A STRATEGY FOR USAID SUPPORT TO AGRICULTURAL RESEARCH IN KENYA

CONSULTANT REPORT

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Preface

Preparation of this report has been an interesting assignment. We owe much to many people. Our first debt is to David Lundberg, Agriculture Officer, USAID/Kenya, who entrusted us to an assignment of such significance. There is little doubt that technology innovation in Kenya's major economic sector is a vital issue in the nation's future. The position taken by USAID/Kenya, in turn will be critical to the handling of technology innovation in agriculture.

We are especially indebted to Curtis Nissly, not only for the excellent manner in which he handled logistics and other essential matters but also for his substantive contribution to our thinking and this report.

We are impressed by our respondents, Kenyans and expatriates. They took the problem seriously and treated us with the utmost kindness and considerations. They shared insights and experiences with us that proved very helpful. We express our gratitudes as well as our respect for their accomplishments under sometimes trying conditions.

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Summary

This paper suggests a strategy for USAID based on a project with some specific characteristics.

The project itself would have two major thrusts. One would aim at a long-range effort to build an authentic basic core capacity in the Kenya research organization, whatever form it eventually takes. It would consist of council to help develop basic management systems, training of personnel and assistance in development of linkages with farmers, extension, and universities and others who provide inputs to the Kenya research entity. Kenya itself has adopted the Farming Systems Research (FSR) approach in research, although under a different name, and has already taken steps to link with extension through specialists associated with the Training and Visit (T&V) system of extension FSR is also an effective means of linking with the farmer. The USAID project objective would be to increase the probability of institutionalizing these linkages with farmers and extension. Linkages with entities supplying inputs would be through contract research.

The second project thrust would be substantive efforts to further specific programs in maize, sorghum, soil and water management, and livestock in mixed farming. Without the capacity building component, Kenya contribution to these substantive efforts will not be great. Kenya has just about exhausted its capacity to match donor efforts to any substantial extent.

The strategy suggested here also includes extra-project efforts designed to improve the project environment. These would have to involve personnel of levels higher than project personnel in both USAID and Kenyan government. Project environment improvement would include such things as seeking decisions on research organization in the Kenya government and other donor cooperation on protecting the basic core capacity as it develops. Thus, improvement of the project environment may very well entail multilateral collaboration.

Style of operation may well be almost as important as substance. Caution against heavy reliance on so-called leverage is expressed. The style most fitting would emphasize patience, empathy and persistence. It would stress collaboration with Kenyan officers in the identification of problems and the development of solutions.

The above outlined strategy considerations were based on what appeared to be two basic problems. One is that set of problems that followed as Kenyans took over a complex economy previously managed by the British. They assumed management responsibilities without "top management" experience, and did that less than a generation ago. Not only did they assume the responsibilities, they had to deal with other dynamics. One was the replacement, impact at least, of European ways with African ways. The other dynamic has been the rapid transformation of the nation's agricultural sector from a large-scale to a small-scale agriculture.

A second basic problem has been the practice of donors to put heavy pressure on fragile and immediate Kenyan institutions with much less attention to strengthening those institutions and helping them mature.

Kenya has a respectable research tradition, due in large part to be sure to colonial influence and donor support, but some also that appears to be genuinely Kenya. Kenya coffee and tea research is reported to be good. ICIPE is largely a Kenya-led institution. The Kenya Seed Company also appears to do respectable research.

The analysis for Kenya is based on studies of returns to research investments in other countries and on three conceptual models. The studies show that potential returns to research are great, which poses the problem of how to organize and manage it so that the returns are realized. The models suggest the strategies presented here.

No claim is made that building an authentic basic research capacity in Kenya will be done quickly or easily. All evidence is that the task is feasible if it is approached with empathy for the Kenyans, who must accomplish the task, and if it is executed with persistence, which is often the better part of genius.

A Strategy for USAID Support for Agricultural Research in Kenya

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A STRATEGY FOR USAID SUPPORT FOR AGRICULTURAL RESEARCH IN KENYA

I. INTRODUCTION

USAID assistance to the agricultural sector in Kenya has been extensive and varied. It is now timely to plan future USAID strategy, based on the premise that food production and family planning are the keys to prosperity and stability in Kenya.

Increase in agricultural production will depend on maintenance and improvement in at least the following areas.

1. Agricultural Research
2. Manpower Development
3. Agricultural Planning and Policy Analysis
4. Natural Resources Utilization and Conservation
5. Agribusiness Development

Within this setting, the authors have been asked to identify the need for agricultural research in Kenya, and to suggest a strategy to insure that investments in research produce the desired impact on food production.

A. Purpose

The purpose of this paper is to identify the need for agricultural research in Kenya, to identify opportunities for USAID/Nairobi to support such research, to develop strategies for such support, to suggest the potential of this research to increase food production, and to relate the proposed research to other components of the sector essential to effective utilization of research.

B. Background

Agriculture in Kenya produces one-third of GDP, employs 2/3 of the labor force, and accounts for 70 percent of non-petroleum exports. Current population growth of 4% exceeds growth in agricultural productivity, estimated at less than 2%, and will cause a tripling of population in the course of one generation.

Agricultural production in Kenya is increasingly dependent on small holders. Although agricultural research is supported at the level of 1% of agricultural product, the focus of this research has been slow to shift to the problems of smallholders. Many smallholder problems are of recent origin,

since many of these farmers have not had long tenure on their lands. The most productive lands are densely populated and intensively farmed. Rapid population growth has increased pressure for expanded food production, resulting in need to both increase production in high potential areas and to bring less-productive areas into cultivation. The low-potential areas are largely semi-arid or arid, and include 80% of Kenya's land area while supporting only 20% of the population. Native vegetation and crop production are limited by water availability. Many smallholders are farming in unfamiliar areas of limited rainfall, and are therefore facing problems for which no traditional solutions exist, much less solutions based on results of current research.

It is not possible to add to the area of highly productive land under cultivation, nor to create new resources of highly productive land through massive irrigation schemes, because neither adequate water resources nor the capital resources are available to support such schemes.

USAID, the World Bank, FAO, and others have supported numerous agricultural development projects in Kenya. Legacies now include effective control measures for several important animal diseases, wheat varieties and corn hybrids which are reasonably productive in high potential areas, and various technological achievements (such as short-season pigeon peas; improved range management concepts; improved livestock) with potential utility to drylands areas. None of the results of recent research have found extensive use in smallholder practice.

Kenyan institutions which have benefitted from donor projects include 15 national agricultural research stations, Egerton College, and the Faculty of Agriculture of the University of Nairobi. USAID assistance to Egerton College has been instrumental in bringing this institution to its present capacity for 1650 students who may receive diplomas from any one of 16 3-year programmes.

Several U.S. Universities, USDA, and a number of private contractors have participated in USAID projects in Kenya, including West Virginia University, University of California, Davis, Virginia State University, Mississippi State University, and Winrock International. This participation has created a cadre of agricultural professionals in addition to USAID staff who are acquainted with problems and opportunities in the Kenyan agricultural sector.

Despite the resources allocated to solution of problems which constrain agricultural production, numerous gaps occur in agricultural technology. Basic grain crops with production systems matched to semi-arid conditions are missing. Grain legumes and/or oilseeds adapted to niches in the various agroclimates are not common. Suitable water and soil conservation practices are uncommon, and improved utilization of rangelands is not practiced.

Additional needs for improvements in export crops and horticultural crops have not been met.

Most troublesome of all, there is neither an effective research program in place focused on problems of smallholders, nor an effective means to relate research findings through new technology to the needs and practices of smallholder farmers. A corollary seems also to be true - the agricultural research community is poorly informed and sensitized to the constraints experienced by smallholders in their efforts to produce food.

II. ROLE OF RESEARCH IN AGRICULTURAL DEVELOPMENT

Results of agricultural research increase productivity by increasing output from fixed levels of input; reducing inputs required to attain fixed levels of production; by reducing the uncertainity (risk) of production; or by improving product quality (and thus value) without equivalent increase in production costs.

Satisfactory returns to investments in research cannot be expected unless subjects for research are chosen with care; unless the research is well managed; and unless there are effective procedures to incorporate results into agricultural practice. In addition, incentives must exist which encourage farmers to increase production; especially incentives of profit and risk reduction.

A. Returns to Research

Evidence of returns to investment in agricultural research were summarized at the Arlie House Conference sponsored by the Agricultural Development Council, AID and the World Bank in 1975. Data from published Conference reports have been summarized into categories of less-developed countries (LDCs), U.S., and other developed country (DCs) experience in Tables 1 and 2. These studies, based mostly on data from 1943 onward, suggest annual returns to investment in agricultural research of the order of 50% in LDCs, compared with 35% in the U.S. and 46% in DCs. These returns compare favorably with those from any other investment in agriculture.

Table 1: Cost-Benefit Returns to Agricultural Research in the U.S. [1]

Country	Commodity	Time Period	Annual Internal Rate of Return %
USA	Hybrid Corn	1940-55	35-40
USA	Hybrid Sorghum	1940-57	20
USA	Poultry	1915-60	21-25
USA	Tomato Harvester	1958-69	37-46[2]
			16-28[3]
USA	Aggregate	1937-42	50
		1947-52	51
		1957-62	49
		1967-72	34
USA	Grand mean values, USA		35-38

1 From Table 1-1 V. Arndt and Ruttan in Resource Allocation and Productivity in National and International Agricultural Research, ed. by Arndt, Dalrymple and Ruttan. University of Minnesota, Press, 1977. p. 5

2 No adjustment to compensate displaced labor.

3 Adjusted to compensate displaced labor.

Table 2: Cost-Benefit Returns to Agricultural Research in Less-Developed and Developed Countries [1]

Country	Commodity	Time Period	Annual Internal Rate of Return %
Mexico	Wheat	1943-63	90
Mexico	Maize	1943-63	35
Brazil	Cotton	1924-67	77
Peru	Maize	1954-67	
	(genotype improvement only)		35-40
	(genotype plus cultivation)		50-55
Colombia	Rice	1957-72	60-82
Columbia	Sorghum	1960-71	79-96
Colombia	Wheat	1953-73	11-12
Colombia	Cotton	1953-72	0
	Grand mean values, LDCs		49-54
S. Africa	Sugarcane	1945-62	40
Japan	Rice	1915-50	25-27
Japan	Rice	1930-61	73-75
	Grand mean values, DCs		49-54

From Table 1: 1. Arndt and Ruttan in Resource Allocation and Productivity in National and International Agricultural Research, edited by Arndt, Dalrymple and Ruttan. Univ. of Minnesota Press, 1977.

Data from Colombia summarized in Table 3 show that improved rice varieties increased yield from 3151 kg/ha (standard Bluebonnet 50 variety) to 4573 kg/ha (average of Tapuripa, ICA10, and IR-8 improved varieties) when the same years are compared - an increase of 45 percent. The Colombian experience - from initiation of rice research in 1957 to completion of 4 or 5 year's extensive trials on the varieties cited - spanned 14 years. By this time, the three improved varieties occupied 41 percent of Colombian rice acreage.

Data[2] for wheat from Colombia during a similar 20-year period (1953-73) indicate that 13 improved varieties developed in the Colombian wheat research program out yielded the two standard varieties by 2117 kg/ha to 1409 kg/ha, or 50 percent.

Similar data[3] for results of the soybean variety research program in Colombia reveal that yields of 3 improved varieties observed for 5 years exceeded yield of the standard variety by 2520 kg/ha to 1946 kg/ha or 29 percent.

Table 3. Increases in yield due to improved rice varieties in Colombia.[1]

	Varieties			
		Improved		
Year	Standard Bluebonnet 50	Tapuripa	ICA-10	IR-8
1967	2893	2690	4707	6098
1968	3208	4600	4789	5890
1970	3339	4500	3852	5180
1971	3164	3610	4234	4748
4-year mean	3151	3844	4396	5479
4-year grand mean, improved varieties			4573	

1 Ardila, Jarge. 1973. Rentabilidad Social de Las Innersiones en Unertigacion de Arrog en Colombia. M.S. Thesis, Bogota, ICA/National University, Graduate School. Tables 5 and 11.

Analyses by economists utilizing sophisticated, abstract procedures confirm the conclusion suggested by the examples given; that is, that the application of technology derived from research has contributed substantially to increased food production.

B. Need for Indigenous Capacity

Research by Robert Evenson shows that international "transfer of benefits based on knowledge diffusion depends heavily on the capacity of indigenous research. The country without an indigenous research capability benefits very little from its neighbor ....". See Chapter 9, "Comparative Evidence on Returns to Investment in National and International Research Institutions," page 237-264, in the Arndt & Ruttan work cited above. Evenson presents a quantitive analysis on page 250 that shows marginal benefits streams associated with a national investment of $1,000 varies from $1,700 to $55,000, depending on the degree of national capacity.

2 Trujillo, Carlos. 1974. Reudimiento economico de la unnvertigacion entrigo. M.S. Thesis, Bogota, ICA/National University Graduate School, 1974. Table 5.7.

3 Montes, Gabriel. 1973. Evaluacion de una programa de investigacion agricola: El caso de la soya. M.S. thesis, Bogota University of the Andes - Table 3.

Technology innovation combines adaptive research with agricultural practice, and thus provides the linkage between science and the farmer. It is specific to local areas of climate, soils, crop and animal husbandry, social usage - in substance, to the farming system. It merges with technology transfer (see Section III), and is therefore local in nature. It cannot be performed elsewhere, and must be performed by Kenyans working in Kenyan organizations.

It is important for Kenya to sustain an agricultural research capability which will enable the country to maintain access to science and technology generated elsewhere in the world. There are numerous sources of such information, which are of vital importance to technology innovation and adaptive research.

Applied science in agriculture has been the province of the U.S. land grant universities and the U.S. Department of Agriculture for decades. The IARCs have focused on applications relevant to the developing world more recently. The well known mandates assumed by IRRI, CIMMYT, ICRISAT, IITA, ILCA, ILRAD, ICIPE, and others include initiatives of great interest and importance to Kenya. These include variety improvement of maize, wheat, sorghum, millet, and grain legumes; animal improvement and disease control; and research on farming systems. IARCs are increasingly involved in site specific adaptive research, although their record in assisting

to build national capacity to assume this role is modest. CRSPs are able to link applied science from Title XII institutions and IARCs to national programs, and can both assist in training and developing institutional linkages.

The scientific research which generates new knowledge, and the applied science which relates basic knowledge to processes which can be manipulated to the advantage of agriculture, are both activities which are largely independent of local conditions. These components of research typically require large investments in facilities and equipment, depend for their success on highly trained scientists supported by large technical staffs, and tend to be long-range in nature and therefore not readily identifiable with solutions to pressing problems.

It is not necessary for Kenya to sustain basic scientific research in many areas of agriculture or biology, except where some unique and important problem in Kenya requires such information and it is unavailable from other sources. Certain animal health problems unique to East Africa may present such needs, and are being met by the "Nairobi Cluster" of animal health organizations located in Kenya. Similarly, plant/soil moisture relationships may require special scientific or applied science research. This need has not been identified, and no systematic initiative for it exists in the country at the present time.

At some point it may be feasible for Kenya to develop capacity for high standard applied science in one or more areas of research. This capacity will sustain world-class scientists in Kenya. Also, it will sustain the capability to solve problems of special importance to Kenya, but which may not have sufficient general importance to warrant research by non-Kenyan agencies. Third, it will create the basis for training and employing Kenyans in scientific disciplines, which will encourage and enable them to maintain linkages and dialogues with peers throughout the world - thus insuring Kenya access to the worldwide network of agricultural science on a personal and highly effective basis.

C. Achievement of Research Potential

The potential for pay off to research investment is beyond question. The issue is organization and management to realize that potential.

1. Research Demand. The research agency (MOA&LD) charged with responsibility for agricultural research in Kenya is young (21 years), is making a significant shift in focus from problems of commercial farming to those of smallholders, and is staffed to a large extent by persons with short experience in their assigned tasks, and in many cases with minimum levels of training for research.

Nevertheless, up to 103 needs for research have been ranked by MOA&LD. A total of 155 research projects (including 95 donor-financed projects) and 31 or more separate experiment stations now exist within MOA&LD, exclusive of projects in Veterinary Medicine. Donor projects typically are funded and administered separately from MOA&LD projects. This proliferation has overwhelmed the national organizational and management capacity for agricultural research.

To further complicate this issue, the newly-adopted Training and Visit (T&V) extension program is creating a regular and pressing demand for participation by research staff as well as for new technology for extension. This demand will soon consume the inventory of existing improved technology and researchers will be faced with generating, testing, and adapting new technology.

2. Kenyan Research Resources Limitations. While national resources allocated for support of agricultural research are estimated to equal 1% of agricultural product, it is not clear that they are distributed in response to real needs. Personnel, funds, and facilities have been stretched thin by a variety of forces.

Donor projects are often not integrated into a national plan for agricultural research even though they support improved production. This has meant that Kenyan resources of scarce administrative and technical personnel and operating funds are not effectively allocated.

The challenge to MOA&LD is to organize and manage an agriculture research establishment which can deal with a range of climates and topography and a diversity of crops and animals so that the potential value of research can be realized. The challenge to USAID/Kenya is to develop a strategy which will assist MOA&LD to accomplish its research mission.

III. CONCEPTUAL MODELS

The purpose of this section is to present conceptualizations of phenomena we face in the task of dealing with USAID/Kenya's objective of supporting and strengthening Kenya's research system. Many things happen in this process that we cannot see or perceive. Thus, we must deal with concepts.

These conceptualizations have proven useful in dealing with similar problems in other situations. They are presented here to facilitate communication. No matter what their inherent worth, they serve (1) to help understand some of the content in later sections of this report and (2) as a medium of communication for discussions of the report.

Three models are presented:

A. The general model of the technology innovation process.
B. A research organization to take advantage of the international technology innovation network.
C. A simple model of research management.

A. Technology Innovation Process

The Technology innovation process is presented graphically in Figure 1. This presentation is greatly overly simplified. It is meant to help understand what needs to happen and to a large extent does happen. It is set forth in a simple sequential or chronological order to facilitate understanding. In practice, several of the functions will be going on at the same time, and there always must be feedback and loops in the process. A single activity may be accomplishing several functions of the process at the same time. It would be a serious mistake to try to separate the functions in practice. In spite of those limitations the model can be helpful in understanding the total technology innovation process. Such an understanding is vital to managing the process, and is particularly useful in dealing with two or more autonomous or independent organizations who share responsibility in implementing the process. While the organizations are separate and independent the process is a single process. An understanding of the single process can be helpful to the organizations in maintaining the integrity of that single process.

There are eight components of the technology innovation process.

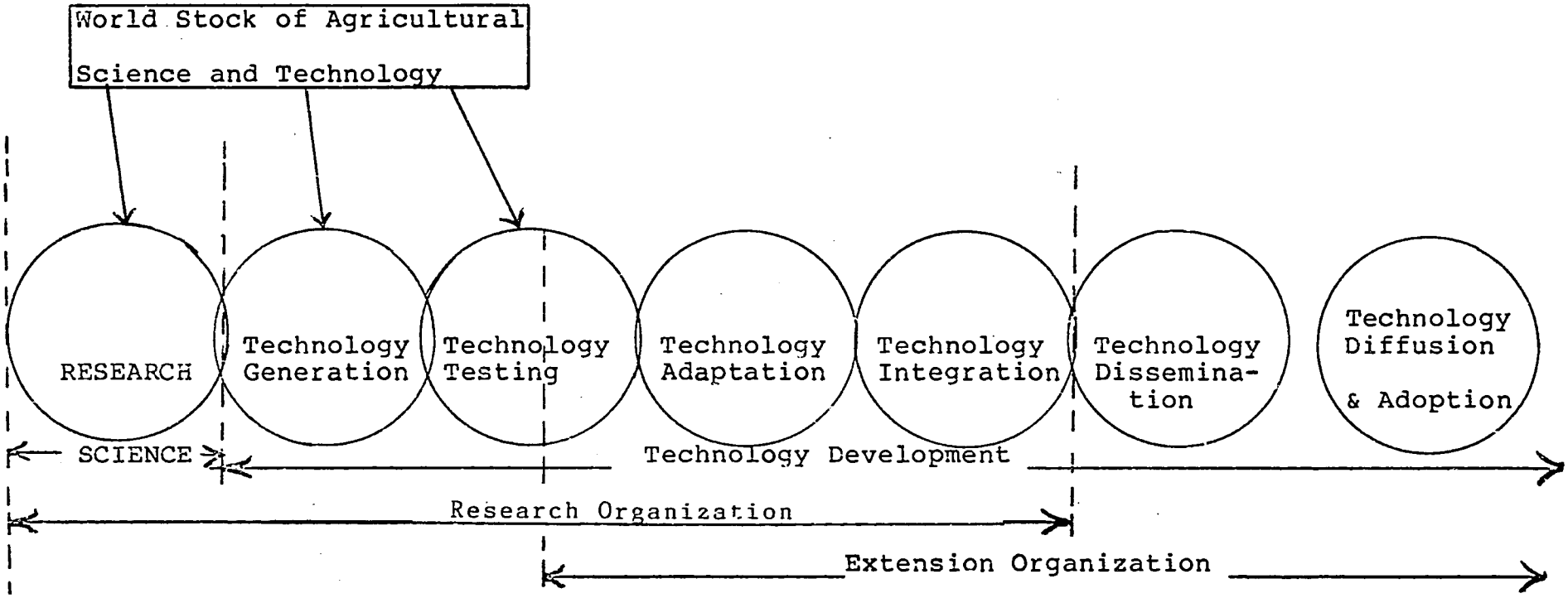


Figure 1. The Technology Innovation Process

1. First component is the WORLD STOCK OF AGRICULTURAL KNOWLEDGE. Throughout history nations and cultures have taken advantage of technology from other nations and cultures. War and trade were two principal means of effecting this.

Today there are organizations established for the specific purpose of generating knowledge for this stock and facilitating its transfers.

2. A second component is scientific research, called research in this model and equated with science. The distinction between science and technology is fundamental. Science is analytical. Science is a major source of new knowledge. Scientific research controls all variables except that one for which new knowledge is sought. Science abstracts from reality. Knowledge per se is of no value until it is put in a form in which it can be used.

Technology on the other hand, is a synthesis. It puts elements together into a product which can be used to perform a useful function in natural environments with not much control. Farmers do not use science. They use technology.

Science can produce information on rainfall patterns, soil characteristics, and water and nutrient requirements of crops. None of this is of any use to the farmer until synthesized into a technology or set of technologies that enable him to operate his farm better than he is now doing. Thus, it is useful to make a distinction between science and technology and between the functions of research and technology development. Because the distinction has not traditionally been made in agriculture, the word "research" is used in this paper to refer to technology development as well as research per se.

3. Technology generation is the first component of technology development. It consists of synthesizing various elements, either from science or practice, to produce an improved technology. This is a creative or innovative function. It can result in a commodity, such as seed. Plant breeding is perhaps the most common form of technology generation. Plant breeders combine genes that carry high yield potential, disease resistance, drought and cold tolerance, and grain quality into a single seed. The technology is embodied in the seed.

There are other technologies, including social and economic technologies. The plow was a technological innovation; so is the agricultural cooperative; an agricultural policy is a technology. Management is a mixture of technologies.

4. The fourth component is TECHNOLOGY TESTING. Technology generation is most effectively done under somewhat controlled conditions, such as laboratories or experimental stations. Its only relevant test, however, is in the production or farming systems or environment in which it is expected to function. Not only must it be tested IN the system for which it is designed, it must also be tested BY criteria of that system. Thus on-farm tests must be accomplished before the research function is complete.

5. TECHNOLOGY ADAPTATION is the next function in the technology innovation process. Technology generated for and tested in certain systems can often be adapted or modified slightly to fit into other systems and environments that are similar. Adaptation increases the scope of an innovation and is important in achieving efficiency in research and extension performance. It can take place between neighboring farms or from continent to continent, depending on the degree of similarity between systems in which the technology is to function.

6. TECHNOLOGY INTEGRATION has several dimensions. One integration is into the current farming systems. Some innovations can be adopted with no change in the system. One variety can be substituted for another, and no other change is needed. Sometimes the other changes are so complex that the farmers cannot accomodate them or can do so slowly. In other cases the innovations are so effective, farmers are motivated to make other changes in their production system. In still other cases, the innovation requires little change in the system, but permits other highly effective changes in the system.

Another dimension of integration is the input or factor market. A new variety can only be adopted if seed is available. Some innovations require different fertilizer formulas.

The product market is another dimension of integration. Some innovations can only be adopted as market developes.

National policies and programs to accomodate or exploit an innovation are yet other forms of integration.

(Note: The functions of testing and adaptation as well as integration into production systems are the conceptual bases for the so-called Farming Systems Research. Technology innovation means innovation that occurs in production systems. Investment in technology innovation (research and extension) pays off only when farming is improved by the innovations the organizations generate and disseminate.)

7. TECHNOLOGY DISSEMINATION is the seventh component of the technology innovation process. Disseminate means literally to seed i.e. "implant" the new technology in place on various farms throughout the area in which it is adapted. This is both a demonstration and an experimental process. Farmers almost invariably experiment with (i.e. test) a new technology before they adopt it. What apparently is a demonstration from extension's viewpoint is facilitation of his experimentation process from the farmer's viewpoint.

This conceptualization does not view the farmer as a passive person who simply accepts an innovation. It views the farmer as a person interested in innovation and willing to assume some initiative in finding improved practices for his farm. Of course not all farmers are innovators, but in virtually all groupings of farmers there are some who have these characteristics.

8. The final component of the technology innovation process is DIFFUSION and ADOPTION. The farmer is the only actor in this scene. Farmers effect diffusion. Technology improvements tested and successful in production systems will be picked up by other farmers using the same production systems. Without this farmer dynamic, technology innovation is extremely slow. No government, rich or poor, can afford an extension system that will be effective if the farmer dynamic is lacking.

B. Organizing Research

While this section also deals with conceptualization the form will be somewhat different. Section 1 is completely derived from the technology innovation process model, and to the extent it is visualized, it depends on Figure 1.

Section 2 addresses an organizational problem created by the emergence of Farming Systems Research. FSR has a sound conceptual basis in the technology innovation process model. It must be organized to strengthen the total innovation effort.

Section 3 presents a model that helps deal with the small scale farmer and his problem on one hand and at the same time can deal with the international network on the other. This is a formidable task but one completely feasible. With a proper indigenous capacity, a country can utilize the international technology network to serve its own small scale farmers.

1. Research and Extension, Division of Labor

While technology innovation is a single process, in almost every country of the world the governmental responsibility for implementing it has been given to two organizations. In most countries, these two organizations have been virtually indepedent of each other. This has been unfortunate in that the functions of the process are so closely interdepedent that there is no place, no line, at which the process can be neatly divided.

For example, it is a responsibility of research to test a technology it has generated in a farming system. Yet if the new technology does prove to be superior, that test serves the same function as a demonstration, and the diffusion process has begun, even if slowly. The same is true in adaptation. On the other hand a thoroughlly tested technology that is being disseminated through demonstration plots may encounter problems in some areas. In these cases the demonstration serves as a test to the extent there is feedback to the researchers.

There are several organizational options for maintaining the integrity of the technology innovation process.

a. One is for research to assume responsibility for a broader band of process. This is happening in the so-called Farming Systems Research (FSR). (See note on Farming Systems Research.) Research is moving to test on farms, to evaluation by criteria of the farmer system and to adapt new technology to a broader range of conditions.

b. A second alternative is for extension to work over a broader spectrum, i.e. to become involved earlier in the process. This would require a small group within extension trained to a higher level than most extensionists. This group by getting involved earlier in the process would be in position to work much more effectively in support of field agents than is now the case.

c. The third alternative would be for both extension and research to broaden the area of work so that both were working on the functions in the center of the process--testing, adaptation, and integration. This would not be duplication to the extent it at first seems, for two reasons. There is a tremendous amount of work to be done, enough for both groups. Secondly, because of their mission each one has a separate interest and would serve a different purpose. Stated another way, the interests of both organizations would be served by working in those three components of the process. Figure 1 visualizes this option, and Kenya is working in this format.

2. Research Organization

As research covers a wider range of the process, i.e. stays with it through testing, adaption and integration, it is faced with handling these additional functions while still performing its conventional functions.

One way to do this is by a grid or two dimensional, organization. This scheme was developed in Guatamala.

On one dimension are national programs -- commodities and other subject matter programs such as soil, water, plant protection, and the like. Leaders of those programs maintain national standards of quality and performance. On the other axis are regional or area programs. Their responsibility is to understand the farming type or types of the region and provide technology to solve specific problem. They work with national programs, and in turn national specialized programs work through the generalized regional programs, which have a specific production responsibility.

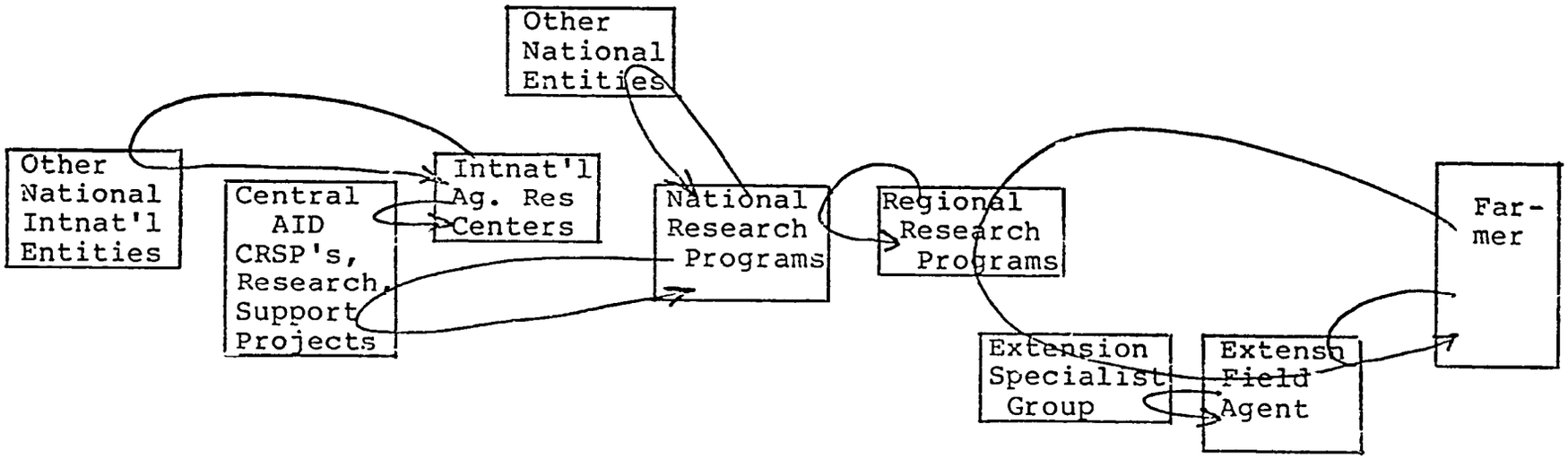
In Guatamala the national specialized programs and the regional general programs are coordinated by annual planning meetings held in the regions by the national programs. At these meetings results of last years research are analyzed and next year's research is planned. There are tensions, to be sure, and senior management presides at many meetings, but considerable learning takes place and a relatively coordinated program results.

3. International Technology Network

Kenya is not going to be able to solve all its agricultural technology problems by itself nor is it necessary to do so. There is a great deal it can draw from the international agricultural technology system. It needs to conceptualize and implement an organization for drawing on this international resource. The resource is available, but without the proper internal organization and management, the country may not be able to take advantage of it. AID itself has a worldwide research network that can be tapped to make the technology of the world available to the field extension agent.

Figure 2 visualizes the international network and suggests one way Kenya can organize to make effective use of it.

This Model reflects a very simple concept. The field agent can handle many of the problems identified. The critical element is problem identification. The second element is referral. If it cannot be handled at one echelon it can be referred back through the system. The third important element is response. Everything must start with the farmer, who is the only one in the entire metwork who will achieve agricultural development. The entire, worldwide system must be organized to serve him. The national system must be organized to facilitate referral, and to provide response throughout the network.



= Referral response function

Figure 2. International Technology Innovation Network

C. Managing of Research

The need for good management of the national research and extension system is well recognized and widely discussed. This section to provide a conceptualization that will help deal with management.

Management is considered to be analysis, decision making, action taking, and assuming of responsibility both for (a) the maintenance of the organization and (b) the production of outputs in both the short run and long run.

Management must be addressed at four levels- Structural, Institutional, Performance and Administration.

These levels can be conceptually distinct. However, in practice they may blend together. There is no need to make distinctions in practice. However, conceptual distinctions are useful.

1. Structural Management

Structure refers to that set of rules, regulations, and policies of the government and society within which the research system has to operate. Although structure includes man made rules, they are outside the control of research management. The research manager may on occasion, be able to have some influence on them, but such occasions are not predictable and whether he can have influence depends on his own genius and current circumstances.

Structure includes civil service regulations that govern personnel policy, procurement regulations, infrastructure development, general budget and revenue situation, price and foreign exchange policies, markets, import and export policies, programs and policies of other public agencies, and perhaps other things of similar nature.

2. Institutional Management

This level of management pertains to the role and function of the research organization in the total economy as well as the development and maintenance of the institution as an organization. It includes action internal to the organization as well as action external to it.

Management must articulate role and function and assure that personnel understand their function. National research personnel must understand their only function is to improve performance of the farming sector of the economy. This must be reflected in their action and attitude.

This aspect of management must also be concerned with authority and resources. This is one type of linkage. Even though the budget situation may not be favorable, management must compete effectively with other claims on the budget. Management must find ways to translate its impact on the farming sector and the food market of the economy into financial support from the political sector. It must also seek other sources of finance and, if needed, the authority to receive them. In other words, care and feeding of the institution is essential, and management must be responsible for it.

Management must also be responsible for another kind of linkage, program linkages -- linkages with those organizations needed to accomplish its mission. For research, perhaps the most critical linkages are with the farmer and with extension. The linkage may indeed be vital. Other linkages are important -- those with institutions who provide personnel; other research organizations, both national and international; and with input suppliers, both private and public sector, especially if technology is to be embodied in a commodity, such as seeds.

Other aspects of institutional management include strategic planning, organization, personnel development and policy, and communication.

Institutional management tends to be long-range and basic. While it is not directly related to task performance it is basic both to producing and to delivering outputs.

3. Performance Management

Performance management pertains to program management and management directly related to output. Much of this management function can be delegated to program leaders and researchers. However, the manner in which delegation is made is crucial to success. Management must condition the work environment within which subordinates manage and implement programs. This is done by providing resources, by assigning both authority and responsibility, by establishing rules and articulating policy, and by good communication.

Annual plans of work, implementation, information, procurement of commodities, budget allocation and management, logistics are all included under performance management.

Long-range planning and research strategy, in many respects, are part of performance management as well as of institutional management.

4. Administration

Administration consists of those routine functions-budget, personnel, logistics, procurement, accounting, reporting. Managers spend much time in administrative functions although many of the functions can be routinized and assigned to others. Skills are involved and technologies are being developed in this are that do require training.

IV. THE KENYA RESEARCH ENVIRONMENT AND STRATEGY CONSIDERATIONS

A. The Research Environment

USAID/Kenya can be fairly well assured that a properly managed investment in Kenya Agricultural Research is a relatively safe investment. In addition to the general justification given in Part II above, both the World Bank and the Harvard T.A. group list research development as the most urgent agricultural development need in Kenya today.

There are still other factors which favor such an investment by the USAID.

1. Research - a sound investment. There has been a reorganization which seems to favor successful implementation of a program. This reorganization consolidates agriculture and livestock and places what seem to be dedicated people in key positions. Some doubt is expressed whether the reorganization is actually final, and this possibility needs to be monitored. On the other hand, there is some hope that KARI will merge with the Ministry of Agriculture and Livestock Development (MOALD), which would constitute a major advance.

Two developments, in particular, significantly increase chances for success of an investment. Kenya has adopted the T&V system of extension and seems to be putting greater emphasis on the subject matter specialist than has been common for other country programs of T&V. It has its own on-farm trials program. Specialist training involves monthly meetings with research personnel from experiment stations.

Also, the Research Division has recently re-inaugarated the Farming Systems Research (FSR) approach supported by the CIMMYT East Africa Economics Program. Still further, extension and research have agreed to collaborate on the FSR, on-farm trials. This is almost an ideal situation, but may increase the urgency for a USAID effort. While the outlook is favorable

to achieving a real research-extension linkage, there are still many chances for things to go wrong. They are more likely to go wrong because of inability to figure out ways to make the collaboration work than because of a lack of desire and good will. One example of this collaboration was observed at the Katumani Research Station with Machakos District Extension personnel. It appears to be going quite well, building in part on earlier CIMMYT FSR efforts.

The T&V program will rapidly use up the available, easily used technology innovation stock of research and soon will be pressing research for further technology. This is a favorable development, if research is able to respond. Otherwise, it will further demoralize the research establishment.

A further need for a USAID effort grows out of the fact that Kenyan agriculture is much more dynamic than is commonly recognized. It has changed rapidly from a large-scale to a small-scale agriculture and is pushing steadily into less favorable ecologies. This change per se requires innovations in production technology, which is the only purpose of agricultural research, and small-farm agriculture is more difficult to serve than is a large-farm agriculture.

2. The Kenya Research Tradition. Kenya has a respectable research tradition, dating from the first decade of this century. It has a good record against some of the epidemic animal diseases through development and production of vaccines. Rinderpest, for example, has not been reported in Kenya since 1975. Associated with this tradition is the so-called Nairobi Cluster, a group of national and international organizations which seem to be developing an effective collaboration in animal disease research.

Unusual results from research are reported in fodder crops, tea, and maize. Maize research, an AID project, has resulted in a virtual green revolution in high potential areas. Maize is now Kenya's staple food grain.

Many of these research efforts resulted from initial colonial or expatriate input. However, the Coffee Research Foundation, said to have an excellent program, as does the tea research group, are both Kenyan institutions. ICIPE also has made impressive progress under Kenya leadership.

3. Agricultural Research, a Troubled Sector. The Research Division of the Department of Agriculture of the Ministry of Agriculture and Livestock Development is indeed troubled. There has been no annual report of research since 1979, which may reflect more than simply the failure to report.

a. There has been a proliferation of stations as well as numbers of non-professional personnel, although precision of that data would be difficult to achieve. Budget increases have not kept pace, and today salaries and wages take up 80 percent of the budget. Living and working conditions for staff have deteriorated.

b. Status of research is low in the Ministry. It is overwhelmed by extension and other field programs. Salaries are low, chiefly because there are so few grades and levels between the beginning researcher and the division director. Extension and field workers are promoted much more rapidly. Personnel who do get higher training soon leave. The training of those left is out of date, personnel are discouraged and poorly motivated. In some cases extension and other field personnel have little respect for research personnel and consider them subordinate.

c. Management systems can almost be described as inadequate, not having changed with the growth of the system. Budgeting is more by routine than by design, and admits virtually no managerial control. Programming is largely the same, by routine, not management. Virtually the only managers below the director are station directors. Programming, is by station which leaves little opportunity for national integration, although some station directors do have nominal resposibility for national program leadership.

d. The effective research that is being done, apparently is through donor project, which provide some discretionery funding. Donor projects often follow donor criteria, rather than Research Division criteria. There are so many projects that Kenya can not meet its commitment to operations costs, let alone maintain them after a donor project terminates, which often happens before full payoff. This pressure on the recurrent budget has virtually precluded development and maintenance of an indigenous, authentic Ministry research program.

e. Some procurement problems are almost unbelievable. For example, the Katumani Station has had funds budgeted for construction since 1978. It must depend on the Ministry of Works to collaborate in the construction. To this date nothing has been built.

f. Research extension linkages have been inadequate. This situation shows promise of improvement, but the prospect still has to be regarded as a promise. Currently, because of lack of funds, and management, the research people cannot discharge their responsibilities to this collaboration.

4. The KARI Frustration. Kenya has made attempts to address its research organization and management problem. One such an attempt, through the National Council of Science and Technology (NCST), produced the Kenya Agricultural Research Institute (KARI). It appears to have been a bold attempt that did not go right, although there are several unanswered questions about it, concerning its origin, its purpose, its characteristics and its chances for the future. One of its specific purposes was to take over the functions of both the East Africa Agricultural and Forestry Research Organization and the East Africa Veterinary Research Organization There were some people, however, who expected it to incorporate overall agricultural and livestock research, including veterinary. Some still think it will, while others doubt it. Original intent apparently was to set it up free of the repressive civil service regulations. It has not fully accomplished this liberation.

The most obvious clear impact of KARI is that instead of consolidating research it contributed to fragmentation and is a divisive force within the research establishment and perhaps even between research and field oriented divisions which are not interested in the development of a research elite. It continues to be an uncertain factor.

KARI appears to have two images. One image is an organization sited at the Muguga Research Station. This KARI is specific and does not have a good enough track record to gain any appreciable respect. As a specific organization it was responsible to another Ministry until recently although it used up part of MOALD's budget. Somewhat more prestigious than the MOALD's own research group, it has created envy and a struggle for power and prestige.

The other image has promise. There are some senior research officers who view KARI as a legal-institutional concept that could take quite a different administrative form. This could be put to a much more productive use under strong MOALD leadership.

5. Causes of the Problem. This attempt to analyze the cause of the problem is not for the purpose of placing blame, but for the purpose of laying a base for the strategy to be suggested. Most of the characteristics listed above are considered more symptoms than problems. In a sense they are problems and they feed on each other once deterioration sets in.

Three problems seem to be more nearly basic.

a. One of these is what can be thought of as the Post-Colonial Syndrome. Kenya was a fairly complex economy when the country was turned over to Kenyans barely a generation ago. It is a major undertaking to assume responsibility for a modern economy built on European models and to maintain its momentum through the process of Africanization. By the very nature of British colonialism, national personnel had limited experience in top management. Management training is very much needed as the research establishment replaces European norms, standards, and structures with Kenyan ways.

Not only were the new leaders faced with taking over a going concern and Africanize it, they were faced with certain dynamics in its agriculture that are likely to be under-rated. In the generation since independence Kenyan agriculture has been virtually transformed from a large scale to a small scale agriculture. It is much easier to provide research-extension support to a large-farm agriculture than to a small-farm agriculture.

In many ways Kenya has done quite a good job, and expatriates have considerable respect for their Kenyan counterparts. All evidence is that the inherent qualities of the Kenyan human resource are up to the task, given time and technical assistance to work out organization and management systems.

b. A second major-problems seems to lie with the donors. The evidence is strong that they have put an enormous pressure on the young and perhaps weak Kenyan institutional structure but have invested relatively little in efforts to help those young institutions to mature and strengthen themselves. Even projects that could facilitate institutional development are often disruptive simply by being terminated before they have a chance to work. Not only do donors press weak institutions, they tend to go in many directions and inhibit the development of an integrated national institutional structure.

c. A third basic problem is related to the first problem listed here but distinct from it. The Ministry of Agriculture and Livestock Development (MALD) has been weakened by the lack of continuity and stability of leadership. This has allowed a fragmentation of research to develop and to persist. The KARI issue, apparently, persists because no firm decision has been made in the MALD. The lack of an adequate scheme of service in the Research Division appears to be due more to the failure of the Ministry to come forth with a definite and specific proposal than it is to rigidities in civil service regulations. Until Ministry leadership takes change, the subordinate units (and fiefdomes within units) will continue the struggle with little hope for a positive resolution.

B. A Strategy Considerations

The strategy suggested consists of one component which can be implemented largely by a project and two other components which would improve the project environment and greatly enhance the potential value and achievement of the project.

1. Project Action. The project component would have two objectives, one being to develop and protect a basic core capacity in the research organization and the other to provide some assistance to selected research programs.

Currently it appears that the Research Division (RD) is the logical host institution for at least basic core capacity development. There is some chance that KARI and the RD will be merged, but they are likely not very great. If they are merged, the project would remain the same, but its scope and potential would be increased, perhaps greatly. There is some chance, also probably not great, that livestock and agriculture will be separated again. If so, a viable project could be done with agriculture. The scope and potential would become reduced and the project would still represent a viable risk for mission investment.

There would be alternatives for the support to specific research programs, such as maize. This support could be provided through KARI. The main reason for considering this alternative is that it may cause a more intense collaboration between KARI and the RD. KARI would almost have to work through RD Stations.

2. Project environment improvement. While the project activities suggested in 1. above can have significant impact within the existing project environment, they can be much more successful if that environment is improved. The following strategy suggestions address this need.

a. Protection of Kenya Core Capacity. One component of project environment improvement would be to work with other donors to persuade them to respect the basic core capacity of the RD and not to press on it beyond its capacity. This would require donors to face the recurrent cost issue. More discussion is present in Part V.

b. KARI - RD merger. The second component of project environment would be to help and persuade the MOALD to merge KARI and RD. There seems little doubt that KARI, as an institutional, legal form, not necessarily its current

structure, is a major resource that MOALD is not using. There seem to be various alternatives for using it. Kenya may have the possibility of having a research organization that has the advantages of parastatal status and at the same time under substantial control of the Ministry.

This issue may be best addressed through some coordinated donor action. This is discussed in Part V.

V. A LIKELY COURSE OF ACTION

This section identifies action alternatives which can be used in some combination to serve as the basis of an AID program for helping Kenya put its agricultural research house in order. While each is suggested to address a major problem identified earlier, any one alone would make its own contribution. All three appear to to be useful and taken in combination would constitute a comprehensive program that would appear to have a significantly greater probability of success than any one or two of the alternatives. It is difficult to determine if sequencing or timing is important, whether one should be accomplished before another would be done.

A. A Project Alternative

This action alternative was developed as a reasonable and workable project idea. It can also be considered as an illustration to help explain the first suggested strategy component.

This activity assumes that USAID will accept as a major objective the building of an authentic basic (or minimum) national core capacity, and that it is committed to a long range program.

This alternative could be accomplished within the Research Division, for the most part, and certainly within the Ministry of Agriculture.

Style and attitude will be important. Consider Kenya's total Technology Innovation System (Research and Extension), in phase one, as having the potential to implement the Technology Implementation Process from the testing function onward in commodity and subject matter areas of major importance. This is considered the minimum national capacity required for agricultural development. It will also be referred to as the "basic core" capacity.

With this basic core capacity, Kenya can then depend on IARC's, expatriate teams, CRSP's, and others, in phase one, to provide science and technology generation inputs.

Flexibility in both strategy and project design needs to be provided to accomodate performance and progress in the Kenya system. In other words, if it takes two projects (10 years) to develop a basic national capacity, be prepared to spend that time. On the other hand if progress is more rapid, be prepared to move either (a) to a broader scope, i.e. the basic capacity in more geographic or subject matter areas or (b) a greater than basic capacity (i.e. back through technology generation perhaps even science) in certain subject matter fields even within one five-year project.

Performance of the Kenya system will need to be monitored and evaluated by Mission and contractors, who will also have to make decisions. It is not possible to predict the time it will take. Criteria for measuring progress need to deal with system management as well as technical performance.

A project would have two categories of elements.

1. Institutional and Management Development

One would be to work in institutional development. This will involve (a) system improvement, (b) human resource development and (c) linkages.

a) System Improvement. The system of research management is outdated. It has undergone no change or virtually none, according to one informant, since it was created.

Putting the system in order is a Kenyan responsibility but USAID can make an input to system improvement by providing a counsellor to the director of the Research Division with a liberal access to short-term technical assistance, some of which would be recurrent.

The term "counsellor" is used to indicate a specific style of operation. His function would be to assist or collaborate with Kenyans in (a) identifying and solving administrative and management problems and in (b) working out improvements in the management system.

The Counsellor is not to "advise" in the sense of prescribing. Nor is he to "assist" directly in management in the sense that he denies a Kenyan an opportunity for an experience.

To be addressed in system improvement are the problems listed below, among others that would be identified.

Budgeting:	Currently budgeting appears to be a routine (as by rote) rather than by a process which admits management and decision making.
Organization.	Currently technical program leaders must also serve as station directors. There is not an adequate division of labor. Currently the relationship between regional (area) and national (subject matter) programs is not clear. National and regional programs have not been fully conceptualized
Program-Resource Imbalance:	Currently 80%, according to several informants, of the research budget goes to salaries. Add to that the expense of running the network of experiment stations, and operational budgets are grossly inadequate. A program reduction is needed until budget resources and management are improved. Alternative actions are: reduce number of stations; reduce number of programs or scope of programs or both; reduce number of personnel; add certain facilities that would improve efficiency, such as vehicle maintenance and repair; and add certain administrative personnel.
Personnel Incentive Mechanisms:	The current system provides extremely limited opportunity for upward mobility along with inadequate working conditions which may be almost as significant as salary and promotions.

Procurement Mechanisms:	Currently, according to some evidence procurement procedures are intolerable. For example, an experiment station must await the good will of another government ministry for the construction of facilities.

A management system must also include such mundane items as keeping vehicles and other equipment in operating condition. The capacity to do this is an essential component of basic research capacity. It could also involve rehabilitating some of the current inoperative equipment. See implementation Note, "Deferred Maintenance".

How many of the system problems could be classified as structural (i.e. beyond control of institutional management) and how many as institutional is not clear. (See section on conceptual models). With the help of the counsellor, the research service can solve the institutional problems. The USAID Mission may have to intervene to help with structural problems. This intervention could be through another project, such as the policy project. It could be directly or it could be through the Consultative Group. So-called "leverage" must be used with caution and probably in the same style as recommended for the counsellor. That style would be to help work out the solutions, plus help in implementing them.

b) Human Resource Development. A variety of training would be provided. Emphasis in the first phase will be training up to the M.S., for research personnel and extension specialists. It will include various forms such as: M.S. programs in the United States; post-graduate study in Kenya, leading to but not always achieving the M.Sc. degree; special courses in Kenya by U.S. professors and T.A. personnel, some at graduate level and for graduate credit; apprentice training in IARC's; study tours for administrators and managers to United States and to third countries; and management training. Imagination needs to be used.

Training can be provided through a Training Institute (see Note) that would develop and take advantage of a wide array of training opportunities to address an array of training needs.

Ph.D training would not be offered until the Kenya research system demonstrates the capability and willingness to retain and utilize personnel at this level.

c) Linkages with three groups are important, and linkages are an essential component of institutional development. The essential linkages are with the farmer, with extension, and with other Kenyan entities which provide inputs into the research program and could provide even more and better inputs than is now the case.

One program activity can address two of the linkage problems. That is the Farming Systems Research component which includes developing an extension specialist expertise. This is a critical element and is discussed both in Section IV and in Implementation Notes "Farming Systems Research." Project objective would be to insure success of a program already initiated by the Kenyans.

The third linkage needed is with a set of organizations that supply either manpower or technical inputs or both to the research program. A contract research program in the Ministry of Agriculture can be an effective means of developing and maintaining linkages with these entities. The program would involve a fund, under the control of the Ministry of Agriculture, but for the exclusive purpose of contracting for research with Kenyan entities, outside the Ministry. Kenyan entities which would be the recipients of the contracts could arrange collaboration with expatriates.

Such contract research would be particularly effective for the University of Nairobi which has a relatively well qualified staff but which is starved for operating funds. Not only would contract research provide the Ministry with research results, it would also lead to an improvement in university teaching as a function of the professors' increased contract with Kenya's agriculture.

A contract research fund could be set up by USAID with either dollars or shillings or both. Other donors may be attracted to it. What the chances are for the GOK eventually to take over the fund cannot be predicted.

It may be possible to utilize the contract research mechanism, perhaps modified, as a means to integrate donor contributions into the research program without putting more pressure on the basic capacity than it can handle. See note, "Research Contracting".

2. Assistance to Specific Programs

A second project element would provide science and technology generation assistance in certain fields. The following seem indicated, although there are arguments for other mixtures.

Maize:	This is the country's most important food crop, and Kenyans put high priority on it.
Sorghum:	Kenya places lower priority on this crop. Yet, they place high priority on dryland agriculture in which sorghum has many advantages over maize.
Soil and Water Management:	This is a translation of the Kenyan second priority, "dry land agriculture". Water is the limiting factor, and water management may be the first area in which the Kenyan capacity should move beyond the minimum, because of its importance and the fact that water management technology may be one of the technologies most difficult to import. Soil management is closely interrelated with water management.
Livestock in mixed farming:	Kenya Places range management and livestock in third priority. Much more than inadequate technology is limiting progress in that sector. On the other hand, in the mixed farming areas, technology is a limiting factor. Livestock are important to crop production and to soil and water management as well as for its product.

In this area, Mission strategy would worry less about building capacity and requiring matching operational funds if such demands press too heavily on basic capacity. Paying most costs for these elements would allow the GOK to develop basic capacity and to provide resources to sustain it.

Another team has recommended the continuation of the livestock-range component of the Agricultural Services Support Project. It seems clear that research in livestock in mixed farming should be sheltered within the basic capacity ahead of livestock and range research. However, this paper does not take a strong stand. It aims more at developing a capacity within the system to make these decisions along with a management systems that can implement them than it does to the substance of the decisions.

3. A Tactical Approach

The tactics followed and the style of project initiation could be important in themselves quite apart from the substance of the project. The tactic that seems to offer a good probability of success would be (1) to offer help immediately in addressing basic and critical problems of the national research service management system, even well before the project is developed and then (2) to add components to the system as certain improvements were achieved. These improvements are suggested below, and one alternative for matching components added with improvement achieved is presented. This tactic would favor an incentive - pressure strategy, if such is adopted.

Chronology of Action

1. Now May, 1984, offer a counsellor to the Director of the research Division and follow a precise style.

a) Define the counsellor's function as that of helping the Director to identify problems and work out solutions in system management. He is not to usurp "national" prerogatives. His style is to be low profile, low pressure, and helpful.

b) Select the counsellor by bringing candidates in for TDY to determine who can establish rapport and work effectively in the system and be accepted by it. The right person is critical.

c) Make the offer at once, or state willingness to provide if requested but don't press for Ministry to accept.

2. After project developed:

Immediately initiate the Kenya component of training, including extension specialists. The specialist function is essential to research-extension linkage. The T&V provisions for specialist development are not adequate.

3. Immediately initiate non-Ministry contract research.

4. Immediately initiate FRS-specialist support.

5. For the rest of the components, following the scheme listed below.

Add this Component	When this Improvement Achieved
a) U.S. training for M.S. and other international training	a) A feasible scheme of service has been adopted.
b) Maize, sorghum/ millet	c) National program is established, a program leader is named, program leader is freed from station management and moved to Nairobi, and GOK accepts Sorghum as alternative to maize in the non-maize areas.
d) Soil and water management for dryland agriculture	d) National dryland program established, program leader named and freed from station management and moved to Nairobi. (Project can help with program development).
e) Livestock in mixed farming component	e) Other developments justify. Perhaps this would require national program of some sort.

How to deal with other management issues as incentives, such as budget, equipment maintenance, research reports and publications, and planning is not clear at this time. These items are essential and project should aim to achieve them, but perhaps they have little utility in a leverage-incentive tactic.

B. Improving Project Environment

The Research Division can only do a partial job of building a research capability left alone in a project format. Some things outside the Division must happen. Most of these necessary external events are theoretically under the power of the Minister of Agriculture, but it is not clear that he actually has the power. It is clear that the power is not being exercised.

1. Consolidation of Research Entities

There are strong reasons to believe that KARI, (1) under the jurisdiction of the Ministry of Agriculture and (2) responsible for all Ministry research (agricultural, livestock, forestry, and veterinary) is a reasonable way to organise research. This gives the Ministry the best of both worlds, control and parastatal flexibility. This consolidation requires a strong decision.

USAID/Kenya has the alternative of discussing this issue somewhere in the Kenya government beyond the project format. It could be with the Minister of Agriculture. It could be with the Office of Personnel and Ministry of Finance and Planning who could bring it before the Cabinet. It could involve the Ambassador and perhaps the President of the Republic of Kenya. It could be done unilaterally or in coordination with other donors.

The issue is major, absolutely worthy of high level attention. Agriculture is the dominant sector in the Kenyan economy, and research is vital to that sector. The current situation results in a great waste or loss, on two counts. Arithmetic is not available, and the accounting would be difficult, but it is quite possible that inefficiences caused by the current system will cause waste perhaps equal to the intended AID input. The second major loss is in time and opportunity. Research is not getting done that could be done, and donor resources are not be used effectively.

Research system improvement is at least as important as the T&V extension project. The report is that this project was accepted at the Presidential level.

2. Protecting National Basic Capacity.

A strong management capacity in MOALD capable of developing a national research program could theoretically manage donor projects in such a way as to protect basic core capacity, once established. Whether this capacity can be developed by a single donor project at the same time that other donors are pursuing their objectives independently of each other, is questionable.

If some donor coordination could be achieved at the time a USAID project was working to develop the management system, the probabilities of USAID success would be significantly enhanced.

The issue of recurrent costs needs special attention. It is going to be extremely difficult for Kenya to develop and maintain a basic core research capacity if it has to provide recurrent costs according to traditional donor formula guidelines. To a large extent recurrent cost policies are a delusion. In many, perhaps most, cases Kenya cannot meet its negotiated recurrent cost obligations. In even fewer cases can Kenya maintain a program initiated by a donor beyond a token scale after the project terminates. Thus, as a result of attempting too much very little is achieved.

This paper suggests two that can be accomplished by the project. One is assistance to develop a management system in research through which the research entity could seek to achieve donor coordination. The other action is to develop a management mechanism to handle donor contributions outside the basic capacity, if such donor coordination is achieved. This mechanism is described in Implementation Note, "Contract Research".

Project accomplishments, while essential, may not be adequate to the task. It is not given to short-time consultants to be able to devise extra-project strategies and actions with the GOK and other donors that would be needed. It must be left to the genius of the Mission to determine how to provide this vital support.

Relaxing recurrent cost rules could be restricted to agricultural research. This may be more easily justified and accepted on the basis of the unique importance of research to Kenya's leading economic sector, agriculture, and may not necessarily constitute a precedent for other sectors.

The World Bank is attempting a type of donor coordination which the USAID needs to monitor closely and perhaps participate in. That initiative needs close examination. It seems to rely more on raw pressure than this report suggests. It also seems to emphasize more the necessity of a national research program than does this report. This report does not down play the importance of a national research program, but is does hold that the institutional capacity to generate and manage a research program and a Kenya-generated program would be far more effective than a negotiated program even discounting the extra time it would take. The World Bank strategy seems to be to press directly on the MALD. This paper suggest that several different options should be considered that would involve other entities of the GOK, even the President.

The Mission can devise various options for taking the initiatives set forth here.

In the course of project implementation, there will be other policy issues that will require extra project ation, either unilateral or multilatera. Such action can greatly enhance project potential.

VI. STRATEGY NOTES

Note 1: Comments on MALD Summary of Immediate and Long Term Research Objectives, March 1984.

This report proposes both geographic and subject matter elements.

1. Regional Centers are proposed for each of the five following ecozones:

A. High rainfall Western Kenya

B. Cool highlands with high to medium rainfall

C. Marginal rainfall areas with both bimodal and unimodal rainfall.

D. Hot, humid coastal tropics and environs

E. Dry range lands.

A total of thirty-one National and Regional Research Stations/Institutes and responsibilities assigned to them are identified in the Summary, without comment as to the adequacy of facilities, staff, or budget. These stations are not identified with the five ecozones deemed essential to research planning.

2. Subject matter research project teams are proposed, with the team leader located at the most appropriate regional center, and team members located elsewhere as necessary.

In the MALD Summary, research programmes include several individual sub-programmes, within which numerous projects are located. Programmes include Land and Water Research Programme, Crops Research Programme, and Animal Production Research Program. Neither Research Support nor Veterinary Medicine are identified as programmes

Problem identification, proposal preparation (including an annual workplan), proposal evaluation, implementation, and end point evaluation are identified as components of project establishment.

Programmes, sub-programmes, and projects identified in the MOALD Summary are listed in Table N1. Sub-programmes are underlined to distinguish them from programmes and projects. The Summary is not clear in nomenclature, or in the organizational level for which an individual senior researcher would have leadership responsibility.

Fifty-six crops, twenty forestry needs,and twenty seven animal production needs are ranked into first (I), second (II), and third (III) priority categories. Land and water research needs and Research Support categories are not ranked.

Among 103 ranked needs, 54% are ranked as Priority I, 31% as Priority II, and 15% as Priority III. Nineteen sub-programmes which may include additional projects are not ranked. See Table N2.

Table N1

Programmes, Sub-Programmes, and Projects Identified in the MALD Summary of Research Objectives, March 1984

	Land and Water	Crops	Production	Research Support
Sub-programmes	Resource Inventory	Cereals	Nutrition	Soil & Ag Chemist
Projects	Water Balance Irrigation & Drainage Soil/Plant Water relationships Machinery Soil Chemistry & Fertility Soil Conservation	Maize Wheat/Barley Rice Sorghum Pulses Roots & Tubers Fruits & Veget. Oil Crops Fiber crops Coffee & Tea Sugar cane Pyrethrum Tree Crops Forestry	Range & Grass land By-product Feed Reproduction Breeding Management Wildlife	Soil Survey Plant Protection Entomology Pathology Seed Quality Quarantine Genetic Resource Research Support Biometics/ Statistics Research Information Service Socio-economics Laboratory Technology

Table N 2

ASSIGNMENT OF PRIORITIES AMONG CATEGORIES OF RESEARCH NEEDS, KENYA MALD, MARCH, 1984

Category of Ranked Research Need	Number of Needs		Priority					
			I		II		III	
	No.	%	No	%	No.	%	No	%
Crops Research	56	100	20	36	23	41	13	23
Forestry Research	20	100	18	90	2	41	0	0
Animal Production Research	27	100	18	67	7	26	2	7
Total Research Needs	103	100	56	54	32	31	15	15
Category of Unranked Research Need								
Land and Water	7	100						
Research Support	12	100						

Note 2: Random Thoughts on Strategy.

There has been considerable criticism of the research system on the part of both donors and expatriate contractors. This is in large due to the pressure donor projects tend to place on the country's fragile institutions, and fragile institutions are the major characteristics of a less developed country. If the institutions were robust, the country would not be less developed. The solution would seem to lie in projects designed to build the institutional framework. Building institutions does not preclude productive action. An institution is not a factory. It does not have to be built in period A so that it can produce in period B. An institution is more like an athlete. It is developed by exercise and practice or experience.

In development a USAID strategy for the development of the agricultural research institution in Kenya it is important to develop a realistic set of expectations. Kenya public institution managers have been engaged in nation management for less then a generation. They were faced all of a sudden with the responsibility of running a fairly sizeable and complex establishment and with only limited experience largely in the status of apprentices. The establishment has grown rapidly, in part at the encouragement of donors, who more often press on national institution than attempt to develop them.

On the demand side, conditions for agricultural research have become considerably more complicated. This has been caused by the very rapid development of the small-scale farming sector which is much more difficult to serve with adequate technology than is the large farm sector.

It seems realistic to expect that much can be accomplished if activities, inputs and expectations are geared to the Kenya situation. The research service will not rival that of Iowa State University over the course of one project.

It is important not to plan and expect a research service that is clearly beyond Kenya's capacity to support. A realistic plan may actually require a reduction in the number of stations and the number of personnel. Curiously such reductions would likely lead to a significant increase in the output of the research division.

Ideally, a country should aspire to handling adequately the entire Technology Innovation Process. Some countries can well do this, even in the relatively short run. Others can, given

more time and assistance. Some never can. Some countries largely as a function of size, will always be dependent on international establishment. We do not have enough knowledge to know where Kenya falls among these three categories.

USAID strategy must start with where the country is now and provide it the opportunity to demonstrate how far it can go.

Strategy must also not tempt or encourage it to go further than its demonstrated (or at least indicated) ability, as meansured by (a) budget support and (b) management capability.

USAID strategy must set intermediate goals (on way to ideal).

USAID strategy must be patient. It may make little difference, in the history of a country, if it takes two projects (10 years) rather than one (5 years) to reach an intermediate goals.

Donor expectations are in terms of modern economics following criteria of the Western or European world. To a large extent the leaders with whom they are in contact attempt to obey the same criteria. It is obvious that such criteria, such norms and standards, do not pervade the Kenya society or body politics. Kenyans who deal with donors serve as mediators between the Kenyan world and the European world. While the distinction is obvious it is likely not given to donors to understand either the magnitude or the nature of the distinction. It is possible, of course, to make too much of this distinction. It is possible, of course, to make too much importance. The greater probability, however, is that it will be under-evaluated or that the nature of the distinction will not be understood. This is due to the fact that the mediators communicate communicate with donors in European terminology and tend to mask the distination. The very terms of communication may actually inhibit understanding on this important issue.

This line of reasoning is not meant to imply an argument for abandoning the European criteria. It is meant to suggest (1) that Kenya's public and administrators (the mediators) who deal with donors probably deserve somewhat more empathy than a frustrated donor or expatriate team may be inclined to have and (2) that these elements need to be dealt with explicitly by donors in developing their strategies.

VII. IMPLEMENTATION NOTES

Note 1: Operational Plan.

The suggested operational plan includes the following elements:

1. Develop a national plan for agricultural research, including

   a. core research sustainable by GOK.

   b. provisions for donor research to supplement core research without compromising it.

2. Design and establish a research management organization with procedures for identifying major problems, assigning allocations of Kenya and donor resources (including re-allocation of existing national resources) and insuring that the linkage of research to farmers and extension is effective.

Elements of such a research management organization would include:

A. A councillor provided by USAID to the Director of Research (DOR) who could assist by assembling and organizing relevant information on programs, projects, facilities, budgets, and staff; by assisting with design and development of a research management organization under the DOR (see Note 2); assisting with design of training capability needed by MOANR (see Note 4), and design of a contractual research procedure both to accommodate donor research to the Ministry core program, and to involve agencies and institutions outside the Ministry in research which supports national objectives and supplements Ministry resources (see Note 3).

B. Support from USAID for training activities, and for high-priority research needs (such as for maize improvement; sorghum and millet improvement; dryland farming systems which include livestock; water use efficiency and water conservation)

Through the proposed contractual research process, and for the on-farm research element which provides direction both to research initiatives undertaken by researchers at experiment stations, and to extensionists who engage in on-farm adaptive research and demonstrations.

Among these elements, the counsellor can be provided almost immediately, upon agreement with the DOR as to the objectives for that initiate.

Need for in-service training is sufficiently clear and training resources sufficiently well known so that a Ministry Training Institute program can be supported and become active as soon as an appropriate program, including management training, is developed in collaboration with DOR.

Development of a new national agricultural research plan and management capability will require more time, especially to allocate elements of the plan appropriately between national core and donor support. It is not proposed that existing MOALD or donor project be terminated abruptly. It is proposed that the programmes of greatest national importance be analyzed first, and that five-year plans, including technical and budgetary plans, be developed under the leadership of a manager/technologists charged with overall responsibility for the various highest priority programs.

Note 2: Organization of National Research.

The authors visualize a two-dimensional research organization, with subject matter responsibilities assigned to national research program leaders for:

Soil and Water Research
Crops Research
Animal Production

Similarly, ecozone area research managers will be assigned, one responsible for each of the following ecozones:

A High Rainfall western Kenya

B Cool highlands with high to medium rainfall

C Marginal rainfall areas with both bimodal and unimodal rainfall

D Hot, humid coast tropics and environs

E Dry rangelands

Subject matter managers will be charged with planning and executing research responsive to national needs, adjusted zone-by-zone in recognition of unique crop/ecozone interations. These managers would allocate their program resources (including their own staff elements) among experiment stations in the various ecozones.

Ecozone managers will be responsible for maintenance of research facilities which are respresentative of the ecozone, for the conduct of zone-specific adaptive research, will be provided with resources sufficient to do so - but not to maintain redundant capabilities within the zone.

The subject matter research manager with his relevant staff will meet with each ecozone research manager and his staff at least annually, to plan research and to review research results before planning subsequent research trials.

Both subject matter and ecozone research managers will receive core allocations from Kenya resources. Core programs will be planned and executed based on these resources.

When donor proposals for supplemental research are received, the appropriate subject matter and ecozone managers will meet with donor planners to jointly develop a plan which is useful to Kenya, supports MALD research objectives, and can be implemented without creating demands on MALD resources which distort the national agricultural research plan.

Note 3: Research contracting.

Contractual research, both as performed by donors who contribute resources, and as performed on behalf of the DOR based on his discretionary research funds, are key components of the proposed operational plan.

1. Donor research projects would be identified independently of MALD core research; would be planned jointly with the DOR and appropriate managers, and would be accepted only on the basis that they did not create demands on research resources already allocated within the national research plan.

The DOR could establish a contracts research administrator who would represent the policies which had been adopted, and would insure that the proposal included sufficient resources to cover both direct and indirect costs.

The contract research administrator would not negotiate the technical components of donor research proposals. This function would be performed by research managers, who would be responsible for insuring that the proposed research would complement the national program; address problems of significance; and include provisions for transfer of resultant technology through the extension agency to producers.

Although use of Kenyan researchers at all levels of project staffing would be emphasized, such staff would not become MALD employees, but would be donor project employees. Thus no liability for permanent civil service employment status would be incurred.

Charges for use of MALD research facilities including both direct and indirect costs, would insure that national programs were not threatened by donor projects. New facilities would not be authorized without full recognition of recurrent costs, and support of new facilities within the national core program.

This component of the national program would insure that donors were encouraged to support research needs within the MOALD research program without distortion of the core national research. It would provide employment opportunities for Kenyan scientists as professional researchers, and would expand the agricultural research program in Kenya beyond the limits which can be supported by national resources.

Donor research would be evaluated by the same procedure and criteria used to evaluate core research.

2. MALD contractual research would be intended to involve both Kenya and non-Kenya research capabilities in support of needs for which no appropriate MALD research capacity exists, and to encourage a synergistic relationship between MALD/RD personnel and their counterparts in such institutions as the Faculty of Agriculture, Egerton College, the new Moi University Faculty, the Kenya Seed Company, Kenya Dairy Cooperative, various crop research institutes, the international university research community, and other private sector entities.

National subject matter and ecozone research managers would be encouraged to submit proposals for contractual research in support of unmet needs of their respective programs. Proposals from institutions outside MALD would be referred to appropriate research managers for review and recommendations as to action.

Donors would be invited to contribute to the MOALD contractual research fund, either in support of proposals received and endorsed by the DOR, or for the discretionary allocation by the DOR, either subject to donor designation or without such limitations. Designation could include subject matter, ecozone, identification of contractor, or other conditions.

Contract research would be evaluated by the same procedure and criteria used to evaluate core research.

Under no circumstance would donations to a contract research fund be used for direct support of core research activities, although it would be appropriate for contract research to support attainment of core objectives.

In any case, no contractual research would be permitted to depend on core resources, or to create commitment of core resources for support of follow-on activities.

Note 4: Training Institute.

Training needs exist to equip research personnel in Kenya for the range of duties from program leaders to experiment station supervision to junior field research officers. No single institution in Kenya is capable of meeting all these needs, nor is it appropriate to depend on foreign training institutions exclusively.

A MALD Training Institute is proposed, for the purpose of identifying training needs for the research staff and meeting these needs from training performed by any competent institution, under contract to the Ministry.

For example, the University of Nairobi faculty could be contracted to provide accredited in-service training at the graduate level, both at Kabete and elsewhere in the country, in concentrated, short-course settings. Depending on subject matter, duration, and student performance, students could earn credit towards an M.Sc. degree from the University of Nairobi, perhaps in combination with a requirement for limited study in residence on the campus.

Egerton College could provide similar coursework at Njoro and elsewhere, to update the skills of its diploma gradutes and possisbly to permit them to earn credit toward an Egerton B.S. degree in the future.

The Institute could utilize TA team members, MALD staff, U.S. University personnel, and IARC personnel as faculty and could employ University of Nairobi and Egerton College faculty in non-credit (but career-supportive) courses independent of those institutions. The institute could also arrange for offshore training, both degree and non-degree, for senior research and administrative staff.

With the Institute identifying training needs and contracting training opportunities, it would require only a small administrative staff, and no faculty. It could insure that all sponsored training was relevant to needs, and that persons were selected for training on the basis of competence, aptitude, and need for the organization.

Note 5: Farming Systems Research.

Since it burst upon the scene as one of the powerful buzz words, "Farming Systems Research" (FSR) has been used to mean many things to many people, both professionals actually engaged in FSR and others. This has led to much confusion.

There are two main streams of FSR as developed by the professionals. One treats the farming system itself as the research variable. These researchers seek specifically to develop alternatives to current complete systems of farming. This stream got its start at IRRI, as multiple cropping as researchers attempted to bring other crops into what was essentially a rice production system. Some of the FAO work at Katumani apparently falls in this stream.

The other stream of FSR does not aim to make drastic changes in current systems. It aims to come to terms with the current system so that conventional research becomes more relevant to those systems. Three functions are significant. One function is to know and understand the farmer so that relevant problems can be addressed and useful signals can be sent to conventional researchers. This function can be achieved with a simple, quick process. The second function is to test a prospective improved technology in the farming system or systems in which it is expected to perform and to do these tests by criteria of the farmer, i.e. the farming system. The third function is to fine tune the technology or make minor improvement to adapt it to the farmer's (i.e. farming system) needs. These latter two functions are accomplished through on-farm trials or on-farm research.

The second stream is most common and widespread. Over time it will lead to changed systems, but it proceeds step by step so that farmers can adopt technologies more easily. Changing an entire system at one time is a "technology" or "practice" very difficult to disseminate.

Both the CIMMYT program and the FSSP program follow the second stream.

FSR is both old and new. It has been both oversold and undersold.

The United States research and extension programs have dealt in the FSR style virtually throughout their histories. It is not new in concept, although certain aspects may be and methodologies are. In most LDC's it is very new. Most LDC research, even under ideal conditions, is not tested off stations. Most LDC extension services have very few specialists. Thus researchers have extremely limited contact with both farmers and extension workers Their research is often not relevant. It is seldom carried through to completion.

In the model shown in Figure 1, research at best nearly always stops part way through the testing phase. It may be thoroughly tested on stations, but not in the system in which it is expected to perform. Without specialists, extension does not start before the dissemination phase. Thus, this is a gap in the technology innovation process that has proven fatal in many LDC programs. FSR is new in these situations.

Early in its career FSR was promoted as an alternative to conventional research. In this context it was greatly oversold. No serious researcher sees it as an alternative to conventional research today. FSR is undersold to the extent that manager do not recognize its potential to condition both conventional research and extension. Properly managed and placed in perspective, FSR can restore the integrity of the technology innovation process. This would be a major accomplishment indeed, and conditions may be emerging in Kenya to favor this accomplishment with the T&V emphasis on specialists and the acceptance of FSR by researchers.

FSR will not reduce demands on conventional research. It is more likely to increase them. A research service not in active interaction with the farm production sector must develop its research program by some sort of rule of thumb or standardized routine, and it feels no pressure for output. FSR provides a new source of research problem identification and information on research needs and opportunities. It also provides a channel by which some pressure from farmers can be applied to researchers. This pressure is being increased in Kenya by demands of T&V specialists and will increase further to the extent the planned collaboration between research and extension in on-farm research is indeed accomplished. As this pressure comes about there will also need to be important changes in research management, especially in data handling and annual planning of the research program.

FSR is in evolution, and an important event in that evolution may be ready to happen in Kenya. The CIMMYT East Africa Economics Program is one of the best programs in the world. It started as an economics survey program. It's evolution now has it very firmly in on-farm research. In fact it is called "On-Farm Research with a Farming Systems Perspective" (OFR/FSP). It has worked with extension but chiefly by using extension personnel to run research errands. There is good evidence now that Kenya extension is being moved into the process in its own interest. If this really does happen, FSR will be in position to condition both research and extension and the likelihood of restoring the integrity of the technology innovation process. One objective of a USAID initiative needs to be the improvement of probabilities that it will happen.

Viewed in another manner FSR is the mediator between the research service and the farmer. This is a vital function. The only justification for a national agricultural research program is that it improves the way farmers farm. This demands strong linkage with the farmer. Once this linkage is established, then technology from the IARC's, CRSP's and other international entities can feed into the country much more effectively.

Implementation Guidelines

Main objective of this accomplishment is to make sure the planned research-extension collaboration works and is institutionalized so that it serves the self-interest of both entities. This will require research to carry in the Technology Innovation Process farther and extension to enter the process soonor so that there is a clear and distinct overlap at least through the testing and adaptation phases. If the planned collaboration does not live up to its promise, it will likely be because they do not know and can't figure out how to make it work rather than because of lack of will and desire.

The key will most likely be development of the specialist function in extension. How the USAID handles it will be critical. This is because the specialist function, as has proved so versatile and useful in the United States is a concept largely foreign to both CIMMYT and the Kenya extension service.

Here are some guidelines:

1. Plan on one or more FSR exptriate teams of agronomist, a farm management economist, and an extension specialist. The extension specialist must be out of the U.S. system and must have had experience as a speciliast. A county agent simply cannot be expected to handle the specialist function. (In the United States there are virtually two "extensions", Field extension and Center extension, and there are substantial differences between them. Needed here is the Center extension).

Whether there is more than one team must be decided by USAID and GOK, perhaps with input from CIMMYT/East Africa.

2. Adopt completely the CIMMYT/EA approach to FSR. This requires some assurance by contract team that it can accept and work with the CIMMYT system. This may require TDY for prospective team members and even include CIMMYT participation in team selection.

3. Do not depend on CIMMYT to help develop the extension specialist role. Currently, this is not part of the CIMMYT tradition.

4. The Research Division will likely not have for a long time enough personnel to do onfarm research to the extent desireable. Extension under leadership of the specialist can supplement research. A division of functions and means for relating to each other need to be developed in the project. They cannot be predicted. A general principle is that each entity should serve its own genuine interests. If these self-interests are accurately defined collaboration will be facilitated.

5. Extension specialist personnel need to be trained to the same level as are their research counterparts. Virtually equal training will also facilitate linkage. It will also greatly improve extension's capability to carry on after the World Bank support terminates.

Project training apportunities must be open to extension. This will facilitate the expatriate team's work in helping develop the specialist function and using to develop research extension linkage.

Note 6: Institutional Linkages.

A broad array of innovating means are available to provide the experience and expertise of U.S. researchers and educators to Kenya institutions such as MALD, the Faculties of Agriculture and Veterinary Medicine at University of Nairobi, Egerton College and third university.

Conceptually, linkages could be developed to facilitate a pooling of professional interests on a sustained basis between Kenya and U.S. students and academic advisors (both during and following the student's postgraduate study), and between researchers and educators with common interests in Kenya and the United States.

1. Ph.D. level programs with formal classroom study in the U.S. to include the U.S. major professor visiting Kenya up to three times to participate in thesis research planning, counseling and review could be provided to Kenyan students. It can be profitable to support continued exchanges (one month per year) between Kenyan students and their U.S. advisors as the student takes up his professional role in the Kenya research establishment.

2. Intermittent visits by U.S. advisors to Kenya core research programs for whatever purpose (planning, needs analysis, review,) could help insure that research in Kenya makes full use of worldwide developments in science and technology.

These visits should be made by persons who assume long-term (10 or more years) commitments to Kenya to insure continuity and maximum impact.

3. Supporting in-service training for Kenyans who can arrange only intermittent absence from job duties, and who may not be pursuing a postgraduate degree.

4. Providing special, non-degree in service training in Kenya (such as in microcomputer etc.) on a continuing basis for groups of Kenyan research scientists and administrators.

These initiatives are less costly than providing long-term technical advisors, and have significant advantages in that they creat continuing professional peer relationships, both personal and institutional.

Note 7: Deferred maintenance and maintenance capability.

Critical equipment maintenance needs exist in the establishment of Kenyan basic core capability. While the team made no attempt to inventory this need, it was an item high priority with many researchers and research administrators.

The concept of a core national capability should not be compromised by a heritage of carried-over costs for deferred maintenance, especially from donor projects supplying laboratory equipment and facilities, vehicles, and staff housing to be maintained by MOALD operating budget.

It is implicit that laboratory and staff housing maintenance be predicated on a national agricultural research plan which would identify locations and facilities scheduled for long-term future use, as well as for phase out or salvage.

Laboratory and vehicle maintenance could be undertaken without delay, on the basis that any such equipment not needed by the research establishment could be re-allocated to other GOK institutions or sold.

There may be oppportunity for private sector involvement, although some needs are so specific to research that an institutional capacity would be needed.

Note 8: Counselor to the Director of Research, MALD - Job Description

Serves as counselor to Director of Research MALD (DOR), and provides:

1. Conceptual studies of alternatives for organizing the MALD research establishment, given the DOR's objectives and criteria

2. Analysis of existing staff, facilities, program, and budget resources, including on-site evaluation of programs projects and facilities throughout Kenya.

3. Assistance in initiating such activities as contractual training and research as may be adopted by MALD.

4. Plans for review procedures within staff of research proposals and training proposals of project, station, and personnel performance; and proposals for resource allocation.

5. Assistance to all management personnel in the development of management skills appropriate to Kenya.

6. Suggestions of special, short-term resource personnel as may be useful to DOR for the tasks listed above and others, and making provisions to mobilize these TDY personnel for the DOR.

Note: To a large extent counsellor must provide own job description by recognizing and exploiting opportunities and identifying and meeting needs.

Note 9: Estimated Cost Summary.

(In $Millions)

a. Training	14.8
b. Counseling and Technical Assis.	18.88
c. Deferred Maintenance and Maintainance capability	5.69
Total	39.37

a. Estimated Training Cost in Support of Agriculture and Veterinary Medical Research

1. MALD	
25 PhD degrees @ $87.5M (3 1/2 years @ $25M 1 yr.)	2.1875
75 MS degrees @ $50M (2 yrs. @ $25M 1 yr.)	3.750
100 MS degrees in Kenya @ $15M (2 yrs. @ $7.5M)	1.500
200 Diploma to B.S. in Kenya @ $7500 (1 1/2 yrs. @ $5000)	1.500
800 Units in-service training @ $1000	.800
1200 persons trained in MALD	9.7375
2. Faculty of Agriculture, Fac. of Vet. Med	
10 PhD degrees @ $87.5M	.875
15 MS degrees @ $50M	.500
	1.375
3. Egerton College	
15 PhD degrees @ $87.5M	1.3125
15 MS degrees @ $50M	.750
	2.0625
4. 3rd University of Ag.	
10 PhD degrees @ $87.5M	.875
15 MS degrees @ $50M	.750
	1.625

60 PhD
220 MSc.
1000 Other

Grand Total $14.8 X 10^6

b. Estimated Costs of Counseling/TA
(USAID Donor Projects)

1.	DOR 2 yrs @ $140M		.280
2.	MOALD		
	Maize 20 yrs @ $140		2.800
	Livestock mixed cropping 20 yrs @ 140M		2.800
	On-Farm research 10yrs @ 140		1.400
3.	Contract research support to MALD		
	Yr 1	.100	
	Yr 2	.200	
	Yrs 3-10, each year	.300	2.400
4.	Institutional linkages with MOALD		
	10 yrs @ .09		.900
	University of Nairobi		.900
	Egerton College		.900
	3rd University		.900
			3.600
			18.880

Estimated Costs of Deferred Maintenance and Development of Maintenance Capability

Deferred maintenance	
Lab equipment (100 @ .5)	.500
Laboratories 12 @ $150	1.800
Field research facilities (12 @ $75)	.900
Staff housing (240 @ $5.0)	1.200
Vehicles (500 @ $ 1.5)	.750
	5.150
Current Maint. Capability Mobile lab equip. repair vehicle	.150
Technician Trng. 3 @ $30M	.090
Mobile structural repair vehicle	.100
Mobile vehicle maint./repair vehicle vehicle 2 @ $100	.200
	.540
	5.690

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