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STAFF SUMMARY REPORT

WORKSHOP ON RESEARCH MANAGEMENT FOR DEVELOPMENT PLANNING

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Background

Since 1971 the Ghanaian Council for Scientific and Industrial Research (CSIR) and the U.S. National Academy of Sciences (NAS) have been engaged in a joint collaborative program aimed at developing local capability to relate science and technology more effectively to solving economic and social problems in Ghana. Initially, the cooperative program took the form of workshops aimed at examining institutional mechanisms for formulating science policy, identifying research priorities and problems in the execution of research in Ghana, and finding ways to make agricultural research results available to user agencies. The three most significant of these workshops have been on the following subjects:

- 1971 Research priorities and problems in the execution of research in Ghana;
- 1971 Agricultural research and extension;
- 1972 The role of CSIR in determining science policy and research priorities.

These workshops and subsequent discussions culminated in the signing of a Science and Technology Project Agreement in 1974 between the Government of Ghana and the USAID Mission to provide support for a continuation of these planning activities. Under this agreement, it was expected that a project would be developed to formulate an institutional mechanism for project design and analysis, and to create opportunities for the CSIR to increase its capabilities for research management.

The first sub-project undertaken under this agreement to create the opportunity for the application of technical and management skills to a

national problem was the Northeastern Ghana Savannah Research Project (NGSRP). The focus of this project was to "assess technically the present and potential impact of drought on agricultural and rural development of the Savannah Region of Northern and Upper Ghana."

The research undertaken for the NGSRP was completed in 1979 and, at the request of the USAID Mission to Ghana and the CSIR, Dr. Priscilla C. Reining, American Association for the Advancement of Science, and Dr. Gerald Matlock, University of Arizona, spent approximately one month in Ghana in October 1979 assisting the CSIR to complete the final report of the project. At that time, Dr. Reining and Dr. Edward S. Ayensu (Director, Office of Biological Conservation, Smithsonian Institution), both of whom are members of the NAS Board on Science and Technology for International Development, discussed with the USAID Mission and CSIR officials the desirability of convening a further joint workshop to examine the experiences of the NGSRP and the management of multidisciplinary research projects in Ghana to support national development objectives. Subsequent meetings between USAID Mission and CSIR officials, Drs. Ayensu and Reining, and NAS staff in Washington and Ghana confirmed the arrangements and details of the workshop. Financial support for NAS participation was available under Contract AID/afr-G-1307 with the USAID Mission, which also provided support to the CSIR. NAS staff support costs were provided by the Development Support Bureau's Office of Science and Technology, under Contract AID/ta-C-1433.

Highlights and Observations

The workshop was held at a time when Ghana is undergoing a transition from a succession of military governments to an elected democratic government, which was installed in September 1979. This period has also been one of severe economic strain for the country and its people, with high inflation and many problems of supplying basic necessities to the population.

In this context, it was particularly encouraging to observe the high level of interest which the workshop generated within the research community and in government and technical assistance communities. Participation by some 70 Ghanaian scientists was approximately double the anticipated level, and the large numbers did not diminish the traditional Ghanaian candor in bringing the fundamental issues out into the open. All the workshop sessions were enthusiastically attended, and the discussions continued after the sessions in the corridors and on the subsequent field trips. The CSIR staff worked heroically to complete the report of the workshop by the end of the week, and edited versions were to be presented to the USAID Mission Director soon thereafter.

The discussions indicated a high level of concern and commitment on the part of the research community to become more effectively engaged

in research linked to national development objectives. The scientists repeatedly pointed out that in spite of the statement of government priorities for science and technology in the 5-year development plan, it is not being given the appropriate attention by organizations such as the CSIR and that the implementing agencies, the government ministries, do not have budgetary allocations to follow up research and implement worthwhile results. The opportunity to point this out in an organized public forum sponsored by the new government was seen as an important achievement. Participants clearly felt that the mechanisms for solving national problems are not working well; there was continual reference to a lack of leadership and, in the implementing agencies, little concern for the plight of the rural farmers, though the research information for improving farm productivity is available. Accountability was repeatedly stressed as was the need for better management and use of resources. There was a clear indication that the resources, in spite of the drain of research staff to other countries and the national financial plight, are considerable and need to be harnessed in a national effort. How this is to be achieved, however, was not so clear. Some called for the restructuring of the CSIR; others felt that the research community will be the same whatever the structure, and what is needed rather is a clear indication of national priority objectives by the government, backed by funds to implement the technical solutions the research community can provide.

It was evident to the NAS panel that the workshop did achieve its objective of identifying the managerial elements which are required for the organization of successful national applied research projects.

Beyond this, it made recommendations for needed actions in priority areas of food production, postharvest technology, energy and rural employment, as well as the completion of the original Northeastern Ghana Savannah Research Project.

The workshop provided an opportunity for researchers and members of the user community who are not accustomed to meeting to discuss their common interests with a forum to do this, and the occasion was warmly welcomed. It also provided the CSIR's Planning and Analysis Group with the experience of mounting a large international workshop, which it accomplished efficiently and successfully, providing the bulk of the staff work in the preparations of the reports and other conference logistics. As a result, in contrast to workshops in many other countries, BOSTID staff members were not expected to be responsible for these tasks.

The visits to the field sites provided participants very useful opportunities to observe at first hand representative types of commodity-oriented applied research. The visit to the Volta Dam at Akosombo was especially interesting in view of the importance of the dam in the country's energy supply and as an earner of foreign exchange, and because it is a good example of a large technical management project that works smoothly and efficiently. Other sites visited included the University of Ghana irrigated rice and sugar cane project at Kpong Research Station, the Bank of Ghana cattle ranch, Shai Hills, the Oil Palm Research Station at Kusi, and the Cocoa Research Institute at Tafo. The quality of presentations was high, and morale and the level of accomplishment achieved under very difficult conditions were impressive; the difficult conditions had not affected the traditional Ghanaian hospitality.

The energy specialist on the NAS panel, Dr. Russell J. deLucia, spent two days of intensive discussions with members of the National Energy Committee concerning a national energy survey which Ghana is proposing to undertake in cooperation with USAID and the World Bank. Dr. Ayensu visited the Weiija Dam, which supports electrical generation and aquaculture, with Dr. de Graft-Johnson, the Vice-President. He advised officials regarding the control of the aquatic weed Pistia sp., which is found in the dam (as well as in the dam at Kpong) and which can be used as animal feed, as the BOSTID report Making Aquatic Weeds Useful indicated.

Dr. Dow and Dr. Rabinowitch visited a number of private farms which are producing large quantities of cereals (rice and maize), vegetables, and animal products with irrigation based on earth dam impounded rainwater. These operations are evidently thriving, in spite of difficulties in obtaining imported spares and purchasing animal feed locally. However, it was also clear that further development of the Plains for farming, as well as the dramatic deforestation occurring as trees are used for firewood and charcoal, will place a severe strain on the ecology, and measures will have to be taken to protect the area from erosion and other destructive environmental consequences.

The Workshop

Organization

In attempting not only to cover, in three days, the review of the NGSRP but to identify other areas in which integrated research related to national development objectives could be managed and implemented by the CSIR and other Ghanaian organizations, the workshop was divided into two sections. The first, dealing with the NGSRP, occupied the remainder of the first day following the opening ceremonies, and a final session on the last day in which lessons learnt were to be reviewed. The second day and part of the third day were taken up with discussions of other priority areas for applied research management. The theme of the discussions was "The Process of Research for National Development," and it was agreed to divide the discussions into three sections:

- 1) Determination of research priorities in the context of national development;
- 2) Definition of the role of the CSIR in determining priorities and undertaking priority research;
- 3) Project management:
 - identification of an appropriate institutional framework;
 - mechanisms for promoting collaborative research;
 - translation of research results into practical applications.

The workshop participants were divided into four working groups to consider these questions under the broad areas of:

- 1) Postharvest technology;
- 2) Food production;
- 3) Rural industry (and employment generation);
- 4) Energy.

The following sections of this summary report contain the presentations and reports of discussions in the various working groups.

Background, Planning, and Management of the Northeastern Ghana Savannah Research Project (NGSRP)

Dr. H. K. Quartey-Papafio gave a brief account of how the Northeastern Ghana Savannah Research Project came into being. One of the responsibilities of the Council for Scientific and Industrial Research is to advise the Government on scientific and technological matters affecting the utilization and conservation of the natural resources of the country and on how scientific research should be coordinated and employed in the interest of such utilization and conservation. With regard to this function, particularly the need to establish an effective coordinating machinery for scientific and technological research that will provide the necessary advice to the Government on the use of the country's natural resources, the Council set up the Conservation of Natural Resources Committee in May 1971 to coordinate multidisciplinary natural resource studies generally and to keep under regular review factors affecting the natural resources of the country, particularly the land and forests, and the extent to which these resources are being utilized judiciously.

The Committee was a truly multidisciplinary group, including representatives from the research institutes of the CSIR, the universities, relevant government ministries and departments, such as the Ministry of Agriculture, University of Science and Technology, University of Cape Coast, Forestry Department, and Geological Department. One of the major tasks with which this Committee concerned itself initially was the question of the possible effect on Ghana of the Sahelian drought which had brought untold hardships, loss of lives, and virtual extinction of livestock herds, vital to the nomadic populations in the six countries affected by this drought; namely, Upper Volta, Mali, Niger, Chad, Senegal, and Mauritania.

In fact, there was the strong belief among some scientists that the Sahelian drought was tending to move southwards. It was therefore the view of the Council that should such changes take place which could not be recognized immediately, the northern part of Ghana would be adversely affected since it shares boundaries with Upper Volta, one of the afflicted countries that already suffers from poor distribution of rainfall and widespread sheet erosion.

In response to the Council's request for assistance in determining what course of action to take in finding long-term solutions to the direct or indirect effects of the Sahelian drought on the northern sector of Ghana, USAID sent Dr. Jack Johnson, who is Director of Arid Lands Studies at the University of Arizona and has wide experience in arid ecology, to Ghana in 1974 to conduct preliminary investigations into areas in the Northern and Upper Regions, which were known to be experiencing long dry spells. In his report, Dr. Johnson recommended, among other things, that there was need to carry out a comprehensive study of the ecological and socioeconomic conditions in the north, particularly the northeast sector of the Upper Region where deteriorating weather and food production seemed to have set in. USAID also made a grant available for the preparation of an annotated bibliography of the Northern Savannah Lands. This work was undertaken by Dr. George Benneh, then Senior Lecturer in Geography at the University of Ghana and now Minister of Lands, Natural Resources, Fuel and Power.

In July 1974, a delegation from the CSIR visited the United States to discuss Dr. Johnson's report with U.S. officials and, as an outcome of these discussions, a joint US-CSIR Design Team comprising scientists

from the United States and the Conservation of Natural Resources Committee met later in the year in Ghana to draw up a detailed study plan.

The Design Team was entrusted with the following assignments:

- 1) to examine the present and potential impact of drought in the Savannah Region of Ghana with a view to assessing its short- and long-term effect on agricultural production and the well-being of the people of the area;
- 2) to identify specific problems relevant to the causes and consequences of drought;
- 3) to propose a detailed study plan to assist the Conservation of Natural Resources Committee to use existing educational research and technological resources most effectively in carrying out the necessary studies; and insofar as possible, scientific manpower needs should be identified;
- 4) to suggest specific opportunities for international cooperation;
- 5) to prepare a report of its findings to the Executive Chairman of the CSIR through the Conservation of Natural Resources Committee.

In particular, the Design Team's attention was drawn to one of the vital functions of the CSIR, which is to "coordinate research in all its aspects in the country and, in particular, to provide machinery which will ensure that the Council, the research institutes of the Council, the universities of Ghana, and other institutions engaged in research in Ghana coordinate their research efforts and cooperate in research." While it was felt that there were a number of competent scientific research institutes and personnel in Ghana capable of pooling resources in conducting such research, it was also recognized that there might be

some studies which would call for cooperation with foreign institutions and personnel.

The Design Team identified four basic lines of research investigations of situations which it regarded as contributing factors to land degradation and desertification in the project area, namely: (1) cultivation practices, (2) burning, (3) water availability and distribution, and (4) overgrazing and deforestation. The team also identified a fifth research study covering the development of a socioeconomic/natural resource data base for analysis purposes and as an input to the other research studies.

The specific objectives of all these research studies were defined by the Design Team as follows:

- 1) to strengthen the capability of the Ghanaian scientific community to conduct interdisciplinary research which contributes directly and significantly to the short-term solution of critical problems of socioeconomic development, particularly in the areas of agricultural production and the improved health and economic well-being of the peoples of the study areas.
- 2) to identify more clearly, analyze, and enumerate the factors involved in possible desertification in the savannah zone of Northern Ghana.
- 3) to investigate and implement cultural and management practices which will halt and even reverse the trend toward increasing land degradation in the northeastern area of Ghana, with a constant view to improving the living standards of the rural people.

- 4) to design a coherent integrated program which will stimulate and contribute to international programs in this area and will attract funds from a wide variety of sources.

Planning of the Project

After the necessary funding was obtained from the USAID for implementation of the project, interested scientists were requested to submit proposals for the implementation of the various sub-projects indicating in detail the methodology to be used in achieving the objectives of the sub-projects and the equipment and funds required. Those proposals that were found to be in line with the overall project objectives were selected for funding. New ideas proposed by the investigators were, in certain cases, incorporated into the studies, particularly when they were found to enhance the prospects of smooth integration with the other sub-projects. A new sub-project on remote sensing was later included in the research studies in order to determine the applicability of this new technology in monitoring activities thought to be responsible for land degradation in the project area. Each sub-project, as designed, invariably consisted of distinct research components which had to be undertaken by investigators of different disciplines. Consequently, where it became necessary for two or more scientists to be involved in the implementation of a sub-project, a principal investigator was nominated as the leader and coordinator of that sub-project.

The principal investigator also had to perform the vital function of ensuring that the work of the individual members of his team remained on target and within the objectives of the sub-project. Further, as the objectives of one sub-project were likely to overlap with another sub-project, close collaboration and interchange of ideas among the various

investigators or researchers became necessary. Consequently, provision was made in the planning of this project for meetings and seminars to be held at regular intervals throughout the implementation of the project.

It was also found desirable to initiate a sub-project in the course of implementing the research proposals for the purpose of integrating the five sub-projects into a well conceived and meaningful report which reflected the overall objectives of the project. In this connection, two USAID-sponsored consultants visited Ghana from 8 October to 1 November 1979 to assist the PMG in integrating the project and preparing a final report; they were Dr. W. G. Marlock of the University of Arizona and Dr. Priscilla C. Reining of the American Association for the Advancement of Science. During their stay, they visited the project site and participated in a two-day workshop from 25 to 26 October to finalize the integration exercise.

Project Management

The Executive Chairman of the CSIR, acting through the Committee on Natural Resources, was made responsible for the overall management and administration of the project. As the membership of this committee was rather broad, it appointed an eight-member Project Management Group (PMG) to be responsible for policy direction, review of projects, budgetary allocation, seminars, consideration of progress reports, and other administrative and technical matters. A project coordinator was appointed and made responsible for the day-to-day administration of the project. He also served as the secretary and an ex officio member of the PMG. Dr. Matlock made routine visits to Ghana to undertake semiannual progress review and evaluation of the project and to hold discussions with the PMG.

The administrative management of the project initially posed a serious problem to the PMG as well as to the project coordinator, who was the chief contact between the different project investigators. The main difficulty was in bringing the different disciplines together into a cohesive working team. This problem arose since most investigators had not been used to working collaboratively within the confines of an interdisciplinary problem-solving project. However, an integrating seminar organized by the PCM at the University of Science and Technology in Kumasi in July 1976 and the Socioeconomic Land Use and Burning Exposition at the American Center in Accra in July 1977 as well as the several meetings held with the investigators contributed in no small measure to focus attention on the vital need for constant communication and exchange of ideas between investigators assigned to the various sub-projects.

Another problem with which the PMG had to grapple was the control and disbursement of funds. While admittedly management was a little slow in responding to requests from sub-project investigators for funds, materials, and transport, it is equally true that investigators often were slow in providing proper justification of their expenditures and in submitting progress reports on their research studies regularly and on time. Different institutions which were involved in the project were not familiar with the financial procedures of the CSIR, and the CSIR itself had to become familiar with AID's financial management procedures before project funds could be released. Incentives offered to the investigators, who had their own institutional assignments to accomplish, were inadequate.

Management also discovered that in a few cases there was a strong tendency among investigators toward academic research which would lead to independent publication of their research findings instead of research studies geared fully to the overall objectives of the project.

The PMG also realized that the remoteness of the project caused investigators logistic problems. Traveling to the area required approximately two days and, in view of the limited facilities available at the site, it was not possible for many investigators to spend more than a few days in the area at one time. The PMG itself had difficulty in meeting regularly since members often could not make themselves available at the same time due to other pressing commitments.

Although some of the problems which faced the PMG in administering the project are highlighted, the accomplishments recorded far outweigh these shortcomings, which serve as experiences that could aid and guide the CSIR in the design of further interdisciplinary research projects. The overall results of the project can be regarded in this light as impressive and encouraging.

There now needs to be follow-up to ensure the effective transfer of these research studies findings to the grass-roots level in order to assist the farmers in the project area to improve their lot. The important fact to note is that if a new technique is to be transferred or extended to the farmer, it must be shown to work, and the farmer must be convinced that he stands to gain in hard cash or benefit in some other way by adopting it. The project has, in fact, been designed to achieve this goal, and effective coordination between the CSIR and the Ministry of Agriculture and

other agencies for the implementation of these recommendations in the report will be of immediate benefit to farmers in the project area.

Discussion

A complaint was made that the flow of funds to investigators was not systematic. In some cases, expenses were incurred by investigators for which reimbursement was unduly delayed due to lack of uniformity in the accounting systems and procedures of the different institutions involved. It was pointed out that funding agencies, such as USAID, have their specific accounting requirements without which funds cannot be disbursed. This difficulty could have been lessened, however, if researchers had been prompt in the justification of their expenditures and in submitting their claims. It was therefore emphasized that proper accountability by researchers is essential to research management.

An observation was made that the PMG was largely composed of members drawn from the user community outside the CSIR. PMG members from the government ministries were responsible for representing the needs and interests of the user parties, e.g., the Ministry of Agriculture represented the interest of the farmers. Unfortunately, members of the PMG could not meet as frequently as was desirable to monitor progress, make necessary decisions, and consider how the results could be transferred. It was then pointed out that the NGSRP was designed to expose scientists to methods for planning and management of multidisciplinary and inter-institutional research, rather than to implement results.

Also raised was the question of whether the changes in government have influenced the order of priorities of national objectives or goals.

This question was considered not directly relevant because the same problems appeared to persist and require appropriate solutions by all governments. However, the NGSRP was not linked directly with any specific target in the national development context. What is important is that the results obtained from this investigation would be passed on to the relevant ministry for implementation or adoption.

It was noted that since researchers had other research commitments, it was difficult to coordinate the time schedule for project investigation and the timely release of funds allocated. This appeared unusual since the institutions concerned had already consented to participate in the project. This anomaly was attributed to the fact that the project had little control over the funds allocated to the institutions or the time schedule of the research investigators for the project.

It was also pointed out that even though the project study represented an experiment in research management, it did not address itself to the question of the transfer of results in the field. This is an important point to be considered in future planning.

BURNING

EFFECT OF BUSH FIRES ON SITE FACTORS WITHIN THE SAVANNAH ZONE OF GHANA

J. BROOKMAN-AMISSAH

The object of the study was the effect of fire on site factors within the savannah woodland zone of Ghana. We thought this sub-project would fit into the NGSRP because it appears to be related to it along two lines, by the linkages which exist between the major causes of these bush-fires and the cultural habits of the zone, i.e. crop cultivation practices, animal husbandry and hunting and perhaps the mere joy of seeing a good fire and also the linkages, which exist between these bush-fires and degradation of the resources which the project seeks to conserve. By conserve, I imply judicious utilization of renewable resources. When I speak of degradation, I am thinking of soil degradation, resulting in reduced crop yields, loss of woody vegetation and I am sure we are aware of what wood means to the arid community, energy source, domestic implements and also its impact on the global environment.

We also felt that most of the pronouncements made about the effect of fires on site factors were mainly qualitative. We saw in the project and also plots established in the Red Volta West Forest Reserve, an opportunity to quantify some of these effects.

We studied the effect of fire on development of woody vegetation, both growth and species distribution, the effect of fire on grasses and forbs and the effect of fire on the soil.

Results

1. Our results indicate better basal area development on the protected plot.
2. More diversity among woody species on the protected plot.
3. Large basal area of grasses on the burnt plots, no difference between early burning and late burning. The extent of basal area is not reflected in the grass biomass.
4. Higher soil nutritional status, total nitrogen and organic matter with protection.
5. Greater bulk density on the burnt plots. These we think may relate to the works of other sub-groups - surface runoff, erosion, siltation, etc.

We did not estimate the extent of burning. This has been covered by the Remote Sensing Group.

We made contact with the locals and identified some of their needs from the forests. Local names and use of some trees have been given in the report.

The sub-group members were:-

Mr. J.B. Hall - Legon
 Dr. M.D. Swanie - Legon
 Mr. J.Y. Attakrah - Forest Products Research Institute

Co-ordination was very satisfactory within our little group: taxonomist, statistician, soil scientist and forester.

Co-ordination between us and other sub-groups, apart from the Kumasi Workshop, the Socio-Economic and Burning Exposé, a chance trip with Dr. Maud and the Integration Workshop, was almost nil.

Like other project officers, we were disturbed by distance and I must say my Legon colleagues had to work over-time with no special incentives.

I must also say our project was a small one with a small budget and naturally did not have much problem with financing. I do not think here I echo the feelings of other project leaders. Equipment for measurement of fire intensity never arrived.

EFFECT OF DIFFERENT CULTURAL PRACTICES ON
SOIL DEGRADATION

MENSAH BONSU

In this Workshop, my statement is going to be based on my experiences on the effect of different cultivation practices on soil degradation, a sub-project of the Northeast Ghana Savannah Research Project (NGSRP).

Factors affecting land degradation in northeastern savannah areas of Ghana may be described as diversified. However, improper cultivation practices are among the major bottlenecks hampering agricultural advancement in this region.

In the dry season, the land becomes virtually devoid of vegetation so that with the onset of the rains, erosion and runoff are consequently accelerated. But the adverse effect of soil erosion cannot be over-emphasized. The shallow top soil which characterises this area and supports arable crops is the first to be eroded. The sub-soil that consequently becomes exposed, is normally poor in supporting vegetation.

Securing an effective measure to combat land degradation in this area requires a multi-disciplinary and inter-institutional approach. It also requires the effort of the Soil Scientist, the Agronomist, the Agricultural Engineer, the Economist, the Sociologist, etc. to work in collaboration in order to come out with effective solution to this problem affecting soil productivity.

The Agronomist must come out with efficient crop management practices such as proper cultivation methods, optimum plant population, plant protection, crop residue management, suitable crop rotations, cover crops etc. while the Soil Scientist must come out with a map identifying the areas according to their capability so that the farmers do not cultivate the marginal lands indiscriminately. He must also evolve a programme giving details of balanced fertilizers required by the various crops grown in the area. Where pressure on the land requires that marginal lands, such as lands on steep slopes be used for farming purposes, the Agricultural Engineer must research into the proper soil conservation supplementary practices, such as contouring, strip cropping and terracing necessary to check erosion in this area.

Once the foregoing disciplines have worked together to achieve a common goal, their activities must be co-ordinated along socio-economic lines. The Economist is to analyse the productive elements within the system and come out with quantitative assessment as to whether or not it is profitable to embark on the project judging from the feasibility studies prior to the commencement of the project.

When the project takes off, the cost/benefit ratio must be evaluated to find out whether the project is yielding the desired results or not.

For the local farmers to accept the practices, they have to be educated through effective extension services that the new practices are superior to what they are used to. Films translated into local languages, showing the proper soil conservation measures, should be shown to the farmers.

A survey should be conducted to find out the extent of degradation of agricultural lands, forest lands, grasslands, and cultivable waste lands, as a result of erosion. The government should institute soil and water conservation development programmes with emphasis on integrated land use, planning and watershed management. (I must stress here that soil and water conservation measures conserve not only the soil and water, but also conserve soil fertility and increase crop yields). The National Soil and Water Conservation Development Programme should later be sub-programmed on regional basis to make the work more practical.

In setting up this programme, the government must realize that soil and water conservation can be done only in the field. There, in developing the regional centres, proper work conditions such as good housing, water, medical facilities, light and other necessary infrastructure must be considered. Research information accrued from the programme must be communicated to the local farmers through extension officers well trained in the programme.

THE GROWTH AND ADAPTABILITY OF VARIOUS TREE SPECIES
ON THE IMPOVERISHED SITES IN THE TAMNE RIVER BASIN

S.P.K. BRITVUM

The natural vegetation which once provided cover for the soil, fodder for cattle, and poles and fuelwood for domestic purposes, has been destroyed as a result of agriculture and repeated bush fires. The soils have been rendered unproductive as a result of soil erosion. The wood requirement of the growing population can hardly be met from the existing tree cover. There is therefore the need to grow trees. The object of the study was to investigate the growth and adaptability of various species on the poor sites.

Fourteen different species made up of exotic and indigenous species were planted on different sites with different soil types. The species included Eucalyptus species, Acacia spp. Casuarina equisetifolia. There is lack of knowledge on how trees growing on these impoverished sites respond to fertilizer treatments. An attempt was made to find out the effect of nitrogen, nitrogen plus phosphorus, and organic matter (cowdung) on six of the species planted.

Assessment for survival of the various species after 18 months of growth showed a good percentage of survival (16 - 98%) for many of the species on the sites where the soils are of the Varampere Association. The survival of most of the species was poor on the soils of the Pusiga Association; many of the species failed completely. The species which showed good percentage of survival included Eucalyptus tereticornis, E. cadambae, Casuarina equisetifolia, Acacia sieberiana and Celiba pentandra.

The species which showed very good height growth at the age of 18 months included the Eucalyptus spp. Casuarina equisetifolia and silk cotton tree. Eucalyptus tereticornis attained a height growth of 3-4 metres in 18 months.

Nitrogen phosphate was the best fertilizer for Eucalyptus tereticornis; height growth of 4.8 metres was obtained in 18 months. Cowdung and nitrogen proved to be the best fertilizers for Eucalyptus cadambae, E.citriodora and Casuarina equisetifolia. Cowdung is to be preferred for those species because of its availability and cheapness. The problem associated with the use of cowdung is that it attracts termites which are common in the area and many of the species especially the Eucalyptus are susceptible to termite attack.

The success or failure of planted trees in the Tamne Basin depends not only on climatic and soil factors, but also on biotic factors such as cattle damage and bush fires caused by man.

Problems encountered in the execution of the sub-project included delays in the release of funds. This necessitated the pre-financing of the study by the Institute. Transportation was a big problem. Incentives for the participants in the project were inadequate.

MANAGERIAL PROBLEMS ENCOUNTERED IN OVERGRAZING AND
DEFORESTATION - DR. F.K. FIANDU AND DR. E.F.G. MANTE

INTRODUCTION

As a result of the accumulation of prodigious volumes of scientific knowledge over the ages, it has become virtually impossible for any single mind to adequately cope with the problems or the influx of information in any but the narrowest fields of specialisation. Thus unlike the days of ancient speculative natural philosophy and medieval alchemy, when solitary effort was the rule, a practical problem today often has numerous facets each calling for a specialised highly trained mental discipline and skill, as well as sophisticated equipment. Such inputs are quite scarce and poly-institutional or even international involvement is often necessary to ensure their availability.

This is often true for the advanced countries. Outer space exploration programmes and projects that have won Nobel Prizes testify to this. So do the thousands more of endeavours that go uncanonized but which have nonetheless contributed in no small way to the upliftment of mankind's quality of life. Joint effort by several institutions in problem solving is therefore both necessary and good.

However, such a 'broad-based' project is not always 'the best'. It can be over ambitious, becoming like the "multitude" in the words of the 17th Century sage, "that numerous piece of monstrosity ... confused together making but one great beast and a monstrosity ..." (Brown, T.E.: Religion Medici II, 1). But that is where the imagery stops. The NGSAP cannot by any stretch of casuistry be likened to a "hineous hydra", as Brown continues his imagery quoted above. For many useful technical facts and managerial lessons have been learned. This paper highlights some of these.

First the technical findings. In the Livestock and Pasture aspects of the Overgrazing and Deforestation sub-project, we were able to look at the soils and some grazing material.

We found that the soils in the project area were sandy and consequently their cation exchange capacity was low. They may be manured to improve them and in fact some farmers were using human manure for this purpose. Fodder and green manure may also be used to raise the soil organic matter levels. Among the legumes, Stylosanthes gujanensis was more promising than Macroptilium atropurpureum, Centrosema pubescens and Leucaena leucocephala. For fodder, legumes are better cultivated with grasses so we looked at some possible forage grasses and found Andropogon gayanus variety besquamulatus to establish better than Conchurus ciliaris and Cynodon plectostachyus.

Should irrigation be desired, a sprinkler system would be appropriate. Salinity from either the soil or ground water would not be a problem as their salt content was low.

These are indeed very useful bits of information but in executing the project, certain logistic problems were encountered. We now address ourselves to two areas, namely,

1. Institutional Commitment and Project Controls and
2. Operational Effectiveness.

INSTITUTIONAL COMMITMENT AND PROJECT CONTROLS

There is some justification for the anxiety on the part of project sponsors regarding the freedom of scientists to contribute fully to such projects outside their normal paid jobs. However, it should not be necessary to involve in the administration of the project, the bureaucracies of the institutions from which the participating scientists are drawn. The researcher should be able to secure permission from his institution to commit himself fully to a national exercise such as the NGSRP. This should not be difficult with a public institution like the CSIR or a University.

By combining the two sets of bureaucratic red tape from the researcher's own institution and from the project's management, the researcher is burdened unnecessarily with the need to comply with the needs of the two different institutions.

Needless to say, the prerequisites of one is enough thralldom to go through. The process of going from one's administration to that of the project often delayed the release of funds for trips to the project site. In one case, it took several months for both sets of bureaucracy to come to agreement that expenses had been duly accounted for before releasing further funds for a trip to the project site. By this time vital observations had been missed.

Motivation and morale are supremely essential ingredients without which progress in any human endeavour is seriously handicapped. The frustration experienced in going back and forth very effectively strifes motivation and morale. Because of delays in transferring funds to the North, field boys were seldom paid on time and some had to petition many times through the Sawku District Chief Executive before being paid. How can a hungry field worker operate effectively, Ladies and Gentlemen?

The poor state of communication contributed greatly to these difficulties but the bottleneck could have been obliterated or at least partially alleviated by sticking to one control point, i.e. the Project Management Centre. This would have the added advantage that sub-group

activities would be more easily integrated by the closer contact so created with the Project Management.

Alternatively, the sub-project may be contracted to the research institution but this would make co-ordination more cumbersome.

NEGATING OPERATIONAL EFFECTIVENESS

Honoraria and Allowances

Research is taxing both physically and mentally, as everybody here knows, but as Bacon said "Studies serve for delight" so the joy of discovery and illumination, etc. should be enough stimulus for further effort by the researcher. This is so. But greater yet are the delight and further effort where the research is relieved of physical discomfort and ever given some token inducement. This rationale is not new in research support. The token consideration may be termed honorarium, a consultancy fee, an allowance, etc. But this was neglected in the NGSRP project.

As though this was not enough, the allowances requested in the budget were drastically cut to levels which were outdated by about twenty years. For instance the payment of six cedis per night for field trips when hotel accommodation without meals cost £20.- £30 per night. In most cases participants found this out only after their first field trips. Some actually incurred personal financial losses by pre-financing their trips. This, 'Ladies and Gentlemen, does not make for effective research execution.

It should be clear that this paper is not advocating the payment of an economic wage for the researcher's effort. This is not justifiable since he is already on payroll in his institution. What is meant here is a token fee so that when the researcher is out there he can entertain his field workers for instance and keep their morale high. He can retire into a decent hotel room at the end of the field trip and where he spends the night in a tent etc. he should be given some inconvenience and risk allowance.

If these conditions cannot be met, one would expect at least that the researcher be advised about the details of the cuts and deletions from his budget with explanations. A blunt statement such as "sixty thousand cedis has been approved for the sub-project" should not be enough. Perhaps the researcher is demanding much here by asking for explanations. But it would be unfair that he be made to justify in detail the expenses he proposed only for these to be rejected mutely and seemingly contemptuously.

If the deletions are merely for budget restrictions sake then the researcher should be permitted to scale down his proposed project. If no agreement can be reached on this, the scientist should be free to say "no thank you" and back out of the project. In the absence of this freedom the researcher might feel committed to a task about which he is unhappy right from the start.

Delays in Releasing Funds and Equipment

Furthermore, the approved funds and equipment were delayed too long. In fact, few sub-projects received all their equipment. In one case the funds had not been released even by October 25-26, 1979 when the final Integration Workshop was held.

Research by Remote Control to wit. Distance from Project Site

One further serious limitation to the efficient execution of sub-projects was the distance to the project site which necessitated travelling some 800 km to the site. The task of booking tickets, collecting the cheque for them, getting to the airport, continuing from Tamale by road to Bawku, and then the local rounds from site to site etc. was quite tedious. Even when all went well mechanically, the time spent in doing this was oppressive. But in this chain anything could happen at each link to cause a failure in the system. To help out, the project management provided one Land Rover for the journey from Tamale to the project site and back to Tamale. However, this was not always available. Sometimes trips could not come on because the vehicle was off the road; much research information was missed this way.

Since the prime objective of the NIGSRP was to sharpen our capability to undertake this kind of multi-disciplinary research, the project could have been sited close by e.g. Afram Plain. Also the sub-project could have secured the services of National Servicemen who would be on the job all the time. Securing servicemen is not the easiest task though, but the project management could secure these servicemen for the various sub-projects. Another possibility which has worked well in FAO projects could be adopted. This is where the scientist obtains leave from his institution for a period - a few months or a year at the start of the project when critical field plots are laid out.

The implementation of these suggestions would not necessarily give 100% assurance of excellence in the execution of the project but at least it would decrease the chances of failure.

SOCIO-ECONOMIC SURVEY AND LAND USE - SUMMARY OF FINDING

SAM B. AMISSAH

POPULATION:

The 1970 census registered a total of 155,000 people in the Bawku District with an annual growth rate of 9.03%. In the Tamne Basin, 65,000 people were recorded with an annual growth rate of 2.7%.

The scenery in the sample villages revealed that:

- (a) Even though 75% of the farmers claimed to be healthy, common diseases such as blindness, small-pox, tuberculosis measles and other ailments such as stomach-upsets and headaches were recorded.
- (b) Considerable seasonal migration was common among the youth who generally move to the south or to the Bawku area. The motives were financial, and the movement occurred intensively during the lean periods when agricultural activities were low. This pattern, however, is typical of rural-urban migration in Ghana.
- (c) In terms of ethnic groupings, the Kusasis predominate (50%) followed by the Busangas (20%), Mamprusis (10%) and the rest shared among the Moshies, the Varigas, and others.
- (d) Concerning marital patterns, a high level of polygamy was noticed with a range of 2-4 wives to a male. The interviews recorded that most of the people were married, with only a small proportion either unmarried or unattached. Divorce rate was equally high, with 46% of those interviewed having divorced their wives. Frequent eloping was recorded, and re-marrying was a common practice after either divorcing or eloping. There was no stability in the marital system.
- (e) There were variations in the size of the family ranging from 2-8 per family. There appeared to be more children, because the adults normally migrated.

SOCIAL SYSTEMS

There is a clear and distinct hierarchy of the chieftaincy system into three distinct tiers, namely, the Paramount Chief who is at Bawku, the Divisional Chiefs, and the Sub-Chief (Village Chiefs). These chiefs derived their origins from different ethnic groups, e.g. the chiefs of Kuka, Bawku and Binduri are Mamprusis; those of Bugiri, Puslga and Kugri are Kusasis; and those of Kulugungu are Busangas. Apart from being chiefs, they are also farmers.

The Tindana is the spiritual head of the people. He has no powers of granting or allocating land except that which belongs to him. He acts as adviser to the chief, and performs land sacrifices, rituals, and other ceremonies connected with the "god of land" with respect to planting and harvesting. He is generally considered as the Chief Priest of the community. Succession to the office of the Tindana is by inheritance.

With regard to religion, the traditional indigenous practice predominates. Islam was the next large group, followed by Christians and others.

Wedding festivities go on for 3-4 days. The usual bride price is paid.

Funeral ceremonies normally last for one day in sharp contrast to the practice in the south which takes several days and weeks, and in some cases months.

EDUCATION

In general, formal education is lacking in the study area. As high as 85% of all respondents have never been to school. The rest have received minimal education at the primary/middle school level. The illiteracy rate is therefore high. This has a reflection on the quality of both the population and the labour force in terms of skills and professional training.

OCCUPATION AND EMPLOYMENT

Farming is the most dominant occupational activity. Over 90% was recorded in this category of employment. Specialisation with respect to work-type was low.

With farming being the predominant activity, most people consider themselves not unemployed. 80.08% of total responses confirmed their permanent employment and economic activity.

LAND TENURE AND LAND ADMINISTRATION

Under the 1969 Constitution of the Republic of Ghana, all lands in the Northern and Upper Regions were vested in the Government. In the 1979 Constitution, recently promulgated, all such lands have been de-vested. This means that ownership of all lands now revert to either the community, kin, family or individuals as the case may be. This, of course, brings the practice in line with what prevails in the rest of the country.

The system of succession of royalty is basically patrilineal.

With respect to land administration, all developments that take place in areas defined as statutory planning areas should receive the approval of the town planning authority in accordance with chapter 84 of the Town and Country Planning Ordinance, 1945. With respect to land in non-statutory planning areas, development is uncontrolled, haphazard and expensive. With respect to farming, however, no permission is sought from any authority. The land owner has no control of the use of the land.

LAND USE AND SETTLEMENT SYSTEM

The land use pattern is dominated by agricultural activity in both intensity and geographic extent. Scattered patches of shrubs and some trees are located in river valleys and other fertile areas. In the settlement areas, small concentrations of dispersed circular compound houses are typical patterns which tend to emphasize the character of the cultural landscape.

Most of the buildings are of Swish construction except at Worikambo and Bindun where a few farmers used moulded bricks and landcrete. Roofing material is in the traditional thatch. The level of service in the houses - in terms of kitchen, toilet and bathrooms - was extremely low. The compound area or generally kept clean and well-swept. Refuse dumping sites are well organised. Enclosures are provided for cattle, sheep and poultry.

The buildings are generally circular in form, but new shapes are emerging in the form of rectangles. They appear as extensions to existing circular formations, or as separate rectangular shapes. These changes and trends tend to create new patterns in the form of a fussy mosaic. The rectangle symbolise affluence, exposure to the south, and a distinguished status in society. As migration accelerates, and as incomes increase as a result of the boom in rice farming, etc. the invasion of the rectangular or the circular become significant. In some areas, succession is about to be completed. Perhaps the wealth of the community can be roughly assessed by the dominance of the rectangles.

SETTLEMENT FORM AND STRUCTURE

The settlements take the form and structure of three concentric rings. The inner ring accommodates the village housing areas and other related uses in the form of a compact nucleated settlement system. The middle circle is identified with small scale farming activities usually of vegetables and other daily requirements. The sizes of the farms within this zone is relatively small, and the farms are within minimal walking distances from the inner core. This zone

also supplies the future land requirements for other housing activities and general expansion of the village.

The outer circle is where the large scale farming activities commence. They tend to seep into the middle zone and overlap it. The farming activities are extensive in nature.

THE MANAGEMENT OF THE PROJECT

The total project was well-conceived and had comprehensiveness about it. The parameters, objectives, methodology and central mechanisms were carefully spelt out.

The management at the office or department level, i.e. at the sub-component level, was therefore made easy. Nevertheless, some problems of co-ordination normally associated with such large projects were encountered.

On the whole, the entire project was a success in terms of attainment of objective, and exposure on the part of the participants.

THE APPLICATION AND EVALUATION OF REMOTE SENSING
IN THE TAMBE RIVER BASIN OF GHANA

DR. ROBERT DODD

Remote Sensing technology is considered an important and useful research tool in inventorying, monitoring and evaluating natural and cultural resources. Hence, the remote sensing research sub-project was designed to supplement the research activities being undertaken within the 5 main lines of research components under the Northeastern Ghana Savannah Research Project (NGSRP).

There were no significant managerial problems associated with this sub-project. This is due, in part, to the overall design of the NGSRP and as one of the investigators for the sub-project, I also served as Project Co-ordinator for the NGSRP for about three years. Furthermore, the University of Arizona Remote Sensing Centre contributed substantially to the management of that aspect of the sub-project activities undertaken at the University of Arizona.

This Workshop is on Research Management for Development Planning, and as such, I would not like to dwell on the technical results of the sub-project. Moreover the results are detailed in the NGSRP Draft Reports, copies of which are available to participants.

Now I would like to discuss issues relating to the NGSRP from the point of view of my experience as overall Project Co-ordinator of the NGSRP.

The design of the NGSRP was an exercise which the CSIR undertook with the collaboration of USAID, the Universities of Ghana and the relevant Government departments in the country. The methodological approach for undertaking the studies, i.e. multi-disciplinary approach, was evolved during the design meeting and it was based solely on the need to ensure that the researchers focus their attention mainly on the problem-solving nature of the land degradation problems in the Tame River Basin.

Institutional commitment for the NGSRP was ensured by informing the heads of various institutions about the awards and subsequently routing all vital information and funds through the Institution.

Project monitoring was undertaken by the Project Management Group, the Principal Co-ordinator and the Principal Investigators. It was through the quarterly or periodic reports and the control of funds that the Project Managers monitored and evaluated the progress being made.

In general, I would like to assert that the NGSRP was well designed and carefully managed. There were, however, a number of minor but significant issues such as incentives which must be considered during the course of this Workshop since they do affect research scientists and their work.

CLIMATOLOGY, AGROCLIMATOLOGY AND WATER RESOURCES
AVAILABILITY

L. QUIST

The Institutions which investigated the water availability in the Tame Basin comprise the Meteorological Services Department, the Physics Department of the University of Ghana, the Ghana Water and Sewerage Corporation and the Water Resources Research Unit. The first two institutions worked on the climatological and the agro-climatological aspects of the occurrence of water in the project area whilst the latter two carried out assessment of the water as well as the groundwater regimes of the study area with possible projections on future water demands and supplies.

Two significant findings that came out from the studies are that:

1. Groundwater exists in sufficient quantity and in suitable quality for domestic purposes and for small scale irrigation.
2. The belief that the Sahara Desert is moving southwards is non-existent. There is no evidence that rainfall is diminishing or that the area is approaching the situation of a permanent drought area. What appears as evidence of desertification are the land degraded conditions of over-grazing, deforestation, bush burning and cultivation practices arising out of lack of knowledge and resources to cope with the harsh conditions brought on by the dry season and especially the late arrival of rainfall.

Apart from the usual transport and accommodation problems, the management problems encountered are mainly twofold. Firstly, due to the various time schedules with which participants programmed their visits to the project site, it became difficult to organise project review meetings. Participants seldom met to share experiences on the project.

Secondly, in order to minimize cost, recourse was taken to utilising data existing in or being collected by other water agencies. This presented some difficulty over the control of the methodology being employed in the collection of some of the hydrological data.

WORKING GROUP REPORT
POST-HARVEST TECHNOLOGY (PHT)

DETERMINATION OF RESEARCH PRIORITIES IN THE CONTEXT OF NATIONAL DEVELOPMENT

The working group on Post-Harvest Food Losses accepted as its starting point the fact that prevention of food losses is high national priority in ensuring adequate quantities of acceptable quality food for internal consumption and for export.

The challenges to the working group, therefore, were to:

1. Identify ways and means of defining research priorities in this problem area;
2. Identify the proper role of the CSIR in co-ordinating the essential research programmes and in ensuring the critical institutional linkages and the conditions necessary for collaboration among the institutions; and
3. Identify translation mechanisms for turning research results into information useful to farmers in combating the food loss problems.

Definition

The working group adopted a working definition to help achieve the stated objectives listed above. Post-harvest was defined as all the processes involved from the point of harvest to the final consumer. Post-harvest technology, therefore, involves all the technological activities in the process.

Categorisation of Produce

The members realised that the various agricultural produce that were to be considered in post-harvest technology had different characteristics that made them susceptible to damage or loss at different rates. Produce was, therefore, classified according to those that perished quickly and those that took a longer time. Those that perished quickly were termed "perishables" and include vegetables, fruits, roots, tubers, fish and meat while the others were classed as "cereals and grain legumes".

Characterisation of Damage

Agents that cause deterioration and spoilage in stored products were identified as:-

- (i) Insects;
- (ii) Rodents;
- (iii) Fungi;
- (iv) Other bio-chemical factors and
- (v) Birds

Quantification of Damage

At the moment the country has no accurate data about the post-harvest losses in general and more specifically those that can be attributed to the causal agents listed above. However, to be able to quantify the respective losses, the working group felt that:

- (a) there should be criteria for judging losses in the post-harvest process and
- (b) a clear definition of what constituted loss.

The group categorised losses into:

- (a) total loss;
- (b) other losses due to loss in weight;
- (c) nutritional value;
- (d) flavour and colour; and
- (e) contamination.

Loss of flavour, colour and contamination become critical particularly for export produce. Since there was no reliable information on these losses, the group realised the need to establish a monitoring system to find out the losses due to the agents and the various losses at the various stages of the post-harvest process. This calls for a system to develop a baseline information. Methods employed in the monitoring system must be standardised. The criteria needed to select the commodities on which priority action was required were itemized as follows:

- (a) national food requirements;
- (b) contribution of food to the national economy; and
- (c) the availability of resources for carrying out the required research.

Pre-Processing, Processing and Preservation

Pre-processing, processing and preservation are key activities in the entire post-harvest operations. The working group recognised that there are losses in all the above operations but could not attribute any figures to the losses because of lack of information in this area. One problem identified by the group was how to develop a mechanism to monitor the losses as they occur at each stage of operation.

It was also pointed out that in the country as of now, there was only a limited technology to undertake the above operations, in say, maize and cassava. However, it was obvious that technology from outside the country could be imported and adapted to suit our conditions in the country. It also became apparent that there existed in the country the potential for developing the appropriate technologies to carry out the above processes.

Quality/Standards of Farm Produce

After some discussions the working group agreed that quality and standards of any farm produce are influenced by (a) variety (b) degree of processing (c) handling and (d) the produce's susceptibility to biological deterioration.

The working group felt the need to establish minimum standards applicable to every stage in the post harvest activities - namely point of harvest, pre-processing, processing, transportation, distribution, and marketing.

Members also felt that differentiation should be made between MINIMUM STANDARDS and QUALITY STANDARDS. A system of grading could then be evolved. Grading could become a great source of incentives for farmers since the grades will have a corresponding discriminatory pricing mechanism.

The Ministry of Agriculture was identified as the principal body that sets and enforces standards for agricultural produce, with the Ghana Standards Board assisting in an advisory capacity and the Food Research Institute and Crops Research Institute providing the research support.

Collaborating Agencies

Although the Ministry of Agriculture was identified as the body responsible for setting and enforcing standards for agricultural produce, members felt work in that area had been neglected. The group therefore felt the need for the establishment of an institutional framework to regulate and co-ordinate activities in the area of standardization in post-harvest.

The following institutions were identified as collaborators in the field of standardization: Ghana Standards Board, Ministry of Agriculture, Food Research Institute, Crops Research Institute, Food Science and Nutrition and Bio-chemistry Departments and GIHC. CSIR will be expected to play a co-ordinating role.

Packaging and Storage

One has to differentiate between packing and package. In the field or the farm most of the processes that occur are packaging. This involves providing a suitable container into which the material is put to help ease movement of the commodities. It is important to take into account time of harvest of the produce in determining the suitable container. Although a World Food Programme identified the various silos and other storage structures and facilities in the country between 1963 and 1970 it found that they were under-utilised. The

working group felt that there was a need again to make an inventory of silos and other storage structures and appraise their current usefulness. It also came to light that the Ministry of Agriculture conducted an exercise to ascertain the storage facilities available in 1978. The availability of this report to the group would be an asset.

With regards to storage, the group would like to make a distinction between farm, regional and national storage.

THE ROLE OF CSIR IN DEVELOPING INSTITUTIONAL FRAMEWORK

Members felt there was the need to know the organisations involved in the collection of statistical data. The post-harvest technology organisations mentioned were CBS, ISSER, Faculties of Agriculture (University of Ghana, Cape Coast, and UST, Kumasi), Centre for Development Studies, CSIR Institutes and Commodity Boards.

There should be 2 levels:

- i. Macro level (Interested Ministries and Research Institutes)
- ii. Micro level (Association of Research Institutes).

The Institutes of the CSIR involved in post-harvest studies were identified as the Food Research Institute and the Crop Research Institute (Food Storage Section). It was mentioned that there was collaboration of the section with the Food Research Institute group on the same subject.

The Food Research Institute was reported to have a storage team engaged on maize and cassava/yam storage projects. Co-operation between the sister institutes was recommended.

If CSIR regarded PHT among its research priority areas, it should mobilise itself to deal with the problem. This could be done by strengthening the staff of the two institutions and by co-ordinating their activities.

Mention was made of the co-operation of the various Commodity Boards (Grains Development Board, Food Production and Distribution Corporation).

Strengthening of the Institutes would involve recruitment of adequately trained personnel. There should be directional training of officers engaged on the work to acquire expertise in certain specific areas. There should be mobilisation and organisational re-orientation of manpower and leadership to focus attention on PHT as a special priority area. Adequate funds, equipment and other infrastructure should be given to the Institutes mentioned.

There should be firm commitment of the Institutes to the work.

EFFECTIVE PROJECT MANAGEMENTCollaborative Mechanism

Members felt the office of the Co-ordinator of the CSIR should be strengthened to carry out its co-ordination duties effectively. This could be achieved by direction of research projects and assembling of interested personnel in PHT studies to discuss projects and to see how co-ordination could be carried out. Seminars, symposia and workshops could be organised to focus attention on achievements, and to locate the gaps that needed to be filled.

It was recommended that CSIR should be allocated funds and other resources to initiate research in priority areas and to carry out institutional collaboration. In addition to conventional methods of subvention, the CSIR should also have a separate fund for such activities.

The group identified Post-Harvest Technology as an area which demands immediate and priority concern of the government, and calls upon the CSIR to provide the leadership in establishing at the highest governmental level, a body responsible for co-ordinating work in Post-Harvest Technology in Ghana.

Such a body, to be called the "Ghana Co-ordinating Group on Post-Harvest Technology", would perform these functions.

- (a) to identify crucial areas in Post-Harvest Technology which require immediate attention and set up multi-disciplinary and inter-institutional research groups to tackle the relevant projects;
- (b) to co-ordinate the research projects, maintain effective leadership, and ensure the provision of adequate resources for the operations of the research projects; and
- (c) to establish the machinery and mechanism for transferring the technology and innovations in post-harvest technology to user agencies and to appraise the feedback regularly.

The group did not see the need for the establishment of a new body. The existing facilities and manpower could perform the functions on either part time basis or full time for a period, as the requirements and organisation may find suitable.

WORKING GROUP REPORT

FOOD PRODUCTION

DETERMINATION OF RESEARCH PRIORITIES IN THE CONTEXT OF NATIONAL DEVELOPMENT

The task assigned to the group is to use the experience derived from the NGSRP to write up a proposal for managing a research project for food production.

Proceedings

The working group agreed that Ghana has a food production problem.

The food items identified and classified are as follows:-

Meat : Cattle, sheep, goats, poultry etc.

Fish : Fresh water, seawater

Cereals : Maize, rice, millet, sorghum etc.

Legumes : Beans, cowpeas, groundnuts etc.

Root crops : Cocoyam, yam, cassava etc.

Fruit crops : Plantain, banana, oil palm, coconuts etc.

Vegetables : Tomatoes, garden eggs, pepper etc.

DETERMINATION OF RESEARCH PRIORITIES IN THE CONTEXT OF NATIONAL DEVELOPMENT

The working group outlined the following criteria for determining priorities in the production of the food items.

1. Nutritional value for health purposes;
2. Consumption patterns;
3. Potential for improving the yields of the food items, i.e. the level of technological inputs, e.g. irrigation, fertilizers, varietal improvements etc.;
4. How quickly the food items can be produced;
5. Market value of food items in specific areas;
6. Employment opportunities offered by the project;
7. Unit cost of production;
8. Savings in foreign exchange from import-substitution;
9. Export potential for foreign exchange earnings;
10. Complementarity and/or substitutability of food items ;
11. Degree of competition for use of the food items as industrial raw material.

THE ROLE OF THE CSIR IN DETERMINING RESEARCH PRIORITIES

The following were identified as the possible combination of the roles of the CSIR in determining priorities for food production:

1. To provide and co-ordinate research work along with food production agencies and other research bodies using accumulated data to determine what food items should receive priority attention.
2. The CSIR should provide the necessary and available data along with cogent arguments to the Government to determine priorities in food production.
3. The effectiveness of the user agencies on the management boards of the institutes of the CSIR should be maximized.
4. The CSIR should be able to call on all institutes and those not under it, as well as other appropriate agencies, to find solutions to specific problems.

THE PROCESS FOR PROJECT DESIGN AND ACTION PLAN

The working group considered the following process to be followed:

1. The problem should be identified and in doing so, the user agencies should be involved.
2. Establishment of objectives - this involves decisions on yields per unit area, time span, goals to be achieved. Again, user agencies are to be involved.
3. Methodology to be adopted - this involves the various approaches, the disciplines and the institutions to be used in solving the problem.
4. Required inputs - these are the human, material and financial requirements in the context of an overall economic analysis of the project.
5. Time schedules - drawing network for implementing various activities.
6. Composition of management team and management control systems. This calls for specific mechanisms for control and reporting as well as periodic review and evaluation of previous years' results.

EFFECTIVE PROJECT MANAGEMENT

Identification of Institutional Framework

1. Location:- The working group considered it worthwhile that the project is located in an area easily accessible to all project participants.
2. (1) Organisational structure would involve the selection of a project manager, leader or co-ordinator depending upon the size and nature of the project.

- (ii) Structuring of relationships of participating institutions.
 - (iii) Adoption of a specific organisational structure for project implementation.
 - (iv) Delegation of authority and definition of responsibilities.
3. Recruitment of staff.
 4. (i) Financial Management - An estimate should be drawn for an overall cost of the requirements for the project.
 - (ii) A specification of budgetary controls and mechanisms, e.g. Forms/Procedures to be followed.
 - (iii) Financial control systems should be specified, e.g. for wages, capital expenditure etc.
 5. Internal dissemination of information - this aspect of the project should be carefully managed to ensure that staff reports and meetings serve their purpose, and that enough work information is shared to enable the Directorate and Field/Executive staff to work harmoniously.

Collaborative Mechanisms

1. This becomes important when we do not have certain requisite skills and facilities in the project group. Provision in such instances should be made for acquiring such skills.
2. The project management should decide at what time during the life of the project and where to acquire these skills and facilities.
3. For such an exercise, specific protocol and mechanism to request for the identified external skills should be established.
4. The use of certain research personnel from other institutions on a temporary but sufficiently long term basis should be investigated.
5. The sharing of facilities between institutions must also be considered.

Translation of Research Results into Practical Application

The working group observed that as of now, research results are not reaching the food producers.

1. As a remedy, research agencies are advised to find out from user agencies what the latter consider as problems.
2. Also a training scheme is required to bridge the gap in knowledge between the researcher and the food producer.
3. The bridge could be in the form of extension activities.

4. The gap has been brought about as a result of the researchers coming from totally different institutions from those who provide extension services.
5. The working group is of the view that extension services provided through the commodity boards could be considered.
6. The use of demonstration farms should be widely encouraged.
7. The food producers should be involved in practical demonstration.
8. Feedback from the food producers should be obtained by researchers.
9. Make sure of the supply and availability of inputs in the right quantity, quality, time and place.
10. Adequate incentives should be provided for the extension officers.
11. Extension officers should know who to contact for information that food producers require but about which the officer has little knowledge.

WORKING GROUP REPORT

RURAL INDUSTRY

OBJECTIVES

The working group recognized that rural industry is closely related to food production and can intervene to prevent the loss of food after harvest. The development of rural industries is a national priority of importance to the improvement of rural infrastructure and the stability of rural populations.

1. Definition: The working group defined rural industry as follows:
the industrial processing of food, plant material, and other rural resources, e.g., clay, rock, and minerals, at production sites of local scale. It also includes local fabrication of tools and equipment for food production, using appropriate technology as a component.
2. Types of project: The group agreed that under rural industry three types of projects could be considered. These are:
 - Food processing;
 - Nonfood agroforestry processing industry (fiber and forest products);
 - Artisanal industry (pottery, handicrafts, weaving, carving, iron smelting).

During the discussion it was agreed to focus on palm oil processing in the south and tomato processing in the north. It was also agreed that some potential participation could be anticipated from most of the Institutes of CSIR if it were to undertake research in the processing of palm oil products and tomatoes. For convenience, we reviewed the names of the constituent institutes:

Animal Research Institute

Building and Road Research Institute

Crop Research Institute

Food Research Institute

Forest Products Research Institute

Herb of Ghana Project

Industrial Research Institute

Institute of Aquatic Biology

National Atlas Project

Oil Palm Research

Scientific Instrumentation Centre

Soil Research Institute

Water Resources Research Unit

1. Determination of Research Priorities in the Context of National Development

Criteria: After some discussion it was agreed that the following criteria should guide the selection of research projects:

- (i) The nature of user community; e.g., population size, population growth rates, regional priorities, and level of technology;
- (ii) The development potential;
- (iii) Institutional capability and skills required for the project;
- (iv) The nature of the product to be processed - whether new or existing;
- (v) Sources of funds; whether mandated or elective;
- (vi) Cost benefit analysis;
- (vii) Political considerations;
- (viii) Research inventory - past and current research and other research in Ghana or elsewhere;

(ix) Problem-solving or mission-oriented research;

(x) Short-term vs. long-term research period.

2. Role of CSIR in Determining Research Priorities

The working group agreed that research priorities should be set by the National Development Plan and discussed whether CSIR should be critically involved in the setting of national priorities.

The group agreed that CSIR should, in any event, examine national development priorities for research implications, and agreed also that development guidelines should flow from the Government to CSIR, which in turn would provide general guidelines to the Institutes. It would be the responsibility of the research staff at the Institute level to translate the proposals into research projects. When a final list of project proposals has been prepared, it should be submitted to the CSIR to establish coordination. Finally, CSIR could then propose to the Government how it planned to implement government directives.

The working group also agreed that, for effective coordination of resources, CSIR should have some control over the budgetary allocation of resources. The group also agreed that for effective coordination of research priorities, CSIR should have some control over the budgetary requests from the Institutes and should be prepared to defend them. Success in the budgetary process can become a criterion of overwhelming importance.

3. The Process for Project Design and Action Plan

The group, in discussing the process for project design, agreed that a good project proposal provides information so that:

a. management can make decisions;

- b. research personnel will have guidelines;
- c. success or failure can be evaluated.

The objectives should include the identification of the problem in terms of national goals. The background information should include the output expected and literature review as well as the viability of the project.

It was also agreed that methodology should be considered. On this issue, certain elements should be considered, including the following: types of analysis, data collection techniques including processing, institutional support, and work plan including phasing of work. It should also include resources needed for research as a basis of the budget.

On the subject of who should be involved in the research design, the group agreed that the project leader and all members of the research team, the financial representative, and the ultimate user should be involved in the project design.

An important example was cited concerning the Institute of Industrial Research on an existing project in the improvement of small-scale iron smelting. The first step involved consultation with the user community to determine the indigenous process and continued through the development of a new prototype using existing and available resources. Probable impact of new resource use was also considered.

4. Effective Management

a. Identification of Institutional Framework

The group saw this as boiling down to institutional commitment. The group identified two major ways through which institutional commitment

would be ensured, namely:

- (1) Involvement of the participating institutions in designing the project, and
- (2) Allocation of funds for disbursement by the institutions participating in the project.

It was recognized that there are institutional characteristics which complicate this issue, such as how institutions are supplied.

Management Structure

An effective organizational structure can be created by having a policy-making board with these members:

- funding agency;
- user;
- representative of researchers.

The Board should be linked to existing management structures through a Project Administrator. For the Technical Committee to function effectively, it should:

- be comprehensive;
- be self-evaluating/monitoring;
- have built-in flexibility;
- have easy flow of information;
- carry authority.

The Technical Committee will be composed of all sub-project principal investigators and will deal mainly with technical issues.

b. Collaborative Mechanism

The essential features of a collaborative mechanism are:

- regular quarterly meetings for participants for the exchange

of information. Scheduling of meeting will also be dependent upon structuring of project.

- a site coordinator;
- clear division of research responsibilities to avoid duplication;
- suitable methods of data collection to ensure meeting all sub-project requirements and avoid duplication;
- circulation of reports to participating institutions researchers;
- periodic dissemination of research information and holding of seminars.

c. Translation of Research Results into Practical Application

Dissemination will vary according to the nature of the project. Implementation will be the responsibility of the initiator of the project, e.g., the Extension Services of the Ministry/Private Sector Contractor. Other forms of dissemination, such as demonstration projects, may be appropriate depending on the nature of the project.

WORKING GROUP REPORT

E N E R G Y

DETERMINATION OF RESEARCH PRIORITIES IN THE CONTEXT OF NATIONAL DEVELOPMENT

Ghana depends on three main sources of energy, (a) hydroelectric power, (b) fossil fuel and (c) traditional sources, namely, wood, vegetable and animal wastes. Hydroelectric power supplies 99% of Ghana's total electrical energy generated in Ghana, with the rest coming from diesel electric plants. This supply will not meet the demand of all sectors of the economy if they were operating at their full capacity. It therefore becomes necessary to look at other priority areas for future energy development.

Energy Inventory of Ghana

1. Conventional non-renewable sources - Fossil Fuel: Enough of this has not yet been discovered, and the country spends over 30% of its foreign exchange earnings on its importation.
2. Renewable sources - Hydroelectric power, wood, vegetable and animal wastes are the traditional sources of energy.

As a priority, there must be a re-examination and assessment of both large and small scale hydro power sources, and the systematic examination and analysis of total biomass production and trends in Ghana.

Energy Budget

For a better utilization of energy resources in the country, there must be a better understanding of the pattern and location of existing energy consumption. This requires the building up of a detailed energy balance, sector by sector, and comparing the energy usage with those of other countries, i.e. a comparison of unit of consumption per unit of output with what pertains in other parts of the world. By this, areas with a greater efficiency in the use of energy will be identified.

Energy Forecast

Examination of available techniques, for the forecasting of energy requirements in other countries, has to be carried out and a suitable method evolved for energy forecasting in this country. It is very important to know the energy requirements for each sector of the economy, taking into consideration the population growth, agriculture, industry, transport and communication, etc.

By this means, we will establish a procedure for energy forecasting for the country, for example, by taking a look at forecasts for economic growth patterns like household or domestic energy consumption, or the amount of energy consumed in producing a ton of aluminium from alumina or in the production of rice or maize. This will enable us to know the changes in the growth relationships in our economy. The changes will then be translated into energy requirements, in terms of requirements per unit of output.

Conservation of Energy

In considering increasing efficiency of energy utilization and the reduction of consumption where possible, it must be realized that under-utilization of manufacturing capacity is wasteful of energy. For example, the amount of power required to turn a set of looms to produce 100 rolls of textile is the same if output is increased to 500 rolls, due to the interlocking system of operation.

Efforts to identify savings of energy in this area should be undertaken.

Alternative Sources of Energy

Alternative sources of energy available to Ghana are solar, nuclear, wind, fossil fuel and others. There is the need to make a real assessment of the potential of each of these resources for future development.

Energy Conversion Processes

Hydropower: There is the need to explore technologies for generating small scale hydropower from micro-sources.

Biomass conversion

- (1) Direct fire: A lot of energy can be generated from biomass, especially for small rural communities. Such energy could be derived from direct fires, e.g. for cooking or for converting other material through intermediates into electricity. Priority research areas should look into the design of efficient devices.
- (2) Physicochemical conversion, i.e. Pyrolysis - production of charcoal and liquid fuel.
- (3) Biochemical conversion, e.g. production of alcohol, biogas.

ROLE OF CSIR IN DETERMINING RESEARCH PRIORITIES

- (1) The CSIR, in collaboration with other relevant institutions and agencies in the light of these proceedings, should assess the energy requirements of the country to establish an accurate data base for energy studies.
- (2) The CSIR, being the national science and technology and research institution, should, as a first step, study and analyse critically, the report of the national energy resources committee so as to make policy and priority research recommendations to the government for action.
- (3) The CSIR should take a leadership role in establishing a research mechanism for carrying out any approved energy priority research studies.

THE PROCESS FOR PROJECT DESIGN AND ACTION PLAN

- (a) Give detailed justification of the project. This should be considered in the light of national socio-economic development plan, i.e. the broad objectives.

- (b) Write down the terms of reference and the inter-relationship between the various pieces of the project.
- (c) Clear definition of individual project components and linkages between project/sub-project components, including inputs and outputs.
- (d) Methodology - All aspects of implementation - information, results, follow up and evaluation should be clearly defined.

EFFECTIVE PROJECT MANAGEMENT

The approach should be inter-disciplinary. There is a difference between inter-disciplinary and multi-disciplinary research. It is not just the use of various disciplines working on the same project, but perhaps working separately. Inter-disciplinary work emphasizes integration/synthesis; it is often organised with a core team representing a number of disciplines, and charged with a JOINT responsibility. Authorship of the work is joint, and the team succeeds or fails as a group. This requires that the core team emphasizes the synthesis/integration from the start. A separate effort may be made to draw from among one or a few other disciplines (e.g. the biomass assessment done by foresters or agricultural scientists). But emphasis must be placed on the integration of the various contributions to the information (e.g. joint biomass assessment) necessary to analyse the biomass conversion. Consequently, the core team must first concentrate on the inter-relations between the various component activities. The systems approach will prove useful in this management process.

This approach requires that the core team members often interact at the peripheries of their professional expertise and experience - learning from one another.

As information develops and continuous integration is pursued, the relative priority of various components may change. Consequently, the emphasis on a particular disciplinary effort may also change. The project plan must be flexible to allow changes in the relative importance of its components. With this arrangement the necessary professional interpersonal and institutional changes that become necessary are facilitated as mutual understanding increases. The supporting budgetary and institutional authority must be made available.

Identification of Institutional Framework

1. A central body for project co-ordination with authority and responsibility.
2. Research institutions that should carry out the project.
3. The Ministry of Lands, Natural Resources, Fuel and Power.

Collaborative Mechanism

1. There should be a central management body.
2. There should be an overall co-ordinator to see to the day-to-day running of the project.
3. There should be team leaders and supporting research personnel.
4. There must be full institutional commitment/contract or undertaking for use of institutional facilities and for release of research personnel.
5. Periodic reporting, monitoring and evaluation, integration of projects/sub-projects and holding of periodic seminars during the project life, and exposure of participants in the project to other project components.

Translation of Research Results Into Practical Application

1. Technical evaluation of the results.
2. Injection of the research results into the national planning process.
3. Use of extension services.

DISCUSSION OF WORKING GROUP REPORTS

CHAIRMAN: DR. MARY E. CARTER

It was remarked that a gap existed between research results and their implementation. The Government, which is ultimately responsible for the implementation of results, does not clearly define its priorities. Consequently research problems selected by Institutes may not necessarily correspond with those of interest to government. It was therefore agreed that Government needs to develop a well laid science and technology as well as socio-economic plan to direct the work of the scientists.

It was pointed out that the report from the Post-Harvest Working Group, made no reference to any particular crop but dwelt on agricultural crops generally probably due to the fact that one of the major problems in the country is the availability of food. The contributor believed that tree crops were equally important and pointed out that much of the nations timber is left to rot in the forests due to poor transporting and inadequate timber processing facilities.

The attention of the Chairman for the group on Energy was drawn to the fact that towards the latter part of 1979 the daily papers reported that there had been a discovery of Uranium at the Kwahu-Tafo area and that so far this report has not been refuted. The group Chairman then replied that his report was based on the publication by the Director of Geological Surveys which made no mention of Uranium deposit in the country.

It was pointed out to the Chairman of the Energy Group that it was incorrect to state that there was no forecast of national energy requirements. This is being done by the Electrical Energy Commission and Ghana Company for electrical power and crude oil respectively. The Chairman repeated his conviction that no comprehensive forecasting was done in terms of requirement per unit consumption.

A participant sought clarification of the role of the CSIR with regard to relating scientific research to national development plans and advising Government accordingly.

The acting Executive Chairman confirmed that the CSIR had the mandate to examine what should be done by way of research and advise Government. How effectively this was done and how seriously Government accepted advice however was a completely different issue. He invited contributions from CSIR institute Directors present.

In his contribution, the Director of the Institute of Aquatic Biology stated that there were user agency representatives on Management Boards of CSIR Institutes. He pointed out that there was a problem of interchange of ideas. For example, he wondered how information ever reached the CSIR from the Ministry of Economic Planning requesting advice on, say, methods of cultivation, processing, etc. of say ginger before asking farmers to cultivate it.

The Chairman for the session then invited the CSIR employees to express views on how this situation could be improved.

In response, the Director of the Soils Research Institute made the remark that communication between the researcher and farmer is not straight forward. He cited an instance when, on one occasion, he wrote a paper which the press, in an editorial made havoc of. He pointed out that the CSIR had extension and demonstration farms which if put to proper use would aid farmers to increase their yield.

A contributor thought that financial support had been wrongly directed in the country. Most loans meant for farmers had gone to people who had influence in the banks, or who were already established in industry, while the real farmers remained unattended.

A member of staff of CSIR stated that the top executives of the CSIR tend to be overloaded with other matters that do not relate to management. This, has adversely affected the efficient management of the CSIR. He, for instance, wondered how Management Boards of the CSIR were appointed and suggested that the CSIR should endeavour to select competent members for the Management Boards of the Institutes instead of pointing accusing fingers at other institutions.

A contributor from GIMPL stressed that in the presentation of all the papers, those aspects of leadership and management were not sufficiently emphasised, playing down the vital role of accountability in research management and co-ordination. He also thought that the Director of Soils Research Institute, whose publication had been distorted by the Press could have done something about it by educating the editor concerned.

A participant said some commissions of enquiry had found it necessary to discuss the CSIR. He requested that reports of such commissions should be studied and the effort made to implement the important recommendations.

The Director of Food Research Institute agreed with the view that the CSIR did in fact have the mandate to advise government on all scientific matters. But this appears to be just on paper. What is needed is the active involvement in carrying out these functions. She concluded that the entire CSIR needs to be activated.

A contributor suggested that the organization and management of similar institutions abroad should be studied for the benefit of improving that of the CSIR.

It was observed that the CSIR had undergone restructuring and was likely to go further. However the contributor felt that what was more important is the organization and better co-ordination rather than mere rearrangement of the same people. Good leadership was equally important.

The need for effective co-ordination between the CSIR and other agencies like the Ministry of Agriculture was stressed, it was felt that people who represent user agencies on the Management Boards of the CSIR have a narrow perspective of the implementation of research results. It was therefore suggested that whenever a programme was proposed, a copy should be sent to user agencies for comments as well, in order to determine their utility for the user agencies.

DISCUSSION AND IMPLEMENTATION OF NGSRP
CHAIRMAN: H.K. QUARTEY-PAPAFIO

The Chairman of PMG opened the discussion by pointing out that only one aspect of the project had already been discussed, that is, the need to strengthen the capabilities of the science community. In examining the management aspects of the project, interest in co-operation as a means to finding solutions to research problems had been rekindled. Those scientists who were not involved in the project have also realised this need.

The next point for discussion is the causes of land degradation in the project area, its impact on the people and how well to control the major aspects of the problem.

The important resources concerned in the project are are:

1. Land
2. Water
3. Vegetation
4. Human, (a resource which is central to the whole environment)

In dealing with chapter 6 of the NGSRP recommendations, it is evident that the report had not only identified certain research areas, but also made reference to findings in other areas where research is needed to provide more data on areas with similar ecological conditions.

LAND RESOURCES

Most of the findings identified erosion as being the major problem in the project area. With land resources, the major problem of erosion is aggravated by other factors like overgrazing, deforestation, rainfall and loss in soil fertility, leading to other problems like low productivity, and reduction in fallow period with indirect effects on population density.

With the growth in population, farmers expand the acreages thus reducing the land for grazing. Cattle overgraze leading to exposure of land under cultivation, hence land for grazing is reduced leading to overgrazing. This leaves the land at the mercy of the weather resulting in loss in fertility. Farmers have appreciated this problem and have tried to control it by using contours, compound manure, and fertilizers. Some of the problems still persist and scientists must try to find solutions to them.

The observation was made that burning was a major causative factor to land degradation in that we could trace the advance of degradation from what used to be bush fallow to a savannah grassland.

Effects of burning not only reduces vegetation but vegetation structures show effect of fire on bulk density, with attendant adverse effects on the nutritional status of the pasture on the site. This generally leads to reduction in production, migration (loss) of people etc. Burning is not the only cause of land erosion, it is however a cheap means for land clearing but its use should be controlled.

WATER RESOURCES

The major factor affecting water availability is rainfall. Rivers cannot flow when there is no adequate rainfall. Technology has shown how both surface and underground water can be found for domestic and irrigation purpose. These sources have some disadvantages which include:

1. Wells - if the rate of depletion of water from wells is not monitored, inhabitants are adversely affected.
2. If the water points are not well regulated health problems may arise due to contamination. Schistosomiasis, guinea worm and other water borne diseases constitute the main health hazards.
3. Sedimentation also takes place and contributes to these hazards. If the structure is not well constructed and covered, water will evaporate or can easily be contaminated giving rise to other problems.

The advantages, however, far outweigh the disadvantages.

A comment was made that care should be taken in the choice of systems and amounts of water used for irrigation, for example in the Upper Region there are not many good sites for water, evaporation is intense and sedimentation constitutes a problem. When subterranean sources are found, some water becomes available for irrigation to a limited extent.

Traditional wells are shallow up to 6 m deep which is easily contaminated especially during heavy rains; and during the dry season, the water level drops and the wells dry up. It was also explained that the bore holes drilled by CIDA are a bit shallow and should, therefore, be investigated in future. They are made up to 30 m deep and in crystalline formations, they can go as far as 60 m deep before water is reached. More research is required in this area.

It was finally said that the southward movement of the desert as a result of drought is non-existent from the point of view of water availability. This southward encroachment is only enhanced by cultivation practices such as burning and other land practices, as well

as delay or variability of the rainy season.

A point was also made to the effect that drought cannot be determined on the basis of rainfall index but rather bad cultivation practices are known to lead to land degradation and the on-set of drought.

VEGETATION RESOURCES

Factors that reduce vegetation are mainly animal and human. Animals overgraze and thereby suppress the growth of grass, and humans fell the trees and make permanent constructions like roads, buildings, etc. In such cases, the destruction exceeds the renewal process. Experiments have identified tree species which can survive in certain areas and these must be encouraged to grow in those areas.

An observation was made that other numerous problems also affect the water holding capacity of the soil, and forestry is not that sufficiently developed through linking vegetation, water, etc. and this should be looked at. If greater emphasis is placed on agro-forestry, the problems like control of erosion, irrigation and other areas which can be integrated with agriculture and water resources will give a greater pay off. The central role of restoring the ecology of the region is very crucial. Agro-forestry has been carried out on a limited scale in Ghana by the Forestry Department but not as an issue for research. The need, was expressed, for the integration of forestry, agriculture, animal husbandry, water, etc. In the Tame basin, Missionaries were found planting trees and there is, therefore, the need to have a combined effort to improve the area.

BURNING

It was found that with regard to burning, it is better to start early and not late in the dry season as in the case in the Northern and Upper Regions. It was pointed out that man is not the only cause of burning but it can be caused by lightning in which case, it cannot be controlled. It is best, it was observed, not to burn at all.

RECOMMENDATIONS

The following points were made about what the Government could do to help the communication in the area.

- (1) Extensive adult education and extension programmes should be embarked upon to reach the farmer on the proper use of research findings. The fact that about 86% of the population is illiterate must be taken into account in this exercise.
- (2) It was found that 75 per cent of the people were healthy even though they lacked medical facilities. Health facilities were therefore needed in the area.

- (3) Communication, transport and roads should be improved. URADEP is doing something (about communication) by encouraging the use of radios.
- (4) Storage and marketing facilities also need improvement.
- (5) Farmers should be organised to make use of certain improved farm inputs.

it was also suggested that the CSIR should take note of the following areas which require further research.

- (a) Pasture improvement studies.
- (b) The continued application of remote sensing techniques.
- (c) Study and selection of tree species suited to the area.
- (d) Burning sub-project should be continued.
- (e) Water-borne diseases should be further studied.
- (f) Soil erosion - the main cause established should be monitored.
- (g) Food production - storage losses should be checked.
- (h) Migration problems.
- (i) Ground water movement should be monitored and other water resources explored.

LIVESTOCK MANAGEMENT AND PRODUCTION

It was noted that (a) range management and (b) disease control should be studied.

Under Forestry, subjects discussed included (a) ecology (b) erosion and (c) fuel.

A suggestion was made that arbor days should be encouraged in schools.

The need to improve marketing, storage and the provision of other infrastructure which would help the farmer was stressed.

The CSIR was requested to submit a report on the Workshop for appropriate action.

CONCLUSIONS AND RECOMMENDATIONS

- A. The Criteria for the Determination of Research Priorities in the Context of National Development
1. The nature of user community - the user as government or as a member of the community;
 2. The development potential - manpower, natural resources;
 3. Institutional capability and skills;
 4. The nature of the product or process; whether they are existing or new, and the level of technological inputs required;
 5. The source of funds, whether mandated or elective;
 6. Social cost/benefit analysis including employment generation, health promotion, energy conservation and general standard of living;
 7. The type of research required - problem solving or basic;
 8. Estimated duration - short, medium or long term.
- B. The CSIR's Role in the Determination of these Priorities
1. Resource Inventorying;
 2. A repository of all necessary data and information from within and other sources;
 3. The maximisation of the effectiveness of co-operating user agencies at both agency and institutional levels;
 4. Assertion of leadership role in establishing the research mechanism for carrying out research priorities;
 5. Control of budgetary allocation for research and the creation of a central fund for other specific priority research projects;
 6. Effective interaction between itself, the government, other research institutions and user agencies including the private sector.
- C. The Process for Project Design and Action Plan
1. Clear identification of problem with clearly defined objectives;
 2. The choice of methodology to be adopted should involve various approaches, disciplines and institutions to be used to solve the problem.

3. Clear identification of individual components and definition linkages between projects and their sub-projects;
4. A clear statement on inputs, outputs and time schedules.
5. Composition of management team and definition of management control and regulatory systems including specific mechanisms for reporting periodic reviews and evaluation of project objectives.

D. Effective Project Management

Inter-disciplinary or multi-disciplinary organization of research is fundamentally more effective in the management and execution of research.

(i) Identification of Institutional Framework

1. Identification of appropriate institution and the setting up of a central body for project co-ordination, analysis and evaluation with clearly defined authority and responsibility for project implementation.
2. Facilities should be provided for the execution of research projects.
3. Effective financial management system and procedures should be drawn up for the allocation, acquisition, utilization, recording and accountability of all financial resources required for project.

(ii) Collaboration Mechanisms

1. Determination of skills and facilities not available to the management of the project.
2. Location of such skills and facilities, and a decision on when they are required.
3. Specific protocols and mechanisms to request for the identified external skills and facilities should be established.
4. The full institutional commitment, contract or undertaking must be secured.
5. Periodic reporting, monitoring, meetings, reviews and evaluation during the life-time of project, and exposure of participants to other project components for a better appreciation of project objectives must be pursued.

(iii) Translation of Research Result into Practical Application

1. The appropriate liaison should be established between research and user agencies to produce the suitable material applicable in the solution of the problem.
2. Counterpart extension establishment should be created in the research organisations to maintain constant linkage with user agencies.
3. Effective training or orientation schemes should be organised in both the research institutions and user agencies for all levels of personnel.
4. The translation of research results into useable forms.

APPENDIX A

P R O G R A M M E

WORKSHOP ON RESEARCH MANAGEMENT FOR DEVELOPMENT
PLANNING

24TH-28TH MARCH, 1980

PLACE : CONTINENTAL HOTEL, ACCRA

FRIDAY, MARCH 21, 1980

- Arrival of U.S. Participants at Kotoka International Airport.

SUNDAY, - MARCH 23, 1980

- Visit:
Bank of Ghana Cattle Ranch,
Shai Hills,

University of Ghana Agricultural Research Station,
Kpong.

Akosombo

MONDAY, MARCH 24, 1980

HRS. 08.00 - Registration of Participants

OPENING SESSION

- Chairman - Executive Chairman of CSIR
- 09.00 - Opening Remarks by Chairman
- Address by the Vice-President,
H.E. Dr. J.W.S. de Graft-Johnson
- Address by the Minister for Industries, Science
& Technology, Hon. Mr. Vincent Bulla
- Address by the Minister for Lands, Natural
Resources, Fuel & Power, Hon. Dr. George Benneh
- Remarks by the U.S. Ambassador to Ghana
H.E. Mr. Thomas Smith
- 10.30 - Break/Refreshments

FIRST PLENARY SESSION

- Chairman Leader of NAS Team
- HRS. 11.00 - Briefing on Background, Planning, and Management
N.G.S.R.P. by Chairman of Project Management Group
- 12.30 - Working Lunch

MONDAY, MARCH 24, 1980

- 14.00 - Briefing by Principal Investigators (NGSRP)
- 15.30 - General Discussion of Working Procedures
and Formation of Working Groups
- 16.30 - Working Group Meeting
- 17.30 - C l o s e
- 18.30 - Cocktails

TUESDAY, MARCH 25, 1980

- HRS. 08.30 - Working Group Meeting
- 10.30 - Coffee Break
- 11.00 - Working Group Meeting
- 12.30 - Working Lunch

Chairman

- HRS. 14.00 - Working Group Meeting
- 16.00 - Preparation of Final Reports by Working
Groups.
- 17.30 - C l o s e

WEDNESDAY, MARCH 26, 1980

SECOND PLENARY SESSION

- Chairman - A member of NAS Team
- HRS. 08.00 - Discussion of Final Reports:
Contents & Format
- 09.30 - Preparation and Production of Final Report
- 10.00 - Coffee Break

THIRD PLENARY SESSION

- Chairman - Chairman of the Project Management Group
- HRS. 10.30 - Discussion and Implementation of NGSRP
(Preparation and Production of Final Report proceeds)

LUNCH

FINAL SESSION

- Chairman - Joint Leaders
- HRS. 16.00 - Adoption of Report - Conclusion
- 17.30 - Closing Session

THURSDAY, MARCH 27, 1980

- HRS. 08.30 - Visit to Kusi/Kade Oil Palm Research Station

FRIDAY, MARCH 28, 1980

- HRS. 08.30 - Visit to Cocoa Research Institute, Tafo

APPENDIX B

LIST OF PARTICIPANTS

GUEST SPEAKERS

1. His Excellency, Dr. J.V.S. de Graft-Johnson,
Vice-President of Ghana.
2. The Hon. Mr. Thomas Smith,
United States Ambassador to Ghana.
3. The Hon. Mr. Vincent Bulla,
Minister for Industries, Science and Technology.
4. The Hon. Dr. George Benneh,
Minister for Lands, Natural Resources, Fuel and Power
5. Dr. A.N. Tackie,
Executive Chairman, CSIR.
6. Dr. E.D. Offori,
Ag. Executive Chairman, CSIR.

NATIONAL ACADEMY OF SCIENCES (U.S.) PANELISTS

7. Dr. Bill C. Wright,
Director, African and Middle Eastern Programmes,
International Agricultural Development Service,
Rockefeller Foundation, New York, N.Y. - (Chairman,
U.S. Panel).
8. Dr. Edward S. Ayensu,
Director, Office of Biological Conservation,
Smithsonian Institution, Washington, D.C.
9. Dr. Mary E. Carter,
Director, Southern Regional Research Laboratory,
U.S. Department of Agriculture, New Orleans, Louisiana.
10. Dr. Russell J. Delucia,
President, META Systems, Inc., Cambridge, Massachusetts.
11. Dr. Priscilla C. Reinling,
Director, Project on Desertification, American
Association for the Advancement of Science, Washington, D.C.
12. Dr. T. Kelley White,
Acting Director, International Programmes in Agriculture,
Department of Agricultural Economics, Purdue University,
West Lafayette, Indiana.
13. Dr. Victor Rabinowitch,
Director, Board on Science & Technology for International
Development, National Academy of Sciences, Washington, D.C.

14. Dr. M.C.C. McDonald Dow,
Deputy Director, Board on Science & Technology for
International Development, National Academy of Sciences,
Washington, D.C.

GHANAIAN INSTITUTIONS

15. Cocoa Research Institute, Tafo - Dr. Yaw Ahenkorah,
Chief Research Officer
16. Council for Scientific & Industrial
Research
- I. Animal Research Institute - Dr. E.W. Agudu,
Senior Research Officer
- II. Building & Road Research Institute - Mr. R.P. Srivastava,
Research Officer
- III. Crop Research Institute, Kwadaso - Mr. Y.O. Amankwatia,
Principal Research Officer
- Dr. G.K.A. Buahin,
Entomologist
- Dr. Y.A. Duodu,
Entomologist
- Mr. A. Ofosu,
Senior Research Officer
- IV. Food Research Institute - Mr. K.K. Ayeson,
Senior Research Officer
- Dr. P.A. Kuranchie,
Research Officer
- Mr. B.L. Lartey,
Principal Research Officer
- Mr. Cudjoe Tsegah,
Assistant Research Officer
- V. Forest Products Research Institute - Mr. S.P.K. Britwum,
Principal Research Officer
- Mr. J. Brookman-Amissah,
Senior Research Officer
- VI. Industrial Research Institute - Mrs. A. Amoako-Mensah,
Research Officer
- Mr. D.S. Ayertey,
Research Officer
- Mr. Sylvanus A. Dogbe,
Research Officer
- VII. Institute of Aquatic Biology - Dr. A.E. Kpekata,
Senior Research Officer
- Dr. S.K. Prah,
Senior Research Officer
- VIII. Oil Palm Research Centre, Kade - Dr. J.B. Wonkyi-Appiah
Senior Research Officer

IX. Secretariat

- Mr. J.T.U.D. Acquah,
Senior Assistant Secretary
- Mr. A. Adu,
Deputy Secretary
- Mr. J.E.H. Bartels,
Scientific Co-ordinator
- Dr. Robert Dodoo,
Secretary (PAG)
- Dr. A.M. Goka,
Industrial Technologist (PAG)
- Mrs. Lena Korsah,
Senior Information Officer
- Mr. C.Y. Nyante,
Principal Administrative
Assistant (PAG)
- Mr. W.W. Dillety,
Assistant Scientific
Information Officer
- Mrs. E. Odartel-Laryea,
Co-ordinator (HCSR)
- Mrs. Barbara Oddoye,
Documentation/Information
Officer
- Dr. E.D. Ofori,
Acting Executive Chairman
- Mr. D.K. Opere-Sem,
Senior Information Officer
- Mr. J. Owusu Yaw
Assistant Scientific
Information Officer
- Mr. E.M.K. Udzu,
Research Officer
- Mr. J.A. Villars,
Librarian

X. Soil Research Institute, Kwadaso

- Mr. Mensah Bonsu,
Research Officer
- Dr. H.D. Obeng,
Director

XI. Water Resources Research Institute

- Mr. Nii Boi Ayibotele,
Director
- Mr. W.N. Okutu,
Research Officer (Hydrologist)
- Mr. L. Quist,
Principal Research Officer

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|--|--|
| 17. Environmental Protection Council | - Mr. R. Abrokwa-Ampadu,
Senior Research Officer |
| 18. Fisheries Research Unit | - Miss R.R. Anang,
Senior Fisheries Research
Officer. |
| 19. Ghana Institute of Management and
Public Administration (GIMPA) | - Dr. Kofi Ankomah,
Senior Lecturer

- Mr. R.K.O. Djan,
Deputy Director

- Mr. B.C. Eghan,
Lecturer

- Mr. J.E. Hagan,
Senior Lecturer |
| 20. Ghana Export Promotion Council | - Mr. William Torgbuiga,
Assistant Research Officer |
| 21. Ghana Industrial Holding Corporation | - Mr. Joseph G.K. Mensah,
Chief Engineer |
| 22. Institute of Statistical, Social and
Economic Research (ISSER) | - Mr. A.H. Seini,
Research Fellow |
| 23. Irrigation Development Authority | - Mr. H.K. Quartey-Papafio,
Chief Executive |
| 24. Land Administration Research Centre,
UST, Kumasi | - Mr. S.D. Amisah,
Director |
| 25. Management Development and
Productivity Institute (MDPI) | - Mr. F.A. Agbotse,
Management Consultant

- Mr. George K. Andoh,
Management Consultant

- Mr. E.A. Cofie,
Management Consultant |
| 26. Management Services Division, State
House | - Mr. T.R.B. Arthur |
| 27. Manufacturers Research & Technical
Services Centre | - Mr. F.S. Okwaning,
Director |
| 28. Meteorological Services Department | - Mr. S.E. Tandoh,
Deputy Director

- Mr. A.K.E. Ussher,
Principal Meteorologist |
| 29. Ministry of Health | - Dr. E.C. Marbell,
Medical Practitioner |
| 30. Ministry of Industries | - Mr. N.O. Adu-Danso,
Senior Civil Servant |
| 31. Research Library on African Affairs | - Mr. A.N. de Heer,
Librarian |
| 32. Starkist International, Tema | - Dr. Eric Kwei,
Senior Project Manager |

33. State Enterprises Commission
- Miss Elizabeth Aye, Economics Officer
 - Mr. E.L. Bartels, Secretary
34. University of Cape Coast,
Centre for Development Studies
- Dr. E. Amonoo, Acting Director
 - Mr. John Micah, Research Fellow
35. University of Ghana, Legon
- i. Agricultural Research Station,
Kpong
- Mr. K. Amoning-Kwarteng, Research Officer
 - Mr. E.O. Darkwa, Research Officer
- ii. Faculty of Agriculture, Legon
- Dr. F.K. Fianu, Lecturer
 - Mr. E.F.G. Mante, Research Fellow
36. University of Science and Technology,
(UST) Kumasi
- Mr. S.O. Bampo, Lecturer
37. USAID Mission, Ghana
- Mr. John Cooper, Chief, Office of Science & Technology
38. USAID Mission, Ivory-Coast
- Ms Vernita Fort, Ecologist

OBSERVERS

- | | |
|--|---|
| 1. Amoana Industries Limited | - Mr. S.A. Dentu,
Secretary/Director |
| 2. Council for Scientific & Industrial Research | |
| I. Animal Research Institute | - Dr. B.L. Nutor,
Senior Research Officer |
| | - Mr. Debrah Spong
Senior Research Officer |
| II. Food Research Institute | - Mrs. J. Maud Kordylas,
Director |
| III. Industrial Research Institute | - Mr. W.A. Atubra,
Research Officer |
| | - Dr. M.N.B. Ayiku,
Acting Director |
| IV. Institute of Aquatic Biology | - Mr. M.A. Odei,
Director |
| V. Scientific Instrumentation Centre | - Mr. E.Y. Addo,
Chief Technician |
| | - Mr. G.A. Kofi,
Technical Officer |
| VI. Water Resources Research Unit | - Mr. P. Gyan-Boakye,
Research Assistant |
| | - Mr. Y. Opoku-Ankomah
Assistant Research Officer |
| 3. Ghana Academy of Arts and Sciences | - Miss Angeline Laryea,
Administrative Secretary |
| 4. Ghana Standards Board | - Dr. G.Y. Ahlijah,
Principal Scientific Officer |
| 5. Department of Agriculture | - Mr. K. Williams-Saffoe,
Director |
| 6. Ghana Institute of Management and Public Administration (GIMPA) | - Mr. K.A. Manuël,
Secretary |
| 7. Meteorological Services Department | - Mr. N.A. Gbeckor-Kove,
Director |
| 8. Ministry of Industry | - Mr. Marcel P. Brosseau,
CIDA Adviser |
| | - Mr. A. Eboe-Arthur,
Economist |
| | - Mrs. Hannah G. Woanyah,
Counterpart CIDA Adviser |
| 9. Office of the Vice-President | - Mr. J.O. Eshun |
| 10. Princeton University, U.S.A. | - Professor William Bonini |

- 11. State Enterprises Commission
 - Mr. B.K.A. Abedi,
Head of Finance
- 12. USAID Mission, Ghana
 - Mr. Irvin D. Coker,
Director
 - Mr. Gerald G. Graf,
Programme Officer
 - Mr. Samuel T. Scott,
Capital Dev. Officer
 - Mr. David Levintow,
Assistant Director
 - Mr. Jim Washington,
HRD Officer
 - Mr. Michael S. Zak,
Programme Officer

APPENDIX C

WORKING GROUP

POST-HARVEST TECHNOLOGY

1. Kofi Ankomah - Ghana Institute of Management & Public Administration, Greenhill
2. E. S. Ayensu - Smithsonian Institution (US-MAS)
3. A. Adu - Secretariat (CSIR)
4. G.K.A. Buahin* - Crop Research Institute, (CSIR)
5. E. A. Cofie - Management Development and Productivity Institute, Accra
6. E. D. Darkwa - University of Ghana Agric. Research Station, Kpong
7. A. N. de Heer - Research Library on African Affairs, Accra
8. K.K. Eyeson - Food Research Institute (CSIR)
9. Felix Fladjoo† - Faculty of Agric., University of Ghana
10. B.L. Lartey - Food Research Institute (CSIR)
11. E.C. Harbell - Ministry of Health, Accra
12. M. N. Okutu - Water Resources Research Unit (CSIR)
13. A. Ofosu - Crop Research Institute (CSIR)
14. E.D. Offori - Secretariat (CSIR)
15. E. Odartel-Laryea (Mrs) - Secretariat (CSIR)
16. M.W. Oblitey - Secretariat (CSIR)
17. V. Rabinowitch - BOSTID (US-MAS)
18. A. H. Seini - Institute of Social Statistics & Economic Research, University of Ghana
19. R.P. Srivastava - Building & Road Research Institute, (CSIR)
20. Cudjoe Tsegah - Food Research Institute (CSIR)
21. H.K. Quartey-Papafio - Irrigation Dev. Authority, Accra

* Chairman

+ Rapporteur

WORKING GROUP
FOOD PRODUCTION

- | | |
|-------------------------|---|
| 1. E.R. Anang | - Fisheries Research Unit, Min. of Agric. |
| 2. K. Amaning-Kwarteng | - University of Ghana Agric. Research Station, Kpong |
| 3. George K. Andoh* | - Management Development & Productivity Institute |
| 4. Yaw Ahenkorah* | - Cocoa Research Institute, Tafo |
| 5. T.R.B. Arthur | - Management Services Division |
| 6. E. Amonoo | - University of Cape Coast |
| 7. E.W. Agudu | - Animal Research Institute (CSIR) |
| 8. Mensa Bonsu | - Soil Research Institute (CSIR) |
| 9. S.P.K. Britwum | - Forest Products Research Institute (CSIR) |
| 10. Mary Carter | - US Department of Agriculture (US-NAS) |
| 11. Y. A. Nuodu | - Crops Research Institute (CSIR) |
| 12. B. C. Eghan+ | - Ghana Institute of Management & Public Administration |
| 13. F. K. Flanu | - Faculty of Agriculture, University of Ghana |
| 14. P. A. Kuranchie | - Food Research Institute (CSIR) |
| 15. Eric Kwei | - Starkist International, Tema |
| 16. E. F. G. Mante | - Faculty of Agriculture, University of Ghana |
| 17. H. B. Obeng | - Soil Research Institute (CSIR) |
| 18. S. K. Prah | - Institute of Aquatic Biology (CSIR) |
| 19. J. B. Wonkyi-Appiah | - 111 Palm Research Centre (CSIR) |
| 20. Bill. C. Wright | - Rockefeller Foundation (US-NAS) |

* Chairman

+ Rapporteur

WORKING GROUPRURAL INDUSTRY

- | | |
|--------------------------|--|
| 1. J.T.G.C. Acquah | - Secretariat (CSIR) |
| 2. Elizabeth Ayegbe | - State Enterprises Commission |
| 3. S.B. Amisah | - Land Administration Research Centre, UST, Kumasi |
| 4. Y. O. Amankwatia | - Crops Research Institute (CSIR) |
| 5. A. Amoako-Mensah | - Industrial Research Institute (CSIR) |
| 6. N. O. Adu-Danso | - Ministry of Industries |
| 7. F. A. Agbotse | - Management Development & Productivity Institute |
| 8. Nii Bol Ayibotele | - Water Resources Research Unit (CSIR) |
| 9. J.E.M. Bartels | - Secretariat (CSIR) |
| 10. Sylvanus A. Dogbe | - Industrial Research Institute (CSIR) |
| 11. J. E. Hagan | - Ghana Institute of Management & Public Administration, Greenhill |
| 12. Lena Korsah (Mrs) | - Secretariat (CSIR) |
| 13. John Micah | - Development Studies Centre, Univ. of Cape Coast |
| 14. Joseph G.K. Mensah | - Ghana Industrial Holding Corp., Accra |
| 15. D. K. Opare-Sem | - Secretariat (CSIR) |
| 16. F.S. Okwaning | - Manufacturing Res. & Tech. Services Centre, Accra |
| 17. L. Quist | - Water Resources Research Unit (CSIR) |
| 18. P. Reinling* | - Am. Assoc. Adv. Sc. (US-NAS) |
| 19. T. William Torgbulga | - Ghana Export Promotion Council, Accra |
| 20. Janet Tay (Mrs) | - P. O. Box 6392, Accra-North |
| 21. E. M. K. Udzu | - Secretariat (CSIR) |
| 22. T. Kelley White | - Purdue Univ., (US-NAS) |

* Chairman

+ Rapporteur

WORKING GROUPE N E R G Y

- | | |
|-------------------------------------|--|
| 1. S. T. Ampofo ⁺ | - Cocoa Research Institute, Tafo |
| 2. D. S. Ayertey | - Industrial Research Institute (CSIR) |
| 3. R. Abrokwa-Ampadu | - Environmental Protection Council, Accra |
| 4. J. Brookman-Amissah | - Forest PRODUCTS Research Institute, (CSIR) |
| 5. S. O. Bampo | - UST, Kumasi |
| 6. John Cooper | - USAID/Ghana |
| 7. M. Dow | - BOSTID (US-NAS) |
| 8. R.K.O. Djang | - Ghana Institute of Management & Public Administration, Greenhill |
| 9. R. Dadoo | - Secretariat (CSIR) |
| 10. Russell J. Delucia ⁺ | - Meta Sysms. Inc. (US-NAS) |
| 11. Vernita Fort | - USAID/REDSO - Abidjan |
| 12. A. H. Goka [*] | - Secretariat (CSIR) |
| 13. A. E. Kpekata | - Institute of Aquatic Biology (CSIR) |
| 14. A. Ofosu-Asiedu | - Forest Products Research Institute, (CSIR) |
| 15. S. E. Tandoh | - Meteorological Services Department, Accra |
| 16. A. K. E. Ussher | - Meteorological Services Department, Accra |

* Chairman

+ Rapporteur

APPENDIX D-1

OPENING ADDRESS BY PROFESSOR A. J. TACKIE, EXECUTIVE CHAIRMAN OF
THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, GHANA

Your Excellencies, Distinguished Guests, Ladies and Gentlemen,
It is both my privilege and very pleasant duty, as Executive Chairman
of the Council for Scientific and Industrial Research, (CSIR) to
welcome you to this Workshop on Research Management for Development
Planning. The CSIR, as you are aware, is hosting and co-sponsoring
this Workshop on Research Management for Development Planning jointly
with the United States National Academy of Sciences (US-NAS).

I wish, at this stage, to express my profound gratitude to the
Vice-President, Dr. J.W.S. de Graft-Johnson, for honouring our invitation
to this opening session. Incidentally, he is not new to us in the
Scientific community, nor to our collaborative Scientific endeavours with
the US-NAS. He has come to renew his ties with his former colleagues
and to reassure us of his continued interest in the progress of science
and technology for the development of this country.

It is also my pleasure to extend a hearty welcome to our Minister
for Industries, Science and Technology, Mr. Vincent Bulla, who is
directly responsible for the affairs of the CSIR. Honourable Minister,
as this is your first formal contact with the CSIR, this Workshop affords
us the opportunity to acquaint you with some of the demands that this
change of science administration will create, and the capabilities
available in this institution to support your new Ministry.

The Minister for Lands, Natural Resources, Fuel and Power,
Dr. George Benneh, is here in a dual capacity. He has, from the beginning
of the Northeast Ghana Savannah Research Project (NGSRP) - which is to
serve as case study for this Workshop - contributed tremendously to the
success of the project. First, in the collection and collation of the
basic data for the study, and subsequently, in serving as one of the
Investigators for one of the research components. I am, therefore,
delighted and grateful that he has been able to find time to be with us
this morning. Indeed, it is appropriate that since the subject of the
Workshop deals with problems and management of natural resources you,
Sir, are here with us.

I would also like to seize this opportunity to specially welcome
the new US Ambassador, His Excellency, Mr. Thomas Smith, to Ghana and
to our scientific community. We welcome you sincerely, and trust that
the fruitful co-operation with your Government in the scientific and
technological endeavours of Ghana will continue to grow.

I would like now to welcome you all to this meeting, and especially,
the American participants who, during the next three days, will be

engaged in the exchange of ideas with their Ghanaian counterparts on research management for development planning.

One of the vital functions of the CSIR is to play the leadership role in research and development (R & D). To enable the Council to pursue this national assignment effectively, the Government has further given the Council the mandate to ensure that all scientific research being conducted in the country, is better co-ordinated, adequately funded and supported, by making provision for common services, requisite manpower and other resources needed for meaningful research. These resources would provide the proper atmosphere for scientific and technological research and ultimately contribute to the development, utilization and management of the resources of the nation. It has been my cherished desire to advance these goals and to ensure that they are reflected in our external relations.

The Council's collaborative programme with the US-NAS dates as far back as 1971. The basic concept underlying this collaborative effort is to assist the Council to effectively execute its R & D mandate, in serving the needs of the wider scientific and industrial research community, and also, in developing the capability of relating science and technology to economic and social problems in Ghana.

The co-operative programme, so far, has taken the form of workshops aimed at examining the institutional mechanisms for formulating science policy, identifying research priorities and problems in the execution of research in Ghana, and also finding out how best agricultural research results could be made available to user-agencies.

The Workshop in 1971 on "Research Priorities and Problems in the Execution of Research in Ghana" recommended among other things, the establishment of an ad-hoc National Advisory Committee on Science Policy to assess priorities in the development of science and to make policy recommendations to the CSIR.

The Workshop in 1973 on "The Role of the Council for Scientific and Industrial Research in Determining Science Policy and Research Priorities" recommended the establishment of a Science and Technology Planning and Analysis Group for the planning, analysis and identification of research priorities and projects, and to conduct special studies in identified areas and fields.

The 1971 and 1973 Workshops revealed the near absence of co-ordination in research - the separate and independent use of the limited research facilities in terms of human resources - the acute shortage of equipment and funds; and the apparent absence of a mechanism for evaluating, monitoring and costing of the various research inputs and activities. It became apparent, in the light of the constraints revealed through these collaborative ventures, that there was the urgent need to

foster institutional co-operation in research, in order to pool our limited resources to improve our research methodologies and management techniques. This led to the design in 1974 of the NGSRP aimed at strengthening our capabilities to conduct multi-disciplinary and institutional research.

This project was chosen specifically to assess technically the present and potential impact of drought on agricultural and rural development of the savannah region of Northern and Upper Ghana. The project chose for its framework five basic lines of research for investigation. They were: Burning; Cultivation Practices; Water Availability and Distribution; and Development of Socio-Economic/National Resources Data Base Analysis.

I am happy to report that the NGSRP has achieved some significant results and has clearly demonstrated that:

- a) the CSIR has the inherent capacity, as an institution, for project design and implementation;
- b) the CSIR, when provided with adequate and independent research funds (from both local and outside sources) could meaningfully undertake short-term multi-disciplinary research focused on critical development problems; and
- c) It is possible for inter-institutional co-operation to be fostered as a means of maximizing the use of our limited research facilities and financial resources.

The next stage in our search for methodologies in the effective execution of our R & D mandate, is to capitalize on the benefits that have accrued from the design and management of the NGSRP.

What is of interest to this Workshop is that the technical objectives of the NGSRP were to serve as a case study, an experiment and a demonstration of multi-disciplinary and inter-institutional research management in Ghana. It was also to serve as a tool in assisting the CSIR in the development of its capabilities in the planning, design organisation, and management of scientific research programmes. It was more so for the latter reason that this Workshop has been so designed to represent as many shades as possible of experiences and practices in management. This no doubt will assist the CSIR to better appreciate the local context in which research management should be organised and executed.

You will agree with me, Your Excellencies, Ladies and Gentlemen, that this approach represents a significant turning point in research organisation in this country, and this Workshop is most befitting not only to announce it, but to create the necessary awareness of the importance

of science and technology for development, and obtain the necessary support.

This change in approach happens to coincide with another change at the Government level, where science and technology have been accorded greater recognition in the creation of a Ministry of Industry, Science and Technology. It would appear therefore that the proverbial wind of change is blowing over the scientific scene in the country, and it is our greatest wish and hope that the necessary support from government, the scientists and the people will be forthcoming to help the cause of science and technology in the country.

During this three-day workshop, the participants will be expected to examine in some detail, the background, planning and management of the NGSRP; and to come out with recommendations for the future conduct and management of R & D in the country, with particular emphasis on agriculture and the better utilization of natural resources.

In conclusion, I wish once again to extend to the US-IAS panelists a very warm welcome and to wish you a useful and enjoyable time with us.

OPENING ADDRESS BY HIS EXCELLENCY THE VICE PRESIDENT
DR. J.W.S. DE GRAFT-JOHNSON

Mr. Chairman, Honourable Ministers of State, Your Excellencies,
Ladies and Gentlemen,

I am happy to be here with you this morning, and once again to be involved in a field I have been intimately associated with during the past fifteen years. Largely for me, it is a home-coming since it affords me the opportunity to meet some of my professional colleagues and friends in the scientific community. I am aware, from my past involvement with the CSIR, that the topic of your Workshop has engaged the attention of our research scientists for some time. It is gratifying to me and the Government that at long last, efforts are being made to grapple with these issues and implications of research, its management, relevance and impact on national development.

In the recent past, there have been pressing demands from several quarters in Ghana for the CSIR to re-organise and re-orient its programmes in order to make a more meaningful impact on the economic and social development of the country. This Workshop is indeed a demonstration of the fact that research scientists and technologists themselves have recognised their role in national development, by ensuring that their own research projects and programmes are carefully planned, analysed and managed to justify the inputs provided from public funds. This awareness is most welcome and timely.

You would agree with me, Mr. Chairman, that research in Ghana has lacked the integrated and collaborative research approach which is so essential for solving the numerous and complex problems facing the nation. I am here referring to problems of rural development, self-sufficiency in food, application of employment generating technologies and import substitution. In this connection, it is gratifying to note that the CSIR in collaboration with the USAID has, through the NGSRP, demonstrated the merits of such an approach to research.

The Government's financial expenditure on research in this country has been substantial. Unfortunately, the returns to national development have been minimal. This has been due, in part, to lack of proper management including an effective communication of research results to policy makers, planners, industry and other users.

The Government is determined, in this regard, not to repeat the mistakes of the past. We shall ensure that meaningful research is undertaken and the results are carefully evaluated and immediately integrated into our national development programmes.

It must also be pointed out that research and development in this country are highly import intensive. In view of the critical financial

and foreign exchange position of the country, I would like to exhort my fellow scientists to be cost conscious and to increase the local resource inputs of our research work. In connection with the increased use of local inputs, I expect the scientific community and the CSIR in particular, to initiate the necessary studies.

The task of formulating a policy for the evaluation and upgrading of traditional technology to improve the living conditions of the rural population is one of the priority concerns of the Government. We are aware that the various institutes of the CSIR and the Technology Consultancy Centre of the University of Science and Technology at Kumasi are investigating aspects of rural technology such as food processing, housing, energy production and craft industries. On assumption of office, the Government received from the CSIR, a document focussing attention on areas of their research operations and results relevant to national development. This document clearly shows that substantial amount of research results have been accumulated over the years which could have been used to improve the living conditions of our rural people. For the efforts of these research establishments to be meaningful and beneficial therefore, I would urge the CSIR to identify the user agencies in their rural technological development programmes.

Ghana is not seriously lacking in research and development resources. We are reasonably endowed with trained scientists and have a fairly well developed institutional infrastructure for research. Co-ordination between the institutions of research however, has not been effectively pursued through the CSIR, which has that responsibility. What is missing particularly, is a carefully formulated Technology Plan. Such a plan should identify the areas and targets of the nation's scientific and industrial research development efforts and, to enable Government to consider appropriate and relevant support to be given. This presupposes interaction of policy-makers, executing agencies and researchers. Government cannot at this time afford a situation of multiple research endeavours, under the CSIR running parallel to motivated research endeavours at the Universities for the academic sake of research. Research activities under the CSIR should, for example, increase the preservation potentials of our mostly perishable food items to minimize post-harvest losses and indeed have direct bearing on industry and agriculture. Government will, accordingly, promote and support a co-ordinated centrally-directed research development that will have practical bearing on national development efforts.

Mr. Chairman, successful application of science and technology for social and economic development requires not only the provision of adequate infrastructure and qualified and competent scientists, but also the provision of an atmosphere conducive to creative work. The

scientist may be a very qualified and competent researcher, but he may find the task of managing and leading others in research difficult and demanding. I believe that the CSIR in collaboration with the Ghana Institute of Management and Public Administration (GIMPA) could organise specialised training for the research scientists in order to equip them for the proper management and direction of research. I therefore invite the CSIR and GIMPA to give serious thought to this suggestion.

The importance of information and its effective dissemination, management and development planning, is very often taken for granted. It is now being realised however, that scientific research, with its supporting information dissemination system is an integral part of national development which cannot be ignored.

I am happy to note that some attention is now being given to the issues involved in the provision of information. I am informed that the CSIR is now in the process of drawing up plans for a national network in a well co-ordinated system. I am also happy to note that already a building is being constructed to serve as the nerve-centre for dissemination of research information.

In conclusion, Mr. Chairman, Ladies and Gentlemen, I wish to assure you that Government is aware of the many problems facing the scientific and technological institutions in the country. These problems, we believe, are not insurmountable and we shall spare no effort in building and strengthening our scientific and technological institutions, and help in finding solutions to these problems.

The theme for this Workshop, I would like to re-iterate, is most appropriate at this time in our development and we hope you will come out with practical and implementable recommendations.

I wish you every success in your deliberations.

APPENDIX D-3

ADDRESS BY MR. VINCENT BULLA, MINISTER FOR INDUSTRIES,
SCIENCE AND TECHNOLOGY, DELIVERED ON HIS BEHALF
BY HIS DEPUTY MINISTER, DR. F. ACQUAH

Mr. Chairman, His Excellency the Vice-President, Distinguished Guests,
Ladies and Gentlemen,

It is both my pleasure and privilege, as Minister responsible for Industries, Science and Technology to join the Vice-President in welcoming you to this Workshop jointly organised by the Council for Scientific and Industrial Research (CSIR) and the United States National Academy of Sciences (US-NAS). The theme of the Workshop, as you are already aware, is "Research Management for Development Planning".

I wish to extend a special welcome to the distinguished visitors from US-NAS who have travelled all the way from their country to join their Ghanaian colleagues in this important national endeavour. I have been informed that the US-NAS, through the Board on Science and Technology for International Development (BOSTID) has for a number of years, been engaged in bilateral programmes with the CSIR. Their effort I understand, is aimed at strengthening the scientific, technological and institutional capabilities of the CSIR and at evolving programmes of science and technology for development in this country. In line with this collaborative effort, I am further informed that the US-NAS and the CSIR have organised studies and workshops. These activities have resulted in the formulation of some relevant science and technology policy guidelines and the development of appropriate institutions, which have helped in bringing science and technology closer to solving priority problems in the country.

The last of such collaborative efforts was the workshop on "The Role of the Council for Scientific and Industrial Research in determining Science Policy and Research Priorities in Ghana". This led to the creation of a Science and Technology Planning and Analysis Group within the CSIR to help, among other things, provide analytical studies for taking appropriate decisions on the application of science and technology. I am pleased with these past collaborative programmes which the US-NAS has undertaken in Ghana and I expect that the links between the US-NAS and the CSIR will continue and be strengthened.

I recognise that in the past the joint programmes have taken the form of workshops, study groups, advisory missions and in some cases, have resulted in the establishment of permanent committees. These activities have resulted invariably in the production of reports touching on various facets of our national life. Some of the recommendations in these reports are yet to be implemented. I shall therefore, take the opportunity to examine these recommendations carefully with a view to ensuring that the relevant and priority ones are duly attended to. It is also my wish however, that your future collaborative efforts should focus attention on our national development programmes and should result in the establishment of pilot projects. It is along these lines that science and technology

will be relevant to our needs and meet the demands of our growing industries.

It is on record that in 1974, the Government of Ghana and the USAID Mission signed a bilateral agreement on the "Development and Application of Science and Technology". The first project under this agreement was the Northeast Ghana Savannah Research Project (NGSRP), a multi-disciplinary research project aimed at addressing the causes and control of desertification in Northeast Ghana. The objectives of the study which has been concluded this March, have been:

1. to strengthen the capability of the Ghanaian scientific community to conduct inter-disciplinary research which contributes directly and significantly to the short-term solution of critical problems of socio-economic development;
2. to identify more clearly, analyse and enumerate the factors involved in possible desertification in the savannah zone of Northern Ghana;
3. to investigate and implement cultural and management practices which will halt and even reverse the trend towards increasing land degradation in the northeastern area of Ghana;
4. to design a coherent integrated programme which will stimulate and contribute to international programmes in this area.

Distinguished guests, I am pleased to note that through this exercise, the CSIR has demonstrated its capabilities in project design, project co-ordination and management, and above all, in ensuring institutional collaboration in multi-disciplinary problem-solving projects. The next step is for the CSIR to internalise and consolidate these techniques for future use.

I note that during the coming few days the joint panel of scientists, engineers, research administrators, educators, planners and government officials will discuss in detail:

1. the experience of the NGSRP, in particular, the benefits accruing from the study, its design, management and results so as to assist governmental planning for the utilisation and conservation of natural resources in the area.
2. implementation of research results in planning policies and activities including issues such as institutional arrangements with the various Ministries for using research output for policy decisions and action programmes;
3. future contribution of integrated research programmes to development planning, including issues such as guidelines for programme selection and level of activity.

These are all crucial issues of priority concern to my Ministry.

You will agree with me that our recent past is littered with research activities which have been ill-conceived, and have lacked proper management. It is the policy of this Government to ensure that research results are developed and applied to the benefit of the country; and to this end, my Ministry which is responsible for the CSIR, is determined to use all the resources at its disposal to encourage research officers, both at the Universities and at the CSIR, to give of their best to this country. The present Government is convinced that science and technology constitute one of the important keys to economic development, and therefore deserve priority attention and support; hence the creation of the new Ministry of Industries, Science and Technology.

The CSIR has been appropriately placed under my Ministry and will continue to carry out its functions of co-ordination of scientific and technological advances likely to be of national importance. My Ministry on its part will ensure that:

1. the research programmes being undertaken within the research Institutes of the CSIR, the Universities of Ghana and other Governmental agencies are geared to the national development programme;
2. scientific and technological research activities will be carefully planned, monitored and evaluated to ensure that the desired linkages between science, technology and industry are established.

It is with these points in view that I welcome you here to address yourselves to the subject of research management and its relevance to national development planning.

I wish you success in your deliberations. I hope to keep in touch with you and your activities during the week, and will be ready to assist in every way possible for the Workshop to achieve its objects.

APPENDIX D-4

ADDRESS BY DR. GEORGE BENJIEH, MINISTER FOR LANDS,
NATURAL RESOURCES, FUEL AND POWER, DELIVERED ON
HIS BEHALF BY HIS DEPUTY MINISTER, MR. J. AFFUL

Mr. Chairman, the Vice-President, Your Excellencies, Ladies and Gentlemen,

It is an honour to have been invited to participate in the Workshop on "Research Management for Development Planning", which will draw substantially from the experiences of the Northeast Ghana Savannah Research Project (NGSRP). I was personally involved in the initial design of the project, and also served as an Investigator in the socio-economic component of the project. It is a pleasure, therefore, to join you in this Workshop which is one of the concluding activities of the Joint CSIR/US-NAS multi-disciplinary and problem-solving research efforts.

I am gratified to note that all the research studies have been successfully completed. The co-ordination of such a multi-disciplinary inter-institutional research project cannot be an easy task. It is, therefore, a significant achievement for the CSIR to have been able to marshal all available resources to ensure an effective co-ordination of the project and the involvement of a number of research institutions in the country.

As one of the Principal Investigators for the NGSRP, therefore, I would like to seize this opportunity to congratulate the CSIR for conceiving the project and using the research studies as a means of pooling together the meagre research and financial resources available in the country for the execution of such a meaningful research project.

I must also commend USAID for making the funds available for the research and associated management activities. I am convinced, by the results of this project, that by making available to the CSIR an independent financial contribution for the project, USAID has helped in establishing the fact that when substantial funds are made available to a national research body and with proper management, relevant research could be undertaken to the benefit of the national economy.

It is, therefore, worth considering, in my view, the creation of a Science Foundation which could be a focal point for attracting independent research funds from both local and external sources, and applying such funds in finding solutions to short-term issues such as finding alternative sources of energy to solve our energy problems.

One of the key concerns of my Ministry is the development and management of the potentially rich natural resources of the country. In this regard, it is important not only for science and technology to be developed and fostered in the country, but for it to be effectively applied towards the development of the known and unknown resources of the land in order to achieve economic and social development. The CSIR,

by its mandate, is to advise the Government on scientific and technological matters of importance to national development. My Ministry, in dealing with matters relating to the land, natural resources, fuel and power therefore, would benefit from the Council's research activities of relevance to our fields of interest and, in particular, from scientific and technological advice on the utilization and conservation of the natural resources of the country.

I would like to appeal to the CSIR to re-activate its Natural Resources Committee. This Committee will then be expected to focus its attention on the application of science and technology in the development and management of natural resources, including the inventorying and monitoring of the resources for economic and social development.

Mr. Chairman, Ladies and Gentlemen, proper management is of crucial importance at this stage in our development. It is gratifying to note that the scientific community in Ghana has recognized the need for research management in development planning, and have organised this Workshop to ensure that future research projects are carefully designed, managed and made relevant to national development objectives.

I wish you all the very best and look forward to a successful and fruitful Workshop.