally arrive, it is often too late to salvage meaningful results from the experiments. The absence of adequate funds for agricultural research has resulted in sloppy research efforts, haphazard research activities, incomplete research projects and general uncertainty for research staff. Because of lack of funds, materials and equipment for research cannot be procured and in the cases where the equipment exist, they can neither be maintained nor replaced.

Most budgets for national agricultural research in African countries are usually top heavy with personal emoluments and light on operating expenses so that even when research personnel is available, research activities are paralyzed for lack of materials and other items needed to keep research going. This poor and erratic budget support for African agricultural research, makes forward and purposeful research planning very difficult.

The general rule of thumb is that a minimum of 1 percent of agricultural GDP should be allocated to funding national agricultural research. Very few African countries have been able to attain this target. In short, African agricultural research has not, in the past, received the required level of funding from African political leaders because they have failed to appreciate the impact and to see the returns on the investments they have already made in agricultural research. However, because African agricultural researchers have, in the past, also not been able to creditably demonstrate the profitability of their research work to the finance and planning officials responsible for funding national agricultural research, it is easy to see why these officials are often not too enthusiastic to provide more funding for agricultural research activities.

Because FSR attempts to harness the small-scale farmers who presently produce the bulk of the continent's agricultural products and constitute the majority of its population into the national agricultural and extension systems, it requires frequent contact and interaction by researchers and extension workers with farmers and frequent visits to their villages and fields to identify their constraints and technical problems. Without adequate and sustained budget support, travel to the field to carry out the required on-farm research would be impossible, thus, compromising the much needed two-way flow of information between researchers, extension workers and farmers.

Given the present difficult macro-economic conditions faced by many African countries, important questions of resource allocation are bound to arise as the need to commit increased resources to NARS becomes obvious. The fact is that a necessary condition for a successful NARS is the maintenance of sustained funding. Most African governments would not be able to go it

alone. There will continue to be need for continued external financial assistance in direct support of the NARS. But donors would need to co-ordinate their support nationally, sub-regionally and regionally within the framework of the NARS.

Lack of Trained Research Personnel

In Africa, agricultural research is usually carried out by several different entities: ministries, autonomous and/or semi-autonomous agencies, and universities (ISNAR, 1986b). The effectiveness of any African NARS will ultimately depend on the availability and stability of people with the requisite agricultural research skills at these entities. There is a required minimum number of research and support personnel to guarantee an effective NARS. Many African countries have found and continue to find it very difficult to put together the required number of core scientists and technicians to sustain their national agricultural research systems.

There is presently an overall shortage of trained national research scientists in the continent (World Bank, 1987; ISNAR, 1986a). The situation is being aggravated by high levels of mobility among the research institutes, universities, civil service and private sectors. The on-going brain drain of African agricultural researchers, has also taken its toll in exacerbating an already critical manpower situation in agricultural research. All of these have led to national research programmes which are perpetually in the planning stages, but which never get implemented. Other effects of the shortage of research personnel and the accompanying staff instability have included a large number of incomplete and abandoned agricultural research projects, poorly co-ordinated research efforts, and inefficient use of the meager resources available for agricultural research in the continent.

The situation could have been much better if the Faculties of Agriculture in African Universities could be better integrated into the national agricultural research systems. Right now, despite the existence of well-trained staff teaching in some of these Faculties of Agriculture, they are seldom involved in the national agricultural research agenda of their countries in a coherent and co-ordinated manner. The Economic Commission for Africa has drawn attention to the low level of enrollment at institutions of higher learning for courses concerned with agriculture, forestry and fisheries in Africa and has called for the reform of university curricula to enable African educational institutions to rise to the challenge of Africa's social and economic crisis.

Faculties of agriculture in African universities and technical colleges of agriculture have a crucial role to play in training the increased numbers of research and supporting staff that would be needed to operate an effective NARS. To accomplish this task, their curricula must be reorganized to respond to the requirements

of a multi-disciplinary agricultural research and extension system. In addition, faculty professors and agriculture teachers will need to be more familiar and better integrated into the national agricultural research programmes and their students would need to spend more time in the field and their project, thesis and dissertation topics would need to address real problems spinning out of the NARS.

The IARC's are also presently providing a wide range of training activities from which African research scientists and technicians can benefit. A recent list of the categories of training which the IARCs can provide include the following (Pickering, 1988):

- (1) Post-graduate thesis related research training under joint supervision of IARC scientists and professors of universities in Africa and elsewhere;
- (2) Commodity production courses, including courses in soil management, crop protection, tissue culture techniques, statistical methods, etc.;
- (3) Special skill training for technicians and supporting staff in agricultural research;
- (4) Vacation studentships that motivate promising undergraduate students to go into agricultural research as a career;
- (5) Post-doctoral fellowships that allow Ph.D. holders to gain relevant on-the-job experience that prepares them for work in the tropics, specially in Africa;
- (6) Visiting scientistships, which in addition to encouraging collaboration among experienced scientists at IARCs and various institutions, provides some on-the-job experience in research management.

This training role of the IARCs can be made more useful and relevant for Africa, if a co-ordinated attempt is made to direct these various categories of training to the priority training needs of the NARS.

Ineffective Linkages Between Applied and Basic Research

In the long run, the most important contributions of FSR to the attainment of sustainable agriculture in Africa would be to assist the NARS and the IARCs to specify priority requirements which they will then use as a basis for their basic research. This would permit basic research at the NARS and IARCs to be better focused on relevant agricultural sustainability issues and problems. Also, and perhaps more importantly, the results obtained

from FSR would be profitably utilized if they are used to encourage researchers doing basic research to include the context of the farmer's environments in the design of their experiments. This would, of course, help to ensure that all research carried out at the research centers are better focused on measures for attaining agricultural sustainability.

A number of international and regional organizations also carry out a variety of agricultural research activities in Africa. Several of the industrialized nations also operate a number of institutions and arrangements to assist in generating improved agricultural technologies for Africa. Many countries in the continent also rely on donor support in their quest to develop their national capacity for generating the required technologies needed to dynamize their agricultural sectors into engines of national economic growth. In addition, there is presently a proliferation of commodity, regional and sectoral project assistance by a variety of donors in the continent. However, as good intentioned and generous as this international research community has been, it has been unable to make much impact on the agriculture of Africa because the activities of its members within national boundaries and within the continent have remained largely unco-ordinated. The fact that many members of this international agricultural research community often have divergent priorities and interests, has not helped matters much either.

No doubt that the international agricultural research community will continue to play an important role in developing the capabilities of African nations to increase their agricultural production. There is, however, need for each government in the subregion to ensure that the agricultural research activities that takes place within their national boundaries are effectively co-ordinated.

The Need for Regional Cooperation Arrangements

The establishment of an effective NARS in Africa has been and will always be a complex and expensive affair. Because of competing demands for limited government funds, most countries in the continent cannot afford the critical minimum number of agricultural research scientists and technicians that would be needed to support an efficient NARS. In any case it is not necessary for all African countries to develop a research programme for all agricultural commodities and for all ecological zones of each country. Technical co-operation in the form of appropriate regional agricultural research arrangements should, therefore, be encouraged so that African countries can share their agricultural research burdens and experiences.

Networking represents a logical and cost-effective strategy for improving upon the effectiveness of agricultural research in Africa in attaining sustainable agriculture because it will ensure the effective use of the relatively meager funds available for agricultural research in the continent. It will also enable maximum utilization of the limited talent that is currently available for agricultural research in the continent. Networking will also be able to bring together the work of the International Agricultural Research Community and the National Agricultural Research Systems in Africa in a meaningful and mutually beneficial manner while, at the same time, improving the effectiveness of the agricultural research process in the continent.

This expectation is supported by a recent World Bank review of African agricultural research which lists the following as the attractive features of the network approach to agricultural research (World Bank, 1987).

- (1) Beneficiary countries are fully involved in programme planning and in setting priorities. The network encourages partnership between centers and developing countries. It is, therefore, a model suited to assisting in the evolution of strong national programmes. When national programmes have reached a position of strength, the model is admirably suited to a continuing arrangement for collaborative research programmes drawing on a wider range of scientific knowledge.
- (2) The network has a catalytic role in bringing together resources to focus systematically on an important topic and, thus, establish a critical mass of scientific activity at a relatively low marginal cost.
- (3) Flexibility is maintained in the use of resources in that programmes can be increased, reduced or terminated relatively easily.
- (4) The network provides a mechanism to link the research of centers to that funded by donors through other channels. It may strengthen the basis of requests from countries for bilateral funding, in that resources would be used as a part of a major integrated international research activity.

There is, however, the real danger that if the regional approach to agricultural research is pursued in a haphazard and unco-ordinated manner, a number of its attractive features may be compromised. For example, the proliferation of networks with overlapping mandates and objectives will only exacerbate wasteful

duplication of research efforts in the continent. The lack of a solid tradition of effective regional cooperation in agricultural research in Africa, means that the strategy should be pursued slowly and cautiously, but more importantly, in a co-ordinated manner. African regional organizations have a crucial role to play here.

V. THE ROLE OF AFRICAN ORGANIZATIONS IN THE DEVELOPMENT OF AFRICAN AGRICULTURAL RESEARCH

There is no doubt that African organizations and institutions must play a crucial role in evolving the appropriate National Agricultural Research Systems that will usher in sustainable agricultural production in the continent. The role that the African organizations must play in the emancipation of the continent from the throes of underdevelopment and retrogression was recognized over three decades ago by the then Secretary General of the United Nations, Dag Hammarskjold, when he said that if rapid economic growth were to be achieved in new states, concerted action and joint efforts were needed so that different states would be able to develop within a common framework that took cognizance of the peculiar needs of each state or combination of states.

It is the realization that individual African countries working alone would find it very difficult to achieve their development objective that prompted the creation of the United Nations Economic Commission for Africa (ECA) in 1958 with the responsibility of promoting the continent's economic development. ECA has since recognized the important roles that Africans themselves and African organizations must play in the development of the continent. Professor Adebayo Adedeji, the United Nations Under Secretary General and Executive Secretary of the United Nations Economic Commission for Africa recently underscored this important role when he said that it is imperative for African countries to enhance their ability to participate fully in the international economy and that as Africa entered the 1990's, economic cooperation and integration would have to be fostered at the regional and sub-regional levels through: closer coordination of economic and social policies; the development of multi-country projects in the key economic sectors, and the promotion of inter-African trade (ECA, 1987).

During the last three decades, ECA has been instrumental in the establishment of a number institutions designed to cater for the continent's economic and social development needs. The number of ECA sponsored institutions, with or without the participation of the Organization of African Unity (OAU) presently numbers over thirty six. They include such notable successes stories as the African Development Bank (ADB) and the African Institute for Economic Development and Planning (IDEP).

Today, there are four main types of regional cooperation in Africa (Robson, 1985). They include:

- (1) Multi-national economic communities;
- (2) Development Commissions for a river basin or a lake;
- (3) Financial institutions, including, central and development banks; and
- (4) Common service bodies, notably for research and/or technical services.

Given the important role that agriculture plays in the economies of most African countries, all four types of regional organizations often involve one form or another of agricultural development activities. However, the common service bodies are usually those that play a more direct role in the development of agriculture in the continent.

A far from up-to-date list of regional and sub-regional organizations in Africa partially or wholly involved in the development of African agriculture is presented in the Annex. Technical and service organizations constitute the largest number of arrangements in the continent.

All the principal documents on African agricultural development ascribe a pivotal role to inter-country cooperation and collaboration in agronomic research, training and extension in the continent's effort to meet its agricultural production challenges in the future. The Lagos Plan of Action (LPA) for example emphasizes the importance of agricultural research in the transformation of agriculture in Africa and calls for the strengthening of inter-country cooperative research programmes geared towards supporting the objective of continental food self-sufficiency. OAU's Africa's Priority Programme for Economic Recovery (APPER), calls for cooperation at the bilateral sub-regional, regional and continental levels in the execution of measures to improve the food situation and the rehabilitation of agriculture in Africa and emphasizes the need to draw up and execute agricultural research programmes in areas of common interest for the rehabilitation of the continent's food and agricultural sector.

The Current Situation of African Organizations Involved with Agricultural Development

The long list of organizations involved in African agricultural development listed in the Annex would suggest that Africans and their supporters have heeded the call to strengthen cooperation among themselves as a means of attaining sustainable agriculture for the continent. The point of great concern, however, is that despite the creation of all these organizations, very little progress has so far been made in solving the

continent's agricultural development problems. What, therefore, are the problems confronting these African Organizations and how can these problems be solved to make the organizations more effective?

Several African organizations suffer from a variety of problems and constraints which have prevented them from achieving their intended objectives. These problems and constraints include but are not necessarily limited to the following:

- (1) Lack of commitment by governments;
- (2) Ill-conceived strategies by the organizations;
- (3) Lack of coordination and too much competition among the organizations;
- (4) Poor financial capacities of African countries; and
- (5) Language and psychological barriers.

Lack of Political Commitment

One of the most common problem faced by most of the African organizations is the lack of firm commitment to their success by the very governments that established them. As the ECA (1989) has pointed out, after pressing for the establishment of some of these organizations and even after having approved the legal instruments for setting them up, many African governments either fail to accede to membership or, if they do, they fail to give it adequate material and financial support. The main reason for this apparent inconsistency between the rhetoric and action of African governments rests with the cumbersome politics and conflicts that often exist among African countries. In many countries the channels and mechanisms for implementing decisions taken at multi-national levels are either none-existent or extremely slow in their operation. The preferences usually accorded to historical linkages and experiences by African countries have also often dampened the political will of African governments to participate in new regional arrangements. Petty competition and mistrust among the nationals of different nations managing the affairs of African organizations have also often prevented them from functioning as originally intended. Top heavy structures, the politization of appointments, and apparent unwillingness by many African countries to give priority to regional issues vis a vis national ones, are all well recognized stumbling blocks.

Ill-conceived Organizational Strategies

Quite often, due to ill-conceived organizational strategies, African organizations fail to successfully address problems of common interest. Either the right problems fail to be addressed in the right order or too much emphasis is placed on areas which are not of common vital interest or immediate relevance. Management problems resulting from the application of inadequate management procedures in an inappropriate management atmosphere,

have also not helped matters much. The absence of specialized manpower to run these organizations is also often a serious constraint. In many cases, the objectives of these organizations have been overly ambitious and the benefits accrueable from them to participating members not readily apparent.

Lack of Coordination and too Much Competition Among the Organizations

The large number of organizations operating in Africa have resulted in coordination problems in dealing with the variety of special sectorial and commodity preferences of these organizations and the various forms of assistance which go with them. The fact that many of these organizations were created on an ad hoc basis, has also exarcebated the problem of effectively coordinating their activities. The existence of so many organizations involved in agricultural activities has also given rise to conflicts over mandates and resulted in divided loyalties between and among individuals and member countries. The end result is that each of these organizations ends up tackling the same problems differently and independently, thus producing solutions which may be contradictory and inconsistent with one another.

Poor Financial Capacities of Member Countries

Lack of sufficient funds by many African governments, and hence, their failure to meet their financial obligations to these organizations represent a major constraint to the successful operation of a number of African organizations. In many cases, the organizations are usually started with support from outside agencies and financial institutions, with the expectation that once they start operating effectively and begin to achieve their objectives, the concerned governments would step in and assume their fair share of the financial burden. Experience would suggest that this is often the exception rather than the rule. Given the current difficult macro-economic conditions faced by man African countries, the situation is very unlikely to change within the near future.

Language and Psychological Barriers

Language and psychological barriers have also often acted as constraints to the successful operation of African regional organizations and may also help to explain the existence of many of these organizations. In the case of agricultural research for example, despite the fact that patterns of crop and agricultural enterprise adaptation in Africa are stratified across several adaptation zones and, hence, countries, a number of similar organizations along linguistic (French or English) lines have been created defying the logic and boundaries of the well-defined adaptation zones. Some organizations appear also to have been created for purely psychological reasons either for fear of

domination by a country or group of countries or as a reciprocal action to counter balance other existing sub-regional arrangement.

The Future Role of African Organizations

As pointed out earlier, most African countries are aware and appear to be convinced about the need to establish ties among themselves as a useful means of achieving their individual and collective national objectives. This is an important pre-condition for the successful operation of African organizations which appears to have been generally met.

Clearly there is need to rearrange, reorganize, improve or strengthen existing African organizations at the sub-regional or regional levels in support of sustainable food and agricultural production in the continent. With regards to agricultural research, there is clearly a need for the creation at the sub-regional or regional level of an effective co-ordination structure for the various research activities and programmes in the continent so as to enhance their effectiveness and expand their results. A number of organizations such as the OAU's Scientific, Technical and Research Commission (STRC) and the Association for the Advancement of Agricultural Sciences in Africa (AAASA) are presently attempting to provide this function, although with considerable difficulties. In order to avoid these difficulties in the future, a number of important requirements would need to be met. These include:

- (1) The creation of more appropriate instruments and arrangements for regional cooperation in agricultural research.
- (2) The formulation of a more realistic regional strategy for agricultural research.
- (3) The development of suitable infrastructures for cooperation in areas of food and agricultural production.
- (4) The implementation of monetary and payments reforms to facilitate the provision of material and financial support to African organizations involved in agricultural research.

Appropriate Instruments and Arrangements

Most African organizations dealing with agricultural research have either found it very difficult to faithfully pursue their initial founding objectives or, due to various difficulties, have just simply abandoned these objectives. In a number of cases, they have just ceased to function. Quite often, the main reason for this is because the instruments and arrangements for cooperation guiding their operations were not very realistic on what can be

achieved within the available resources and under the prevailing conditions. There is therefore need for the instruments and arrangements for cooperation of these organizations to be more realistic, taking into account differences in resource endowments, political ideologies, and influence in external factors over which many African countries have very little or no control.

It would also be necessary to include more specifications in the cooperation arrangements of agricultural research so as to ensure more equitable distribution of the costs and benefits of cooperation among the partner states.

Formulation of Realistic Regional Research Strategies

African organizations concerned with agricultural research should be guided by a well defined regional agricultural research strategy. This strategy should be based on a realistic appraisal of the common agricultural problems confronting sub-regional or regional groups of countries and the comparative strengths of the various National Agricultural Research Systems. In this regard, there is need for the creation at the sub-regional or regional levels of a single coordination structure to bring together all the numerous research programmes currently being implemented in the continent. Not only will this minimize the existing tendencies whereby several organizations are tackling similar problems simultaneously but independently with the risk of producing conflicting solutions, it will also permit the right agricultural problems and constraints to be addressed in the correct order. Such a regional strategy will permit the harmonization of the design of NARS so as to avoid policy conflicts and costly duplication of research efforts among different African countries.

This kind of a coordinating structure, if properly designed and implemented, will result in considerable economies of scale by ensuring the availability of the critical mass of staff needed to conduct meaningful agricultural research and by justifying the provision of common facilities and equipment such as libraries, laboratories and experimental farms which individual countries can not afford. This will not only result in the fostering of human and institutional links across the African continent, it will also ensure the availability of more indigenous agricultural research personnel more suited to the conditions of African agriculture.

There is perhaps, a strong need here to create a new African Regional Center for Agricultural Research which consolidates the objectives of the present Association for the Advancement of Agricultural Sciences in Africa and those of the Organization of African Unity's Scientific, Technical, and Research Commission, and other similar organizations in Africa. The primary objective of this new organization would be to serve as a coordinating structure for all the agricultural research activities taking place in the continent. In playing this coordinating role, the regional

research center will perform research, training, and advisory roles in ensuring sustainable agricultural development of the continent. This center will serve as a focal point of African excellence in agricultural research and training where resources can be concentrated in pursuit of sustainable agricultural development for the continent.

Development of Suitable Infrastructures for Cooperation

Regional cooperation in agricultural research in Africa would be ineffective unless, the national agricultural research structures needed to effectively participate and benefit from regional cooperation are strengthened and are functioning well. In this regard, and in order to contribute meaningfully to the attainment of sustainable agriculture in Africa each African country must endeavor to establish the basic minimum national agricultural research infrastructures necessary to exploit the benefits from regional cooperation. This will require the strengthening and reorientation of existing institutional and administrative structures at all levels with respect to enhancing the national and regional capacities to administer them efficiently. The emphasis here should, however, be placed on the design and implementation of infrastructures that will support functional and practical regional agricultural research strategies rather than on the construction of grandiose secretariates with all the accompanying avoidable costs.

Financing and Payment Reforms

Because most African countries find it difficult to generate and divert material and financial resources to support the African organizations they have created to promote regional agricultural research, more imaginative ways must be found to reform existing financing and payments procedures for these organizations. For example, while for obvious reasons, outside agencies and financial institutions must continue to be called to support the creation, improvement, and strengthen of institutional arrangements and mechanisms at the national, sup-regional, and regional levels which will promote technical cooperation among African countries in the pursuit of sustainable food and agricultural production, collective African action is needed to ensure that whatever resources are brought from outside to support African agricultural research remain in the region and are put to work mostly for African agricultural research. There will also be need for greater accountability and dedicated management of the funds available to the organizations and for clear signs that the need for further financial support from donors and other outside sources will eventually decline.

VI. CONCLUSION

In the ultimate analysis, the African food and agricultural crisis can be made a thing of the past only by moving the vast majority of African farmers to levels of agricultural productivity much higher than those they are presently attaining. The solution, however, goes beyond simply introducing measures that will increase the productivity of these farmers. The distinctive climate and soils of Africa and the traditional farming systems imposed on them often results in reduced sustainability of the agricultural production systems under the conditions of rapidly growing populations that is currently obtained in most African countries when new technologies are introduced.

There is, therefore, urgent need to direct attention towards the evolution of new and improved farming systems in Africa that are capable of not only attaining the required increases in agricultural productivity to meet the food and agricultural requirements of the continent, but also to maintain and sustain the capacity to meet these requirements indefinitely.

One of the most important requirement for achieving sustainable agricultural production in Africa is the conduct of more imaginative agricultural research designed to permit planning backwards from a new and improved technology scenario which takes the technical, social, economic, and ecological implications of the modification of the existing systems into consideration, and also allows planning forward from the existing traditional farming systems to new systems that ensure the conservation and sustainable management of Africa's land, water, flora, fauna, and atmosphere.

The Farming Systems Research methodology and philosophy is capable of accomplishing this task because it is predicated on the important and valid assumption that the future of African agriculture rests with its small-scale farmers and that radical changes of their current farming systems are not necessarily possible or desirable, at least, in the short-term, but that these systems can be prompted to evolve overtime along preferred lines as improved agricultural inputs and practices are tested and introduced, if found appropriate technically, economically, socially and ecologically.

National Agricultural Research Systems (NARS) would need to play a critical role not only in generating and adapting the technology required to meet the requirements for attaining sustainable agriculture in a coherent and systematic manner, but also to ensure that the new technologies conform to the wider sustainable agriculture imperatives of the relevant agro-ecological zones falling within the boundaries of the country. The NARS are, however, currently confronted by a number of difficult constraints which prevent them from attaining sustainable agricultural production for their countries. These include: lack of effective

national systems for the delivery of research results; inadequate funding for research; lack of trained research personnel; and inadequate linkages between applied and basic research.

The above constraints notwithstanding the establishment of an effective NARS is a complex and expensive undertaking and many African countries will find it very difficult to achieve their sustainable agriculture objectives by working alone. Technical cooperation in the form of appropriate regional agricultural research arrangements appear to hold the key to success in this area in the future. In this regard, the ECA secretariat, including its sub-regional Multi-Lateral Programming Centers (MULPC) have an important role to play.

To attain success in this area in the future, the many problems currently preventing existing African organizations from achieving their intended objectives must be eliminated. These include lack of political commitment by Governments; the implementation of poorly conceived strategies; lack of coordination

and too much competition among the organizations; poor financial capacities of African countries; and language and psychological barriers.

In the final analysis, the single most important requirement for achieving sustainable agricultural production in Africa is political commitment and action. The commitment must be total and must permeate all levels of society, starting from the very top, the Head of State himself. The required action, on the other hand, must be more bottom-up and less top-down, with the full participation of the people themselves in all the decision making processes.

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List of Regional and Sub-regional Organizations
in Africa Partially or Wholly Devoted to the
Development of African Agriculture

Type and Name of Organizations	Year of Establishment	Location
I. Economic and Customs Union		
(1) African and Mauritanian Common Organization (OCAM)	1966	Bangui, Central African Republic
(2) Central African Customs and Economic Union (UDEAC)	1964	Bangui, Central Africa Empire
(3) Council of Entente State	1959	Abidjan, Cote d'Ivoire
(4) Customs union between Swaziland, Botswana, Lesotho and South Africa	1970	None
(5) East African Community (EAC)	1967	Arusha, Tanzania
(6) Economic Community of Great Lakes Countries (CEPGL)	1976	Gisenni, Rwanda
(7) Economic Community of West African States (ECOWAS)	1975	Legos, Nigeria
(8) Maghreb permanent consultative Committee (CPCM)	1964	Tunis, Tunisia
(9) Mano River Union	1973	Freetown, Sierra Leone
(10) Mauritani-Morocco Co-operative Agency (AMAMCO)	1975	Rabat, Morocco
(11) Nigeria-Niger Joint Commission for Co-operation	1973	Niamey, Niger
(12) Preferential Trade Area		

	for Eastern and Southern African States (PTA)	1981	Lusaka, Zambia
(13)	Senegambia Permanent Secretariat	1967	Banjul, Gambia
(14)	Union of Central African States (UEAC)	1968	Ndjamena, Chad
(15)	West African Economic Community (CEAO)	1973	Ouagadougou, Burkina Faso

II. Organizations for the Development of Land, and Water Resources, etc.

(1)	Inter-African Committee for Hydraulic Studies (ETEH)	1960	Ouagadougou, Burkina Faso
(2)	Lake Cade Basin Commission (CBZT/LCBC)	1964	Ndjamena, Chade
(3)	Liptako - Gourma Region Integrated Development Authority	1970	Ouagadougou, Burkina Faso
(4)	Organization for the Development of the Senegal River (OMVS)	1972	Dakar, Senegal
(5)	Permanent Inter-state Committee on Drought Control in the Sahel (CILSS)	1973	Ouagadougou, Burkina Faso
(6)	River Niger Commission (CFN)	1964	Niamey, Niger
(7)	Southern African Development Coordination Conference	1980	

III. Technical and Services Organizations

A. Education and Training for Rural Development

(1)	African Insititute for Economic Development and Planning (IDEP)	1962	Dakar, Senegal
(2)	African Regional Center for Integrated Rural Development	1980	Arusha, Tanzania

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|--|--|------|---------------------------|
| (3) | Inter-state School for Rural Engineer (EIER) | 1968 | Ouagadougou, Burkina Faso |
| (4) | Pan African Institute for Development (PAID) | 1964 | Switzerland Geneva |
| B. Crop and Livestock Production and Rural Development | | | |
| (1) | African Groundnut Council | 1964 | Lagos, Nigeria |
| (2) | African Inter-Ministerial Committee on Food | 1976 | Addis Ababa, Ethiopia |
| (3) | African and Malagasy Sugar Agreement | 1966 | Njdamera, Chad |
| (4) | African and Malagasy Coffee Organization (OAMCAF) | 1960 | Paris France |
| (5) | African Society for the Development of Millet and Sorghum Based Food Industry (SADIAMYL) | 1972 | Niamey, Niger |
| (6) | Association for the Advancement of Agricultural Sciences in Africa | 1968 | Addis Ababa, Ethiopia |
| (7) | Association of Africa Trade Promotion Organization | 1975 | Tangiers, Morocco |
| (8) | Cattle and Meat Economic Community of the Council of the Entente States (CEBV) | 1970 | Ouagadougou, Upper Volta |
| (9) | Comite Maghrebin des Agrumes et des Primeurs (COMAP) | 1972 | Casablanca, Morocco |
| (10) | Desert Locust Control Organization for East Africa (DLCOEA) | 1962 | Addis Ababa, Ethiopia |
| (11) | Inter-African Coffee Organization (IACO) | 1960 | Paris, France |
| (12) | Orgnization Commune de Lutte Antiacridienne et de Lutte Antiaviacire (OCLALAV) | 1965 | Dakar, Senegal |
| (13) | Organization International Contre le Criquet Migrateur African (OICMA) | 1962 | Bamako, Mali |

- | | | |
|---|------|-------------------------|
| (14) Scientific, Technical and
Research Commission
of the OAU (STRC) | 1965 | Lagos, Nigeria |
| (15) West African Rice Development
Association for Africa | 1971 | Bouake
Cote d'Ivoire |
| (16) Joint FAO/WHO/OAU Regional
Food and Nutrition
Commission for Africa | 1963 | Accra, Ghana |
| (17) Inter-African Bureau for
Animal Resources (IBAR) | 1951 | Nairboi,
Kenya |
| (18) International Red Locust
Control Organization for
Central and Southern
Africa | 1971 | Mbala,
Zambia |
| (19) African Commission on
Agricultural Statistics | 1961 | Accra, Ghana |

C. Fisheries Development

- | | | |
|--|------|------------------|
| (1) Committee for Inland
Fisheries of Africa | 1971 | Rome, Italy |
| (2) East African Fresh Water
Fisheries Research
Organization | 1967 | Arusha, Tanzania |
| (3) East African Marine
Fisheries Organization | 1967 | Arusha, Tanzania |

D. Forestry Wood and Wood Product Development

- | | | |
|--|------|----------------------|
| (1) African Forestry Commission | 1959 | Accra, Ghana |
| (2) African Timber Organization
(ATO) | 1975 | Libreville,
Gabon |

IV. Investment and Financial Organization

(1)	African Development Bank (ADB)	1963	Abidjan, Cote d'Ivoire
(2)	African Regional Agricultural Credit Association (AFRACA)	1977	Accra, Ghana
(3)	Arab Bank for Economic Development in Africa (ABEDA)	1973	Khartoum, Sudan
(4)	Association of African Development Finance Institutions	1975	
(5)	African Agricultural Credit Commission	1966	Rabat, Morocco

ANNEX II

Programme of the Symposium

PROGRAMME

(Coffee break from 10 to 16 h, Lunch from 12 to 15 h)

Saturday 26, Sunday 27 August

Ambassador Hotel

Registration of participants

Monday 28 August

Kwame Nkrumah Conference Centre

09:00 Official opening

10:00 Introduction of the Symposium theme
Dunstan Spencer, Steering Committee Chairman
Jacques Faye, Coordinator

15:00 Keynote addresses :

- FSR Approach in West Africa - Trend or Need
Prof. Bede Okigbo
- Sustainable Agricultural and Food Production : Role Played
by Agricultural Research and African Organizations
Dr. Georges Abalu
- SPAAR and Collaborative Research in West Africa
Dr. Moctar Touré
- Farmers Organizations and Agricultural Research
Representative of a professional organization

18:00 End of session

Tuesday 29, Wednesday 30 August

Ambassador Hotel, K.N. Conference
Centre

Group I
Forest zone

Group II
Sudanian zone

Group III
Sahel zone

Group IV
Irrigated or
inland valleys
zone

Dr. H. Mutsaers
Dr. Lyonga

Dr. P. Kleene
Dr. J. Olukosi

Dr. Ch. Renard

Dr. D. Spencer
Dr. Ph. Jouve

09:00 Presentation and discussion of papers
Identification and discussion on themes of collaborative research

15:00 Group proceedings followed

18:00 End of session

Thursday 31 August

K.N. Conference Centre

09:00 Presentation and discussion of the group proceedings

15:00 Presentation and discussion of the group proceedings followed

17:00 Closing ceremony

18:00 End of session

Friday 1 sept.

Ambassador Hotel

08:00 Network General Assembly

15:00 Steering Committee meeting

ANNEX III

LIST OF PARTICIPANTS AT THE
SYMPOSIUM

Symposium RESPAO
28 août - 1 septembre 1989
Accra, Ghana

FICHER PARTICIPANTS/LIST OF PARTICIPANTS

Groupe I : Zone forestière ou humide

Animateurs : - Dr. Hendrik Mutsaers, IITA, Nigeria
- Dr. Simon Ngale Lyonga, CU Dschang, Cameroun

Nom, prénom,	Adresse	Nom, prénom,	Adresse
Addison Emmanuel	CRI P.M.Box 3785 Kumasi Ghana	Asiedu Ernest	CRI P.O. Box 3785 Kumasi Ghana
Afun Jakpasu Kofi	Ghana Grain Dev. Project CRI P.O. Box 3785 Kumasi Ghana	Atuanene A.G.	CRI P.O. Box 3785 Kumasi Ghana
Alay Susan	TLU/NCRE IRA-Ekona PMB 25 Buea SWP Cameroun	Bahiru Duguma	IRA/ICRAF project P.O.B. 2057 Hessa Yaoundé Cameroun
Amezah A.	Volta Reg. Agric. Dev Project P.O. Box 165 HO Ghana	Baker Doyle	NCRE/IRA Project B.P. 2057 Yaoundé Cameroun
Arias Roberto	CIMMY P.O.Box 1693 Accra Ghana	Besong Manfred	IRA Ekona PMB 25 Buea Cameroun
Asafu-Agyei John	Ghana Grains Dev. Project CRI P.O. Box 3785 Kumasi Ghana	Dapaah Kwame Harrison	CRI P.O. Box 3785 Kumasi Ghana
Asante-Kwatia D.C.	Faculty of Agr. U.S.T. Kumasi Ghana	Daramola A.H.	Institute of Agric. Research and Training Obafemi Awolowo University PHD 5029 Ibadan Nigeria
		Duah-Yentumi Stephen	Dept of Soil Science University of Ghana P.O. Box 245 Legon - Accra Ghana
		Eponou Thomas	CIRDES Université d'Abidjan 08 B.P. 1295 Abidjan 08 Côte d'Ivoire

Nom, prénom,	Adresse	Nom, prénom,	Adresse
Eremie S.W.	World Bank Resident Mission P.O. Box 127 Lagos Nigeria	Mutsaers Hendrik J.W.	IITA Oyo Road P.M. 5320 Ibadan Nigeria
Ezumah H.C	IITA Oyo Road PMB 5320 Ibadan Nigeria	Ndabalishye Ildefonse	DCV/IDESSA B.P. 635 Bouaké Côte d'Ivoire
Fillonneau Claude	ORSTOM B.P. 5045 34032 Montpellier Cedex France	Nounamo Laurent	IRA - Nkolbisson B.P. 2067 Messa Yaoundé Cameroun
Haizel K.A.	School of Agriculture Univ. of Cape Coast Ghana	Obouayeba Samuel	IRCA/CIRAD Bimbresso 01 B.P. 1536 Abidjan 01 Côte d'Ivoire
Kaindaneh M. Peter	IAR Njala Univ. College PMB 540 Freetown Sierra Leone	Ohemeng-Dappah, Seth	CRI P.O. Box 3785 Kumasi Ghana
Korang-Awoakoh S.	Min. of Agriculture P.O. box M 37 Accra Ghana	Okoli Obinani O.	Crops Res. Institute P.O. Box 3785 Kumasi Ghana
Koudokpon Valentin	DRA B.P. 884 Cotonou Bénin	Onu Donatus Orji	Iwo State University College of Agr. and Vet. Medicine PMB 2000 Okigwe Nigeria
Lahai Mohamed	FSR Project c/o IAR PMB 540 Freetown Sierra Leone	Osafo Daniel M.	Dept. of Crop Science U.S.T. Kumasi Ghana
McKellar Martin A.	Douala, USAID Dept. of State Washington, D.C. 20523 USA	Osseni Bouraïaa	IRFA 01 B.P. 1740 Abidjan 01 Côte d'Ivoire
Mulbah Charles K.	CARI P.O. Box 10-3929 1000 Monrovia Liberia		

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FICHER PARTICIPANTS

Groupe II : Zone soudanienne

Animateurs : - Dr. Paul Kleene, DSA/CIRAD, France
- Dr. James Olukosi, FSR/IAR, Zaria, Nigeria

Nom, prénom,	Adresse	Nom, prénom,	Adresse
Abalu O.I. Georges	ECA/FAO UNECA Addis Ababa Ethiopia	Gilbert Elon	GARD Project Dept. of Agriculture Banjul The Gambia
Adjahossou Firmin	Faculté des Sciences Agronomiques/UNB B.P. 526 Cotonou Bénin	Goïta Mamadou	Chef DRSPR B.P. 9030 Bamako Mali
Attengdem Pascal Baylon	Fac. of Agricul. Univ. of Ghana Legon Ghana	Guillonneau Anne	IRAT/CIRAD B.P. 5035 34032 Montpellier Cedex France
Ayebou Abakan	DRA/DRSTOM B.P. 2318 Lomé - Togo	Gumah S.A.	Farmer Upper East Region Ghana
Banta Gordon	CRDI B.P. 11007 CD Annexe Dakar Sénégal	Kamuanga Mulumba	IITA/USAID/NCRE B.P. 305 Maroua Cameroon
Bouaré Seydou	PIRT/INRZFH B.P.2357 Bamako Mali	Kipo Timothy	CRI P.O. Box 52 Tamale Ghana
Doumbia Sékou	IDESSA-DCV B.P. 635 Bouaké Côte d'Ivoire	Kleene Paul	DSA/CIRAD B.P. 5035 34032 Montpellier France
Eleme K.A.	IAR/ABU PMB 1044 Samaru Zaria Nigeria	Koli Stephen	CSIR P.O. Box M 32 Accra Ghana
Foalong J.Y.	SROP/IFAD Ghana P.O. Box 801 Tamale Ghana	Kouma Kossi	DRA B.P. 2318 Lomé - Togo
		Martin Zacharie	DRA B.P. 804 Cotonou Bénin
		Miranda Isabel	C.P. 71 DEPA Bissau Guinée Bissau

Nom, prénom,	Adresse
Owusu-Akuaw M.	Ghana Grain dev. Project CRI P.O. box 3785 Kumasi Ghana
Poats Susan	108, NW 26th Str. Gainesville FL 32 607 378.5575 USA
Poubom Fri Christine	IRA PMB 25 Buea Yaoundé SWP Cameroun
Samatana Marc	IRA/Bambui P.O. Box 80 Bamenda Cameroun
Tegua Alexis	IRA B.P. 2123 Yaoundé Cameroun
Tarawali G.	ILCA PMB 2248 Kaduna Nigeria
Tonye Jean	IRA B.P. 2067 Yaoundé Cameroun
Tsra-Kasu R.J.	Volta Region Agric. Dev. Project P.O. Box 18 Kpeve Ghana
Unamma Ray	NRCRI Umudike PMB 7006 Umuhia Iao State Nigeria
Vernier Philippe	DCV/IDESSA B.P. 635 Bouaké Côte d'Ivoire

Nom, prénom,	Adresse
Versteeg Mark N.	IITA/Bénin B.P. 06-2523 Cotonou Bénin
Woldetatos Tsegazeab	IAR/NCRE Ekona PMB 25 Buea SUP Cameroun

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FICHER PARTICIPANTS

Groupe III : Zone sahélienne

Animateur : Dr. Andre Bationo, ICRISAT, Niger

Nom, prénom,	Adresse	Nom, prénom,	Adresse
Bationo André	FDC/ICRISAT B.P. 12404 Niamey Niger	Serpantié Georges	ORSTOM 2051, Av. du Val de Montferrand B.P. 5045 34032 Montpellier France
Coulibaly Boubacar	DRSPR B.P. 9030 Bamako Mali	Sirifi Seyni	INRAN/CNRA Tarna B.P. 240 Maradi Niger
Faye Jacques	Coordonnateur RESPAD s/c SAFGRAD B.P. 1783 Ouagadougou	Sorgho Marie-Claire	INERA B.P. 7192 Ouagadougou Burkina Faso
Gaye Matar	ISRA B.P. 199 Kaolack Sénégal	Sumberg James E.	Care International B.P. 10155 Niamey Niger
Ibro Germaine de Souza	INRAN B.P. 429 Niamey Niger	Tézenas du Montcel Laurent	ORSTOM B.P. 182 Ouagadougou Burkina Faso
Kaboré P. Daniel	INERA 03 B.P. 7192 Ouagadougou 03 B.F.	Zoundi S. Jean	INERA 03 B.P. 7192 Ouagadougou 03 B.Faso
Kadi Maliki	INRAN B.P. 429 Niamey Niger		
Khibe Torade	INRZFH Sotuba B.P. 1704 Mali		

Nom, prénom,	Adresse	Nom, prénom,	Adresse
Ndiamé Fadel	ISRA/Djibélor B.P. 34 Ziguinchor Sénégal	Sanogo Zana Jean Luc	DRSPR B.P. 186 Sikasso Mali
Ndiaye Madina	IRAG B.P. 1003 Conakry Guinée	Senghore Tom	Dept of Agric. Research Yundum Research Station Banjul The Gambia
Nkwain Sama Joseph	CUDS B.P. 110 Dschang Cameroun	Tegua Alexis	University Centre of Dschang P.O. Box 222 Dschang Cameroun
Olukosi James	FSR/IAR ABU PMB 1044 Zaria Nigeria	Tetio-Kagho Fidèle	University Centre of Dschang P.O. Box 222 Dschang Cameroun
Dwusu-Bennoah Emmanuel	Dept of Soil Science University of Ghana P.O. Box 245 Legon Accra Ghana		
Roesch Marc	CIRAD B.P. 5035 34032 Montpellier Cedex France		
Samatana Marc	IRA/Bambui P.O. Box 80 Bamenda Cameroun		
Saku-Dawson	Dept. of Agr. Extension Fac. of Agriculture Legon Accra Ghana		
Sorgho Marie-Claire	INERA B.P. 7192 Ouagadougou Burkina Faso		

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FICHER PARTICIPANTS

Groupe IV : Zones de culture irriguée et bas-fonds

Animateurs : - Dr. Dunstan Spencer, IITA, Nigeria
- Dr. Philippe Jouve, DSA/CIRAD, France

Nom, prénom,	Adresse	Nom, prénom,	Adresse
Carsky Robert James	IITA Oyo Road PMB 5320 Ibadan Nigeria	Massaquoi William K.	Suakoko, Bong County/ CARI P.O. Box 10-3929 1000 Monrovia Libéria
Gilbert Elon	DAR/GARD Project P.O. Box 19 Banjul The Gambia	Mulbah Charles K.	Central Agric. Research Ins. P.O. Box 10-3929 1000 Monrovia 10 Liberia
Gomes Simao	MDRA/DEPA C.P. 71 CENEHAC Contuboel Guinee Bissau	Nyanteng Victor Kwame	ADRAD 01 B.P. 2551 Bouaké Côte d'Ivoire
Jouve Philippe	DSA/CIRAD B.P. 5035 34032 Montpellier France	Obeng Letitia	? Ghana
Le Gal Pierre-Yves	DSA/CIRAD ISRA B.P. 186 St. Louis Sénégal	Roland Nuhu Issaka	Soil Research Institute Academy Post Office Kwadaso Kumasi Ghana
Legoupil Jean-Claude	IIMI B.P. 5383 Ouagadougou Burkina Faso	Sarr Papa Léopold	ISRA B.P. 3120 Dakar Hann Sénégal
Marlet Serge	INRAN/IRAT-CIRAD B.P. 429 Niamey Niger	Spencer Dunstan	IITA Oyo Road PMB 5320 Ibadan Nigeria
Masajo T.M.	IITA Oyo Road PMB 5320 Ibadan Nigeria	Tourrand J. François	IEMVT/CIRAD ISRA/Sénégal B.P. 292 Saint-Louis Sénégal
		Ukatsuki Toshiyuki	Faculty of Agriculture Shioane Univ. 1060 Nishikawatsu-cho Matsue 690 Japon