PN-ABL-501

# Design of a Monitoring and Evaluation System for the Kenya Agricultural Research Institute (KARI)

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## III. PROJECT DESCRIPTION

### A. PROJECT GOAL

The goal of the amended project is the same as for the original project: To increase Kenya's national food security through increased agricultural productivity especially in the smallholder sector.

### B. PROJECT PURPOSE

The purpose of the amended project likewise remains the same as for the original project: To develop a well-managed national agricultural research system providing the agricultural sector with appropriate technologies which will increase productivity on a continuing basis. The Project Paper designed a 10 year project in support of a 15-20 year research development effort. In addition, the project was anticipated to be funded in two tranches.

### C. PROJECT AMENDMENT COMPONENTS

#### 1. RESEARCH PLANNING AND MANAGEMENT

Introduction

The overall objective of this component remains the same: To improve the efficiency and effectiveness of Kenya"s agricultural research system. This component is linked to and in support of all other project components. Efforts in Phase II will concentrate on building on the achievements realized in Phase I.

In Phase I notable gains have been made in establishing within KARI administrative support systems for financial management, data processing, and management information, and training KARI personnel in the use and maintenance of those systems. Specifically KARI now has automated systems to handle payroll/personnel, fixed asset management and accounting. Progress has also been made on establishing a system to determine research priorities and allocate resources. Both of the mid-term reviews spoke to the progress that had been made in these areas although the Joint Donor Review observed that much more needed to be done to move KARI in the direction of program budgeting.

With the achievements of Phase I, USAID support will be targeted in Phase II towards institutionalizing the new systems and helping managers understand their capability as decision making tools. Continued assistance is crucial at this stage if the KARI administrative team is to make the transition from being simply administrators of a large complex bureaucracy to being managers and leaders of a research organization.

Objective for Phase II

As indicated above the overall objective for this component remains the same as stated in the original project paper. However, during Phase II the emphasis will shift from the development of administrative support systems to: enhancing the efficiency of those systems, maintaining them, establishing continuing education programs for KARI staff in their use and, most importantly, sensitizing KARI management to the data base that can be brought to bare in decision making processes. Thus a major emphasis will be given to making use of the systems as Management Information Systems (MIS) rather than as simply computerized versions of what was previously done with paper and pencil.

Complementing this will be a parallel effort to install a planning and program budgeting process based on prioritization of projects/programs and allocation of resources consistent with these plans. In addition a major effort will be made to develop within KARI, systems which will allow research managers to effectively monitor and evaluate the progress of projects and the contribution individual scientists are making to those projects. A companion effort will assist KARI in developing the capability to assess the impacts of its research which in turn will feed back into an on-going priority setting process.

Overall, the emphasis in Phase II will shift from establishing the administrative structure necessary for any large organization to function, to an emphasis on improving research management per se. A major part of this will involve the development of a monitoring and evaluation system for KARI. Both KARI and USAID are committed to developing a system which will be responsive to the needs of KARI managers. The need for such a system has been widely and repeatedly expressed during Phase I. Its uses are obvious: strategic planning, policy formulation, allocating resources, measuring productivity, evaluating quality, assessing impacts, priority setting, and measuring progress toward institutional objectives are important outputs of such a system. These shifts in emphasis are elaborated upon in Annex G.1.(a), Technical Analysis Update-Component 1.

Outputs

The principle expected output remains the same as for Phase I: A viable national agricultural research program including improved systems for identification of research priorities, commodity/factor programming and evaluation, the allocation of resources, financial management, procurement of necessary goods and services, maintenance of the physical plant, manpower development, data processing and the receipt and dissemination of relevant information.

Inputs

Component inputs will concentrate on technical assistance in

management information systems, monitoring and evaluation systems, training of KARI staff and maintaining existing systems. A research management advisor/chief of party will serve for five years as the right hand of the KARI Director helping senior management determine their needs and to coordinate the other, principally short-term, technical assistance inputs.

A second individual, with a strong background in monitoring and evaluation and assessing project impacts, will be identified to assist KARI develop appropriate units to undertake these tasks. This individual would serve a two-three year term and help energize this effort as well as bridge the gap until appropriately trained KARI staff can be positioned to assume full responsibility for these activities.

Short term technical assistance will continue to be provided. Emphasis areas in Phase II will include: Maintenance of existing systems, establishing management information systems, program budgeting, extending existing management systems (e.g. expand automation process to the NRCs/RRCs as appropriate), enhance KARI's capacity to do their own training on the use of the administrative support systems, strengthening the capability of KARI's Human Resource Development Office to better undertake assessments of manpower needs and the training required to meet those needs, and station management and maintenance. An emphasis will be put on identifying and utilizing "recurrent consultants"--the same short-term individual returning over tho course of the project.

Short and longterm training will also continue under this component. Long-term training will concentrate on filling gaps in the disciplines that play key roles in monitoring and evaluation/assessing research impacts and other key niche areas (e.g. personnel management) where a special need exists. Additional long-term training is needed is the area of information dissemination and publications which will support both the needs of KARI senior management and the research programs targeted for support in Component 2.

Short-term training will emphasize much the same areas as short-term consultants. Emphasis here will be on exposing senior and mid level management to new approaches to solving problems and on providing medium term (three-six months)internship experiences. In addition, training to enhance the capabilities of administrative support staff and research/technical support staff (both at HQ and outlying Centers) is planned for Phase II.

Annex G.1.(a): Technical Analysis Update - Planning and Management Component I.

Background: Kenya's Approach to Agricultural Research.

A. Developments since 1986

The Technical Analysis for the original project paper described and commented on the Kenya agricultural research situation through 1986. It will be referenced here but not repeated. Instead focus will be on updating the analysis to include developments for the period 1987 through 1990 and elaborating on those elements which represent new emphases.

Organizationally, much has happened since 1986 in terms of how Kenya has organized itself to conduct agricultural research. In 1985 at the request of the GOK, ISNAR developed a strategy for the organization, structure,programs and priorities of a national agricultural research system for Kenya. Foremost among those was to be the establishment of a National Agricultural Research Project implemented by a new institution--the Kenya Agricultural Research Institute (KARI). With considerable donor support, the GOK has moved to implement the major components of the NARP including the consolidation of KARI, creation of National and Regional Research Centers, improved management structure within KARI, prioritized research programs, coordinated research programs, staff training, new schemes of service for employees, research/extension linkages, provision of technical assistance and multi-donor financing. While progress has been made on all fronts particularly noteworthy are the following developments all of which have occurred since 1986:

•A new KARI has been formed which has the status of a parastatal with an independent Board of Directors reporting to the Minister of Research, Science and Technology. This organizational structure has been stable for two years.

•An internal reorganization of the KARI management structure which has emphasized clearer lines of responsibility and efficiency of decision making.

•A new scheme of service designed to keep and attract skilled employees.

•Installation of new management support systems designed to provide KARI Management and the donor community with the information required.

It is USAID/Kenya's assessment that the GOK has lived up to its organizational commitments and that a well-established foundation is now in place upon which further improvements in planning and management can be added. The GOK and KARI have gone much further than simply redraw organizational charts. A completely new

organizational model with new procedures, modes of operations and policies has been established which, for the most part, has taken into account the unique needs of an organization whose primary outputs are in the area of knowledge creation.

B. Rationale for USAID Assistance to Planning and Management

This analysis remains largely the same as was presented in the original project paper, although most of the organizational impediments discussed in this section have largely been resolved. At the core, a well developed system of planning and management is essential if high quality and productive research programs are to flourish under conditions of resource constraints. In this sense , this component is inextricably linked with all the other components in the project and especially those which deal with support for specific commodity programs (e.g. maize).

II. Technical Feasibility of Expected Outputs

A. Statement of Component Purpose:

This section of the original analysis remains valid and relevant. The purpose of this component of the NARP is to improve the efficiency and effectiveness of Kenya's agricultural research system. The purpose of this component relates directly to those of the other project components-support for commodity research, human resource development and the research fund. While those will be somewhat modified in Phase II, the analysis is still pertinent. Simply stated good management is a necessary condition for an effective and productive research organization.

B. Expected Component Outputs

In summary, the principle output of this component is a viable national agricultural research including improved systems for the allocation of resources, financial control, manpower planning and the dissemination of information.

C. Discussion of Activities to Achieve the Output

Again, much of the analysis in the original project paper remains valid and will not be repeated here. The NARP was planned as a long term effort and while great progress has been made during the first four years there is still a need for carefully targeted assistance. The changes proposed are evolutionary, not revolutionary, and are designed to institutionalize the investments that have already been made and enhance other areas of management which were not able to be addressed in Phase I.

1. Office of the Director

Technical assistance to the Director's Office will be in three

forms: Long-term assistance(7-8 person years); short-term assistance in planning, program budgeting and other areas as needed; and short-term training in the form of management tours, management/leadership seminars and executive short courses.

The Research Management Advisor, who will also serve as the contractor's chief-of-party, will have the responsibility of being a key advisor to the senior management team at KARI, maintaining contact with other donors(e.g. ISNAR) to insure that duplication of effort is minimized or eliminated and that the timing of inputs is maximized, and coordinating all other inputs being provided by the contractor. We anticipate a gradual transition in these inputs from long-term TA at the start of PHASE II to increased use of short-term recurrent TA as the project progresses. Maximizing the use of these inputs will require a significant portion of the Research Management Advisor's time.

In order to strengthen the systems for monitoring and evaluation, two principle strategies will be employed. First a long-term monitoring and evaluation specialist will be assigned to the unit charged with this responsibility. It is anticipated that this individual will serve a two-three year tour. She/he will be supplemented by short-term consultants in specialized areas. In addition, long-term PhD and MS degree training in disciplines relevant to monitoring and evaluation will be undertaken as well as targeted short-term training for KARI management personnel. In the final section of this analysis there is a well developed plan for an management and evaluation system for KARI.

2. Finance and Administration

Considerable progress was made in this area during Phase I of the project. Computerized systems for payroll/personnel, accounting and fixed assets management have been installed on two local area networks (LANs) in KARI headquarters and are now fully operational. Current efforts are focused on training KARI personnel to assume administrative/management responsibility for these systems with contractor/subcontractor roles shifting to that of consultant from that of implementor and manager. It is anticipated that this transition will be fully accomplished by the Phase II begins.

While KARI is now on the threshold of taking total responsibility for its administrative support systems, a modest amount of technical assistance and training and some additional commodities will be necessary in Phase II to insure that the systems are properly maintained and that a critical mass of personnel familiar with their use is available at all times. In addition there is a need to expand the automation process beyond KARI HQ to selected centers. Finally, support for the enhancement of some of the existing systems to automate closely related tasks is planned for Phase II. For example. The current Fixed Assets management system might be modified to allow the inclusion of consumable supplies

(e.g. fuel, fertilized, seeds etc.).

Issues related to the management and maintenance of research centers will received increased attention during Phase II. The analysis in the original project paper remains pertinent except that it should be noted that the physical deterioration of structures and the shortage of space at many centers should be significantly resolved via the support KARI is receiving from the World Bank. USAID support will focus on the development of plans and procedures for maintaining facilities and equipment and on the training of center personnel (technical and administrative personnel) in the implementation of those procedures.

3. Human Resource Development

While major progress has been made in establishing an accurate picture of KARI's human resources and putting the data into a form where it can be used for planning and management decisions, much more attention needs to be given to this area. Coordinating the training activities of a large number of donors and building a personnel data base for over 6000 employees (570 scientists) who were previously located in two ministries has been a formidable challenge. However, with a reasonably accurate picture of the current situation, attention can now be focused on planning for KARI's human resource needs in both the scientific and support staff areas. This activity will have to be closely coordinated with the efforts underway to establish priority research areas and questions related to the allocation of resources. In addition, this office will need to move in the direction of building in-service training programs for a wide range of KARI employees. In all of these undertakings a moderate amount of short-term technical assistance will be required complemented by the contribution of the long-term research management advisor discussed above.

III. Appropriateness of USAID Assistance

The nature of the assistance to be financed by USAID is substantially the same as was true during Phase I although the areas in which the assistance will be targeted will shift substantially. Specifically, attention will shift from developing and installing administrative systems to fully utilizing those systems as decision making tools. Both require a mixture of long and short-term technical assistance but the nature of what is being done changes radically. Those involved will see their roles shift from "doer's" to "advisors." Overall, substantially less technical assistance will be required for this component than was true in Phase I.

Limited long-term training directed toward improved management is planned for Phase II along with a marked increase in short-term training opportunities for both senior and mid-level KARI management and technical/administrative support staff. Management

tours, short courses, internships and similar experiences have all proven to be effective tools to promote change and an expansion of these activities is planned for Phase II all of which was anticipated in the ten year project design. The targeting of monitoring and evaluation systems for attention in Phase II will require, in addition of long-term and short-term technical assistance, some long-term degree training to enhance the skills of the individuals assigned to this unit.

Since the original project paper and accompanying analyses was prepared, a number of other donors (12 in all) have signed-on to support the NARP. There has been a remarkably successful effort to coordinate donor activity which has resulted in minimal duplication of effort and relatively clear-cut divisions of responsibility. Within this component only the World Bank and the European Community can be said to have any activities at all. In the case of the World Bank, they are supporting physical infrastructure development, equipment procurement and technology transfer activities. The first two clearly complement USAID's activities and the third will be discussed in Component 2.

The situation with regard to the EC is somewhat more complicated but manageable. The EC has negotiated an agreement with the International Service for National Agricultural Research (ISNAR) to implement a management training program for KARI staff. To date ISNAR has conducted approximately five workshops for KARI management (headquarters and centers) on such topics as priority setting, scientific writing, analysis of data, and managing personnel. While ISNAR's and USAID's activities have to date been complementary, special attention will be given to insuring that close coordination and communication are maintained in the future. Already, representatives of the current USAID host country contractor have held discussions with ISNAR senior staff for the purpose of fully informing all parties about current activities and plans for the future.

## III. KARI MONITORING AND EVALUATION SYSTEM

### NEED FOR MONITORING AND EVALUATION SYSTEM

The need and justification for a comprehensive monitoring and evaluation system for KARI have been widely and repeatedly expressed during the first phase of the NARP. Various project evaluations by individual donor teams, reviews by multi-donor teams, and the top management at KARI have all clearly stated the need for a comprehensive, multi-faceted, computerized monitoring and evaluation system as an critical management tool within a management information system.

### USES OF MONITORING AND EVALUATION SYSTEM

Some of the uses of such a system are obvious: strategic planning, policy formulation, budgeting financial resources, prioritizing research thrusts, recognition of unit performance, and measurement of progress toward institutional objectives. Other tasks for a monitoring and evaluation system, while perhaps not immediately as obvious, are perhaps even more important. In addition to tracking the development of the institutional base itself (KARI), the system must:

- provide tracking of technology generation and transfer to clients (e.g. farmers, marketers, processors);

- provide tracking of the intermediate impact of the technology generated, its adoption by target groups, and/or severity of constraints limiting adoption; and

- track the long-term impact of KARI's technology generation process on national goals such as increased agricultural productivity, increased net farm income, improvement in national food security, and agro-industrial transformation.

Needless to say, any monitoring system which meets these objectives will require extensive data collection and management to provide--first and foremost--a baseline against which progress can be charted. Table 1 provides an illustrative list of a few of the many indicators of progress in the four stages of the agricultural research process: the Institutional Base, Technology Generation and Transfer, Intermediate Impact, and Long-term Impact.

BASIC CHARACTERISTICS OF THE MONITORING AND EVALUATION SYSTEM

Above all else, if the M&E system is to be useful and sustainable, it must truly be KARI's system--not a donor-imposed condition or donor-serving data collection system. KARI management and researchers must see the utility of the system, have a stake in its implementation, and contribute to its maintenance.

Much of the data collected for KARI's M&E system will have to be generated at the research project level, checked for authenticity by the RRC or NRC director, passed to the M&E unit, and then (and ONLY then) aggregated. There is no way such data can be generated "from the top down".

The M&E system must be integrated into KARI's overall work objectives, so that the M&E unit will not be seen as extrinsic to the concerns of researchers, or as a "policing" or "auditing" function.

While the M&E system's data will largely be generated "from the bottom up", the establishment of the M&E functions will have to come "from the top down". In other words, it will have to be mandated by the director of KARI. Recent experience of the small

M&E unit established in 1989 clearly demonstrates that the provision of data from the research centers on a voluntary, survey basis will not occur.

Data which will drive the M&E system must be reported on a timely basis if the system is to be useful for KARI management. Quarterly reporting of most data is desirable, but for the initial implementation of the system semi-annual data reporting may be a more realistic objective.

The sheer magnitude of the data collection and reporting function dictates that the entire M&E system be computerized. The M&E database will have to accommodate both quantitative and qualitative data, but this can readily be done with the use of micro computers such as those already in place at KARI. Consider the following numbers: KARI has some 30 research centers and substations, up to 900 separate research projects, some 550+ researchers, and more than 6,000 total personnel. Even semi-annual reporting on these components will require at least several functioning micro computers and trained operators, plus professional staff experienced in agricultural research and trained in monitoring and evaluation techniques.

Although data collection for the M&E system will occur throughout KARI, the M&E unit will have to be centrally located in KARI's headquarters to be constantly available to management. The centralized location should be accomplished when KARI moves to its new headquarters building.

By now it should be clear that if a functioning M&E unit is to systematically provide timely data to KARI management and researchers, real resources (staff, work space, equipment, and funding) will have to be allocated by the director of KARI. Furthermore, the unit will have to function under a clear mandate from the director of KARI: the directors of NRCs and RRCs will have to be held responsible for ensuring that data are provided on their respective research projects by their respective researchers.

Lastly, if the management of KARI chooses to implement an M&E system with the self-serving characteristics described above, it will in all likelihood satisfy to a high degree the reporting needs of KARI's various donor organizations. In fact, several donors are probably willing to support this M&E effort to some degree.

## TYPES OF DATA NEEDED FOR KARI'S MONITORING AND EVALUATION SYSTEM

The following tables illustrate the various types of data which must be systematically collected and maintained to constitute a functioning M&E for an agricultural research institute as large and complex as KARI.

Tables 2 through 7 indicate in detail the various measures which

can be used to chart the progress of the Institutional Base which is fundamental to a national agricultural research center such as KARI. These tables are drawn from an extensive experience base including the work of ISNAR, the International Service for National Agricultural Research. Many of the data needed for these tables (for example, see Table 2) can be provided to the M&E unit by the central management of KARI. Other data, such as annual expenditures by research program (e.g., crop, livestock, commodity), may have to be derived from the project level database.

Tables 8 and 9 deal with the extension component of the research process, and may not apply directly to KARI. However, they are included here to illustrate the type to date needed to chart the progress of the extension component of the institutional base in a complete research institution.

Table 10 illustrates the kind of data which are needed to track each new technology developed in the Technology Generation and Transfer stage of the research process. Realistic data of this nature can only be collected or estimated by the individual researchers in the various research centers.

Table 11 shows the kinds of measures which gauge the level of technology adoption associated with a specific research program focused on a given crop or commodity. Data collection of this nature will clearly have to be done at the station level, and provision for its collection would ideally be a component of the research design.

Table 12 illustrates the types of data which measure factors external to the research process (i.e., beyond the control of the KARI researchers) which nevertheless limit the successful adoption of the new technology generated by KARI's research and extension functions. Again, data on these constraints will clearly have to be collected at the research station level.

Tables 13 through 15 show the types of data which provide measures of the ultimate impact of Kenya's investment in agricultural research and technology generation. Increased agricultural productivity, increased farm income, and increased food security all key goals in Kenya's national development strategy. In the near term, KARI's agricultural research efforts may not be reflected by positive changes in the variables which measure progress toward these national objectives. However, it is critical that the KARI M&E system immediately begins collection of these data in order to provide a baseline to demonstrate positive impact in the medium and long term.

## MONITORING AND EVALUATION: LEVELS OF ANALYSIS AND LINKAGES

This approach to monitoring agricultural research groups issues,

questions and agricultural research impact indicators into four levels: the Institutional Base, Technology Generation and Transfer, Intermediate Impact, and Long-term Impact. There are linkages both within each level and among levels. Some of the indicators are clearly more important than others, but a ' 'son learned from the various evaluations which have been made the impact of research and development projects is that there are often many factors which combine to determine success, and it is their interaction as much as their individual contribution which is crucial to the outcome.

Moreover, the relative contributions of the factors measured may vary given different circumstances. For example, the constraint imposed by poor transportation and access to markets on the production and price of fruits and vegetables, which are bulky and perishable, is often much greater than is the case with cereals. If this cannot be overcome, the incentive to adopt technology which increases production of fruits and vegetables beyond subsistence needs is likely to be small. Similarly, seed companies may simply not produce bean seed varieties developed by KARI if there is a very thin market, although beans are central to the diet of each household. Farmers save their own seed, and have bred seed for a variety of characteristics without the help of researchers.

Level I: Institutional Base - At this level the over-arching objective is to assess the overall institutional capability and capacity of KARI in generating and transferring new technology to technology users. All facets of KARI are evaluated including: its management structure; human, capital and financial resources; research program monitoring, evaluation and planning processes; and linkages to technology transfer agents and users and linkages with international and other national research institutions.

Level II: Technology Generation and Transfer - Questions and indicators at this level assess the rate and the quality of technology generated and transferred to farmers, seed companies and other clients. This includes extension as a transfer agent. In looking at technology generation (i.e. research output), it is essential to consider not merely the availability of new technology, but also its appropriateness to the needs of potential clients of the research, generally (but not always) Kenya's farmers. There are many examples from Africa of research systems having produced innovations which were suited to the needs of estates or large farmers, but were either too cash-intensive (risky), or too labor-intensive to be acceptable to smallholder farmers.

To understand the diverse requirements of technology users, KARI must develop mechanisms for assessing client needs and must test its products under user conditions. KARI must also forge strong linkages with the extension services and private sector agents such as seed and fertilizer distributors, which can normally cover a

much wider spectrum of client situations than the research system. If this linkage is poor, or the extension service contacts with farmers are inadequate, the research outputs are likely to be irrelevant to meeting farmers needs or to solving farmers problems.

**Level III: Intermediate Impact** - Indicators here measure the progress made by KARI and technology transfer agents in disseminating the technology (for adoption) to the target clients, and assess the severity of the constraints limiting adoption of the new technology by clients.

**Level IV: Long-Term Impact** - The indicators used by the M&E system here examine to what extent the national agricultural research system and technology transfer agents have contributed to Kenya's national objectives as articulated in the five- to ten-year Economic Development Plan. Consideration is given to impact on productivity, the natural resource base, farm income, food security, and agro-industrial changes. Impact is assessed over a given time interval so that the issues of sustainability of the benefits, degradation or improvement of the environment, and food security can be addressed.

The multiplicity of linkages and their variability with ecological, institutional, social, and political circumstances make the choice of indicators for impact evaluation complex. Sometimes the impact of a soundly-managed and well coordinated research system is nullified by political or economic circumstances beyond its control. For example, there is clear evidence of low levels of adoption of new technology in several African countries which have experienced serious political unrest. Similarly, changes in exchange rate valuation or in world market prices can either depress or stimulate changes in land use and use of technology. Adoption of improved maize seed in Malawi is an example where producer price changes had a negative impact on adoption of improved seed, when linked with the lowering of fertilizer subsidies.

For these reasons, it is difficult to short-circuit the pursuit of a logical series of indicators in attempting to evaluate the effectiveness of a national agricultural research system such as KARI, or the impact of new technology, whether at the national level or the program/project level. However, there has been a considerable effort over the last decade, especially since the establishment of the International Service for National Agricultural Research (ISNAR), to identify the factors which determine the effectiveness of agricultural research systems and component institutions. Consequently, it is not an insuperable task to postulate what needs to be corrected or strengthened in reviewing the performance of a research institution ex post, although it may not always be easy to persuade the government concerned to institute the necessary reforms. Where a new investment in research is being considered, the experience of

national agricultural research systems accumulated by ISNAR, FAO, the World Bank, USAID, and other development assistance agencies provides a sound basis for preparation of a project which has a good chance of success in terms of research productivity.

KARI MONITORING AND EVALUATION SYSTEM
FOR THE NARP II PROJECT

**Table 1. Overview of the Agricultural Research Impact Indicator Matrix**

| LEVEL | | INDICATORS (examples) |
|---|---|---|
| I. | Institutional Base | Country development plan includes research<br>Long-term research plan |
| II. | Technology Generation & Transfer | Varieties released<br>% of research on-farm<br>Menu of technologies |
| III. | Intermediate Impact | Adoption of technology<br>% of farmers adopting technology<br>% of area affected<br>Constraints to adoption<br>- soil problems<br>- climatic variabilities<br>- availability of farm inputs<br>- access to markets<br>- adequacy of processing & storage facilities<br>- price & tax policies |
| IV. | Long-term Impact | Agricultural Productivity:<br>- Changes in yield<br>- Stability in yield<br>- Change in gross vale of production per farm by farm size<br>- Change in farm investments<br>- Change in cropping patterns & cropping intensity<br>- Changes in farming systems<br>- Change in land use & pressure on land<br>Increase in Net-farm Income:<br>- Farm income by farm size<br>- Change in farm income per farm and by commodity<br>Improvement in Food Security:<br>- Per capita food production<br>- Stability of Agricultural Production<br>Agro-industrial Transformations:<br>- Increases in number of rural-based small businesses<br>Improved Health:<br>- Increases in caloric consumption per capita |

Table 2. KARI Total Operating Budget Analysis

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Personnel Costs | | | | | |
| Operating Expenses | | | | | |
| Total Operating Budget | | | | | |
| Capital Budget | | | | | |
| Total KARI Budget | | | | | |
| Personnel Costs as % of Total Operating Budget | | | | | |
| Budget per Researcher | | | | | |
| Change in Operating Budget | | | | | |
| Government Funding: | | | | | |
| Operating Budget | | | | | |
| Capital Budget | | | | | |
| Total Gov. Funding | | | | | |
| Donor Funding: | | | | | |
| Operating Budget | | | | | |
| Capital Budget | | | | | |
| Total Donor Funding | | | | | |
| % of Operating Budget Funded by Donors | | | | | |
| % of Capital Budget Funded by Donors | | | | | |
| Change in total Donor Funding | | | | | |
| Total Ag. GDP | | | | | |
| Total Public Investment in Agriculture | | | | | |
| Research Budget as % of Total Ag. GDP | | | | | |
| Research Budget as % ublic Ag. Investment | | | | | |

Table 3. KARI Total Research Budget by Commodity

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Maize | | | | | |
| Wheat | | | | | |
| Beans | | | | | |
| Sorghum | | | | | |
| Other | | | | | |
| Total Operating Budget | | | | | |

**Table 4. KARI Total Research Staff Analysis**

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Research Scientists: | | | | | |
| BSc | | | | | |
| MS | | | | | |
| PhD | | | | | |
| Total Number of Research Scientists | | | | | |
| Postgraduate as % of Total Research Scientists | | | | | |
| Technicians: | | | | | |
| Trained | | | | | |
| All Other | | | | | |
| Total Number of Technicians | | | | | |
| Administrative & Support Staff | | | | | |
| Total KARI Staff | | | | | |
| Ratio of Technicians to Scientists | | | | | |

**Table 5. KARI Distribution of Scientific Staff by Discipline**

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Plant Science: | | | | | |
| Breeding | | | | | |
| Pathology | | | | | |
| Entomology | | | | | |
| Soil Science: | | | | | |
| Agronomy | | | | | |
| Chemistry | | | | | |
| Taxonomy | | | | | |
| Animal Science: | | | | | |
| Breeding | | | | | |
| Husbandry | | | | | |
| Veterinary | | | | | |
| Social Sciences: | | | | | |
| Agro-business | | | | | |
| Economics | | | | | |
| Sociology | | | | | |
| Marketing | | | | | |
| Engineering: | | | | | |
| Mechanics | | | | | |
| Irrigation | | | | | |

**Table 6. Distribution of Research Staff by Program**
**Program:_____**

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Research Scientists: | | | | | |
| BSc | | | | | |
| MS | | | | | |
| PhD | | | | | |
| Total Number of Research Scientists | | | | | |
| Postgraduate as % of Total Research Scientists | | | | | |
| Technicians: | | | | | |
| Trained | | | | | |
| All Other | | | | | |
| Total Number of Technicians | | | | | |
| Administrative & Support Staff | | | | | |
| Total Research Staff | | | | | |
| Ratio of Technicians to Scientists | | | | | |

**Table 7. Distribution of Program Scientific Staff by Discipline**
**Program: _____**

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Plant Science: | | | | | |
| Breeding | | | | | |
| Pathology | | | | | |
| Entomology | | | | | |
| Soil Science: | | | | | |
| Agronomy | | | | | |
| Chemistry | | | | | |
| Taxonomy | | | | | |
| Animal Science: | | | | | |
| Breeding | | | | | |
| Husbandry | | | | | |
| Veterinary | | | | | |
| Social Sciences: | | | | | |
| Agro-business | | | | | |
| Economics | | | | | |
| Sociology | | | | | |
| Marketing | | | | | |
| Engineering: | | | | | |
| Mechanics | | | | | |
| Irrigation | | | | | |

**Table 8. Extension Service Total Operating Budget Analysis**

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Salaries & Wages | | | | | |
| Operating Expense | | | | | |
| Total Operating Budget | | | | | |
| Capital Budget | | | | | |
| Total Extension Budget | | | | | |
| Salary & Wages as % of Total Operating Budget | | | | | |
| Budget per Ext. Officer | | | | | |
| Change in Operating Budget | | | | | |
| Government Funding: | | | | | |
| Operating Budget | | | | | |
| Capital Budget | | | | | |
| Total Gov. Funding | | | | | |
| Donor Funding: | | | | | |
| Operating Budget | | | | | |
| Capital Budget | | | | | |
| Total Donor Funding | | | | | |
| % of Operating Budget Funded by Donors | | | | | |
| % of Capital Budget Funded by Donors | | | | | |
| Change in Total Donor Funding | | | | | |
| Extension Budget as % of Total Ag. GDP | | | | | |
| Extension Budget as % Public Ag. Investment | | | | | |

**Table 9. Distribution of Extension Service Staff by Gender**

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Extension Officers | | | | | |
| Male | | | | | |
| Female | | | | | |
| Administrative & Support Staff | | | | | |
| Total Extension Workers | | | | | |
| Number of Farmers: | | | | | |
| Male | | | | | |
| Female | | | | | |
| Total Number of Farmers | | | | | |
| Farmers per Extension Officers: | | | | | |
| Male Farmers per Male Extension Officer | | | | | |
| Female Farmers per Female Extension Worker | | | | | |
| All Farmers to All Extension Officers | | | | | |

**Table 10: New Technologies Generated & Transferred**
**Commodity:_____**

| | Variety 1 | Variety 2 | Variety 3 | etc. |
|---|---|---|---|---|
| Name of variety | | | | |
| Date Released | | | | |
| Agro-ecological Zone:<br>Altitude<br>Rainfall<br>Soil-type | | | | |
| Days to Maturity | | | | |
| Recommended Farming System | | | | |
| Expected Yield | | | | |
| Input Use:<br>Seed (Ton/Hec)<br>Fertilizer (Kg/Hec)<br>Pesticides (Kg/Hec) | | | | |
| Storing Quality (1=poor, 5=Excellent) | | | | |
| Taste (1=poor, 5=Excellent) | | | | |
| Relative Price Index | | | | |
| Number of Collaborator & Client Trained:<br>Short Term<br>Long Term<br>Degree<br>Non-degree | | | | |
| % of Arable Land to be affected | | | | |

**Table 11. Level of Technology Adoption**
**Program/Commodity:_____**

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Total Arable Area | | | | | |
| Total Crop Area | | | | | |
| Total Program Area | | | | | |
| Affected Area as % Of: | | | | | |
| Total Arable Area | | | | | |
| Total Crop Area | | | | | |
| Total Program Area | | | | | |
| Total Production: | | | | | |
| Arable Area | | | | | |
| Crop Area | | | | | |
| Program Area | | | | | |
| Change in Yield: | | | | | |
| Arable Area | | | | | |
| Crop Area | | | | | |
| Program Area | | | | | |
| % of Farmers Adopting New Technology in: | | | | | |
| Arable Area | | | | | |
| Crop Area | | | | | |
| Program Area | | | | | |
| By Farm Size | | | | | |
| By Gender | | | | | |

Table 12. Factors Limiting Technology Adoption
Program/Commodity: _____

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Farm-To-Market Roads (in Kilometers) | | | | | |
| Change in Farm-to-Market Roads (in Kilometers) | | | | | |
| Average Distance to the Nearest Seed Outlet | | | | | |
| Average Distance to the Nearest Fertilizer Outlet | | | | | |
| Average Distance to the Nearest Pesticide Outlet | | | | | |
| Farm Credit Available: | | | | | |
| Total | | | | | |
| By Farm Size | | | | | |
| Change in Avail. Farm Credit: | | | | | |
| Total | | | | | |
| By Farm Size | | | | | |
| Value of Production | | | | | |
| Value of Farm Input | | | | | |
| Ratio of Value of Production to Value of Farm Inputs | | | | | |

**Table 13. Impact on Agricultural Productivity**
**Commodity: _____**

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Aggregate Production ('000 of Metric Tones) | | | | | |
| Crop Area ('000 Hectare) | | | | | |
| Change in Aggregate Production | | | | | |
| Yield (MT/Hec) | | | | | |
| Change in Yield | | | | | |
| Expenditure on Ag. Inputs | | | | | |
| Change in Expenditure on Ag. Inputs | | | | | |
| Value of Production: per Hectare | | | | | |
| per Farm (by size) | | | | | |
| Value of Production as % of GDP | | | | | |
| Value of Production as % of total Public Investment in Agriculture | | | | | |

Table 14. Impact on Farm Income

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| National Level: | | | | | |
| Gross Farm Income | | | | | |
| Cost of Ag. Inputs | | | | | |
| Cost of Hired Labor | | | | | |
| Net Farm Income | | | | | |
| Change in Net Farm Income | | | | | |
| Distribution of Net Farm Income by Commodity: | | | | | |
| Commodity 1 | | | | | |
| etc. | | | | | |
| Change in Net Farm Income by Commodity: | | | | | |
| Commodity 1 | | | | | |
| etc. | | | | | |
| Distribution of Net Farm Income by Farm Size: | | | | | |
| Farm Size 1 | | | | | |
| etc. | | | | | |
| Change in Net Farm Income by Farm Size: | | | | | |
| Farm Size 1 | | | | | |
| etc. | | | | | |
| Change in Distribution of Net Farm Income by Gender | | | | | |
| Female owned Farms | | | | | |
| Male owned Farms | | | | | |

Table 15. Impact on Food Security
Commodities: _____

| | 19xx | 19xx | 19xx | 19xx | 19xx |
|---|---|---|---|---|---|
| Value of Total Food Production | | | | | |
| Value of Total Food Imports | | | | | |
| Less Value of Total Food Exports | | | | | |
| Less Buffer Stock | | | | | |
| Total Value of Food Consumption | | | | | |
| Value of Food Consumption per Capita | | | | | |
| Change in Value of per Capita Food Consumption | | | | | |
| Value of Food Imports per Capita | | | | | |
| Change in Value of Food Exports per Capita | | | | | |
| Change in Value of Buffer Stock | | | | | |