

Report of a Mission

**Agricultural and
Livestock Research
Upper Volta**

The World Bank
United Nations Food and Agriculture Organization
International Service for National Agricultural Research

**Report prepared for the Government of
The Republic of Upper Volta
On the joint mission of
World Bank-FAO-ISNAR**

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List of Acronyms

AGRHYMET	Agro-hydro-meteorology
Arcoma	Atelier Régional de Construction de Matériel Agricole
AVV	Autorité des Aménagements des Vallées des Volta (Volta Valley Development Authority)
CAP	Centre Agricole Polyvalent de Matourkou (Polyvalent Agricultural Center of Matourkou)
CCCE	Caisse Centrale de Coopération Economique (Central Savings for Economic Cooperation)
CEAO	Communauté des Etats de l'Afrique de l'Ouest (West African States Community)
CER	Centre d'Education Rural (Center for Rural Education)
CERCI	Centre d'Expérimentation sur le Riz et les Cultures Irriguées
CFJA	Centre de Formation des Jeunes Agriculteurs (Young Farmers Training Center)
CIDA	Canadian International Development Agency
CIEH	Comité Inter-Africain d'Etudes Hydrauliques (Inter-African Committee on Hydraulic Studies)
CILSS	Comité Permanent Interétats pour la lutte contre la Sécheresse au Sahel
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo
CRMPN	Comité Militaire de Redressement pour le Progrès National
CNACB	Commission National de l'Attribution et de Contrôle des Bourses
CNCA	Caisse National de Crédit Agricole
CNESRS	Conseil National de l'Enseignement Supérieur et de la Recherche Scientifique
CNO	Commission National de l'Orientalion
CNRST	Centre National de la Recherche Scientifique et Technologique
CPCR	Commission de Programmation et de Coordination des Recherches
CRST	Commission de la Recherche Scientifique et Technologique du CNERS
CRTA	Centre de Recherche sur les Trypanosomoses Animale (Research Center for Animal Trypanosomiasis)
CSPA	Caisse de Stabilisation des prix des Produits Agricoles
CSPPN	Conseil Supérieur du Plan et de la Planification Nationale
CSRA	Comité Spécialisé de la Recherche Agronomique
CSRAZ	Comité Spécialisé de la Recherche Agronomique et Zootechnique
CTFT	Centre Technique Forestier Tropical
CVRS	Centre Voltaïque de Recherche Scientifique
DDP	Direction de la Documentation et des Publications (MESRS)
DEP	Direction d'Etudes et de Projets
DGOB	Direction Générale de l'Orientalion et des Bourses
DGRST	Direction Générale de la Recherche Scientifique et Technologique
DSA	Direction des Services Agricoles
DSE/IA	Direction des Services de l'Elevage et des Industries
EEC	European Economic Community
EIER	Ecole Interétats d'Ingénieur et de l'Equipement Rural
FAC	Fonds d'Aide et de Coopération
FAO	Food and Agriculture Organization of the United Nations
FDR	Fonds de Développement Rural

FED	Fonds Européen de Développement (European Development Fund)
FRG	German Federal Republic of Germany
FSU	Farming Systems Unit (SAFGRAD - Purdue University)
GERDAT	Groupe d'Etudes et de Recherches pour le Développement de l'Agronomie Tropicale
GTZ	German Technical Cooperation Institute
HER	Direction de l'Hydraulique et d'Equipeement Rural
ICRISAT	International Crops Research Institute for the Semi-arid Tropics
IDA	International Development Association
IDRC	International Development Research Center (Canada)
IEMVT	Institut d'Elevage et de Médecine Vétérinaire Tropicale
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
ILCA	International Livestock Center for Africa
INSAH	Institut du Sahel
IRA	Institut de Recherche Agronomique
IRAT	Institut de Recherches Agronomiques Tropicales et des Cultures Vivrières
IRBET	Institut de Recherches Biologie et d'Ecologie Tropicale
IRCT	Institut de Recherches sur le Coton et les Textiles
IRFA	Institut de Recherches des Fruits et Agrumes
IRHO	Institut de Recherches sur les Huiles et les Oléagineux
IRRI	International Rice Research Institute
IRSN	Institut de Recherche sur les Substances Naturelles
IRSSH	Institut de Recherche en Sciences Sociales et Humaines
ISNAR	International Service for National Agricultural Research
ISP	Institut Supérieur Polytechnique
IVE	Institut Voltaïque de l'Energie
IVRAZ	Institut Voltaïque de Recherche Agronomiques et Zootechnique
MDR	Ministère du Développement Rural (Ministry of Rural Development)
ME	Ministère de l'Equipeement
MESRS	Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
MET	Ministère de l'Environnement et du Tourisme
MSU	Michigan State University
OFNACER	Office National des CERéales
ONBI	Office National des Barrages et de l'Irrigation
ONERA	Office National de l'Exploitation des Ressources Animales
UNIDO	United Nations Industrial Development Organization
OPEC	Organization of Petroleum Exporting Countries
ORD	Organisme Régional de Développement
ORSTOM	Office de Recherche Scientifique et Technique d'Outre-Mer
OAU	Organization for African Unity
PAPEM	Point d'Appui de Prévulgarisation et d'Expérimentation Multi-locale
PNRA	Programme National de Recherche Agronomique
UNDP	United Nations Development Programme
RUV	Republic of Upper Volta
RPAA	Responsable de la Production Agricole Accélérée

SAFGRAD	Semi-Arid Food Grain Research and Development
SNS	Service National des Semences
SOFITEX	Société des Fibres et des Textiles
STRC	Scientific, Technical and Research Committee of the OAU
UNICEF	United Nations Children Fund
UVOCAM	Union Voltaïque des Coopératives Maraîchères
WARDA	West Africa Rice Development Association
WADB	West African Development Bank

Summary of Recommendations

1. Present State of Organization of IVRAZ

The creation of Institut Voltaïque de Recherche Agronomique et Zootechnique (IVRAZ), which illustrates the government's will to strengthen its agricultural research system, only dates back to March 1981. Although IVRAZ involves a significant number of national research workers (about 30) and some administrators, the institute has not yet the capabilities to function as the central organization responsible for planning, programming, coordination, and implementation of the agricultural research programs in Upper Volta.

The implementation of national agricultural research activities is presently entrusted to research workers from at least four different types of organizations, under the aegis of different ministries maintaining loose working relationships between them.

These four organizations are:

- * IVRAZ itself, under the Ministry of Higher Educational Scientific Research;
- * bilateral organizations (French, American, Canadian, German, Dutch);
- * institutions under the aegis of several other ministries (ministries of Rural Development, of Equipment, of Environment and Tourism);
- * the University -- Institut Supérieur Polytechnique (ISP);

In addition to national research institutions, there are international research centers in Upper Volta (IITA, ICRISAT, etc.).

At the programming level, no central unit responsible for the coordination of research activities between various organizations and the setting up of future programs is presently operational. This is true not only for the specific interests of each organization, but also for the assessment of national priorities related to food self-sufficiency and national economic imperatives.

IVRAZ's full development and ability to carry out its priority research programs also run up against a series of constraints, as much at the level of resources (qualified personnel, infrastructure, material resources) as with the programs themselves (geographic imbalance, absence of certain priority programs, duplication with other programs).

2. Proposals for an Organizational Scheme

- a. Consequently, it is necessary to draw up a long-term master plan which can serve either as a prospective plan, or simply as a vision of the role and organization of an IVRAZ which could deal with any future challenges facing the country and solve problems resulting from the numerous existing constraints. Given the current state of affairs, and especially taking into consideration the shortage of available manpower and the nature of programs already underway, such a master plan represents only an idealized goal, an achievement for the long-term future. Only gradually will it be possible to develop administrative departments, divisions, and services and to create

new support services, with the recruitment of new national staff, the increase of resources, and the management capabilities to coordinate all agricultural research activities. To implement a master plan, of whatever sort, means going through a series of successive intermediate phases, during which the structure will be adjusted progressively, and evolve in line with the national conjuncture.

- b. As a first step, priority will no doubt be given to the establishment of a Programming and Coordination Unit, responsible for translating national goals into action programs and avoiding duplication. Once a program of work has been designed and some coordination achieved with donors, priority will be given to the reorganization of technical, administrative, and operational services in terms of program needs. Note that research structures must be designed to meet program needs and not, as is sometimes the case, to accommodate programs to suit the structures. The following intermediate phases (medium term) will be concerned with the consolidation of programs and structures, and the progressive integration in IVRAZ of all research workers participating in the national research programs. Such gradual integration could be achieved either directly by transferring all research service to the Ministère de l'Enseignement Supérieur et de la Recherche Scientifique (MESRS), or through a concerted effort in formulating national programs under the auspices of IVRAZ.
- c. Research programs implementation and the evolving concept of research departments. The scientists of IVRAZ, who are going to be responsible for the future national programs, are presently regrouped within administrative structures designed to suit research programs they have themselves selected. However, such administrative structures are likely to evolve in time to better serve new programs. The attached diagram shows in a simplified way the foreseeable evolution of IVRAZ structures as described in Section 4.2 of the report.

The present organization of IVRAZ is based on commodity departments (five for the moment) and, given the limited number of research workers, it would be premature, even inopportune, to support radical organizational changes by regrouping IVRAZ staff within a structural frame based exclusively on departments by disciplines. This is the more so as most research programs in progress are organized on a commodity base (food crop, cash crop, etc.). However, in the short term, with the recruitment of new national research workers, the integration of scientists from bilateral and donor agencies, and the launching of new priority research programs focused on multidisciplinary fields (i.e., soil fertility research program, soil-water-plant relationships in farming systems, etc.), it will be desirable to devise a mixed structure combining commodity and disciplinary departments. The concept of departments organized by scientific disciplines, and the gradual regrouping of all research workers within them, follows the views of MESRS to which IVRAZ belongs

and is justified by a set of arguments, the details of which are given in Section 4.1 of the report.

Of course, the co-existence of departments by disciplines and by commodities will create some coordination problems at the beginning. However, a clear definition of the respective responsibilities of the directors of departments would minimize these initial difficulties. With an increasing number of scientists and the growing development of disciplinary units into full-fledged disciplinary departments having a critical mass of research workers, the commodity departments will be replaced by national programs (i.e., sorghum program, farming system program, etc.), conducted by multidisciplinary teams drawn from all disciplinary departments (i.e., Department of Soils, Department of Bioclimatology, Department of Agronomy, Department of Phytopathology, Department of Socioeconomics, etc.).

3. Planning and Programming of Research Activities

While the structure of IVRAZ moves gradually toward a system based on scientific and agricultural disciplines, the research planning and programming system and the establishment of national operational programs will develop in three different but complementary directions:

- a. a disciplinary approach to solve basic priority problems such as: knowledge of the natural environment, study of water-soil-plant relationships, soil fertility, inventory of natural resources, bio-cycle of disease vectors, etc;
- b. a commodity or products approach, in which the subject itself becomes the program (e.g., sorghum, corn, and cotton), whereas discipline and techniques involved are organized in multidisciplinary research operations;
- c. a systems approach, in which programs are built around multidisciplinary research activities, working directly in the farmers' environment to overcome development constraints of its production systems (pluri-commodities), to devise appropriate technologies, and to improve the entire farming system. The national programs, whatever approaches are taken for defining them, are entrusted to research departments organized as described under 2. above (see Section 4.1 of the report).

4. Research Priorities

The mission's goal was not to provide a detailed plan for future research activities. However, the analysis of the agricultural sector and major national options indicate some research areas of high priority in the short or medium term:

- a. water-soil-plant interrelationships under farming field conditions, water availability being the major constraint to agricultural production in Upper Volta;

- b. soil fertility, in the broadest sense (chemical and organic potential for production), but also conservation and maintenance of soil fertility;
- c. farming systems, or the study of the overall socioeconomic and agro-technical aspects of production. Note that all specific research activities should be geared and integrated into farming systems;
- d. animal production, given the basic importance of this sector in the national economy, including animal breeding, animal health, animal feeding and its relations to soil fertility and farming systems (production of organic matter, soil conservation, animal traction, etc.);
- e. crop genetic improvement, with particular reference to crop adaptability to production ecosystems (cropping seasons), pests, diseases, drought resistance, etc., to sustain constant yields rather than to achieve exceptionally high yields.

5. Specific Recommendations

- a. Among major priorities related to research management, the mission recommends:
 - * the creation of a planning-programming and coordinating unit in IVRAZ entrusted:
 - o to define national programs based on priority objectives as formulated by the government's scientific policy, and needs expressed by the farming community;
 - o to facilitate the negotiation of agreements with foreign cooperative agencies with a view to securing their active participation in program formulation and implementation;
 - o to ensure coordination and complementarity between all institutions and services operating in the fields of agriculture, livestock, and forestry research;
 - o to conduct an in-depth study of scientific, technical, and managerial research manpower requirements, including the formulation of training needs (in cooperation with specialized international organizations and services);
 - o to ensure the gradual establishment of IVRAZ's organizational structures.
 - * the establishment of a research-development strategy based on current experience and strengthening of the dialogue through concerted planning structures with regional development organizations (ORD);
 - * the strengthening of the decentralized national network of IVRAZ research stations, taking into account the needs of research units in the northern and eastern regions of the country;

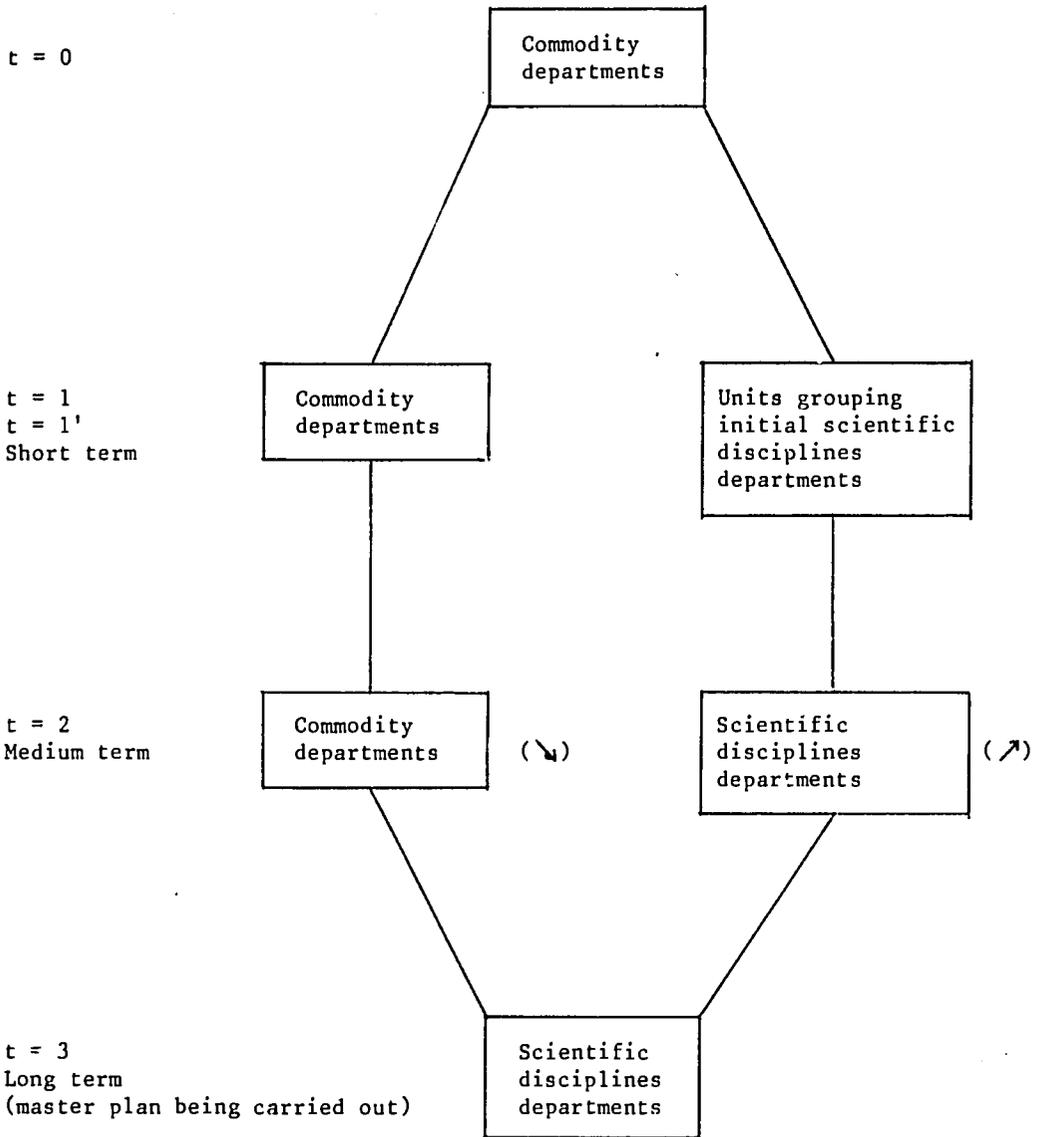
- * the consolidation of current research programs within the framework of more comprehensive national programs, and the establishment of operational activities in priority sectors so far neglected (i.e., livestock research program -- see document UNDP/FAO, 1982).

- b. The mission suggests that serious thought be given to the potential role of trained personnel from the Institut Supérieur Polytechnique (ISP) in the agricultural research sector. ISP has a large number of high-ranking teaching and research staff (about 40), who, on condition of adjustments to their scheduled loads, could be given official mandates to accept responsibility for research projects or programs;

- c. IVRAZ's headquarters being in the capital and there being a need to create or strengthen a main research station for the country's central region, the mission suggests that a careful study be made in the near future on the possibility of setting up a training and research center as a joint effort of ISP and IVRAZ;

- d. During the elaboration of the national agricultural and livestock research program, the mission proposes that the government request a donor agency of its choice to assign in Upper Volta a top level specialist in the area of research planning and management (see ISNAR mission's preliminary consultation in Upper Volta Report, January 26-30, 1982, transmitted March 10, 1982 to the director of IVRAZ; also the FAO project document, end 1982, prepared for this purpose);

- e. The mission considers that a consultation as large as possible between national officials and representatives of foreign assistance agencies be organized in working out the national agricultural research program, and proposes that a national seminar be convened with donor assistance and funding agencies to which the program would be submitted.



Notes: (↗) Being expanded and consolidated
(↘) Being reduced

Diagram. Structural Changes

Chapter One: Introduction

1.1 Origin of the Mission

During July 1982, the government of Upper Volta, recognizing that the technical assistance efforts provided by FAO, the World Bank, and ISNAR are complementary, and anxious to ensure better coordination and harmonization of their respective activities, sent telegrams simultaneously to each of the above organizations, asking them to join in organizing a single combined mission. This mission would deal with the development of agricultural research in Upper Volta and the organization and consolidation of IVRAZ (Institut Voltaïque de Recherches Agronomiques et Zootechniques). This mission followed up initial contacts made by these three organizations with the Government of Upper Volta (TCP project document sent to FAO November 26, 1981; exploratory mission by ISNAR from January 26-30, 1982; World Bank mission in January 1982).

1.2 Terms of Reference

The main terms of reference and objectives of the mission carried out in Upper Volta from September 30 to October 29, 1982 were the following:

- (1) an inventory of the present potential of agricultural research in Upper Volta, including an analysis of programs in progress; an evaluation of research results on the development of agriculture in Upper Volta, and how well this meets the farmers' needs;
- (2) a study and formulation of recommendations on the structures, working methods and planning procedures, programming and coordination of agricultural research activities;
- (3) preparation of an indicative plan for developing and strengthening institutional structures, human, physical, and financial resources, and management capabilities of IVRAZ in line with program needs and resources availability;
- (4) a draft prospective plan for long-term development of research, taking into account the country's present and future resources and needs, which on a short- and medium-term basis might be a useful framework for:
 - a. the establishment of a national agricultural research program,
 - b. the development and progressive strengthening of IVRAZ,
 - c. better integration and complementing of efforts presently provided by outside assistance,

- d. the identification of projects¹ for which supplementary technical and financial aid might be obtained from bilateral and international assistance programs and funding agencies,
 - e. the direction that international scientific cooperation should take to benefit Upper Volta.
- (5) The analysis, evaluation, and formulation of recommendations for strengthening and improving the research-extension-development interfaces, in order to ensure program adaptability and the applicability of research results to agricultural needs, taking into account the socioeconomic facts of the rural milieu.

1.3 Composition of the Mission

The mission was composed of the following: two staff members and one consultant from FAO, one staff member and two consultants from ISNAR, and two staff members from the World Bank. The team, besides its international nature, represented a wide range of disciplines and specializations in the scientific and technical fields of agricultural research. This included, most notably: organization, administration and management of research; agricultural education; research and development; agricultural ecology; farming systems; agricultural economics; genetics; pedology; plant improvement; and phytopathology. All members of the mission participated in the design of the study and in all its development phases (Annex I).

1.4 Schedule of the Mission

Following two preparatory sessions at ISNAR on September 27, 1982 and at FAO on September 29, 1982, the mission worked in Upper Volta from September 30 to October 29, 1982. During its stay in the country, the joint FAO, World Bank, and ISNAR mission visited all organizations and institutions directly or indirectly involved in agricultural research and development. The mission's work calendar, including meeting with institutions and individuals, is attached (Annex II).

Two UNDP projects will be prepared within the framework of the PCT of FAO.

Chapter Two: Present State of Agriculture in Upper Volta

2.1 General Background of the Agricultural Sector

2.1.1 The Natural and Human Environment

Geographic situation

Upper Volta's 274,200 km² are a mountainless terrain. Some rocky masses, generally granitic inselbergs, can be found throughout the landscape. Upper Volta is a land-locked country at more than 600 km from the Gulf of Guinea, between 9 degrees 20 minutes and 15 degrees 5 minutes latitude north, and 2 degrees 20 longitude east and 5 degrees 30 longitude west. It is linked to Abidjan on the Atlantic coast by the Abidjan-Niger railway and by road to Accra, Ghana via Lomé, Togo.

Upper Volta shares its borders with six countries: in the north and the west with Mali, in the south with the Ivory Coast and Ghana, in the southeast with Togo and Benin, and in the east with Niger.

The natural environment

- a. Geology. Upper Volta stretches over three major geological formations in West Africa: the precambrian base, metamorphic and eruptive, which covers three-quarters of the country; the sedimentary covers of the eastern and northeastern edge of the Taoudenni Basin, and those located at the northeastern edges of the Taoudenni Basin, and those located at the northeastern extremity of the Oti formations which are part of the Volta system. Tectonic movements have been insignificant since the precambrian period, consequently very old consolidated rocks have been eroded to give the present landscape its uniform relief.
- b. Soils. Upper Volta has soils of great diversity, with a wide range of agricultural qualities as follows:
 - * Lithosols on diverse parental material and iron crusts (cuirasses) are made up of a thin or almost nonexistent top soil lying on the rock, sandstone, and ferruginous cuirasses.
 - * Poorly developed soils from eroded gravel material are often associated with the previous lithosols, and with undifferentiated profiles often originating from dismantled iron crusts. They are often found over large areas as plateaus or gentle hills running from the central to the eastern part of the

country. Limited in depth, they are associated with tropical ferruginous soils.

- * Vertisols on alluvium or clayey materials in scattered spots are linked to basic crystalline rocks or clayey alluvium, particularly in the Sourou valley. Often associated with brown eutrophic soils, they are characterized by a high percentage of clay, predominantly swelling clays, rich in minerals but with limited physical structure.
- * Brown eutrophic tropical soils on clayey materials, developed from basic crystalline rocks (dolerites) or neutral crystalline rocks (migmatites), are distinguishable from vertisols by better physical properties and the absence of large internal movements. The inherent fertility is higher. These are the country's best soils.
- * The tropical ferruginous soils cover about half of the country's area and are linked to all the other soil families. They are fairly deep, have low base status and are relatively deficient in physical properties.
- * Typical desaturated ferrallitic soils on sandy-clayey materials are rare in Upper Volta and are only found around Bobo-Dioulasso. They are very deep and have fairly good physical properties but are chemically poor.
- * Hydromorphic mineral soils border large drainage axes, depressions, and flat plains, and have different agricultural potential.
- * In the north, there are few spots of halomorphic soils of degraded structure associated with brown soils and tropical ferruginous soils.

The arable land is estimated at about 89,000 km². With forest and pasture lands, the agricultural land of about 229,000 km² represents 84% of the total area of the country.

The area under cultivation is about 3 million ha., which means that it is still possible to expand land under cultivation. However, both soil fertility and population distribution vary greatly. Some areas are on the verge of their optimum development, the coefficient of cultivation intensity (relationship between cultivated land and agricultural land) being higher than 50% (Yatenga ORD, 71%; north-central ORD, 56%; central ORD, 54%; west-central ORD, 51%).

c. Climate. The climate is under the influence of two predominant air-masses. One is dry air from the northeast created under the high pressure systems of the Sahara, hot during the day and cool at night. The other is humid air from the south-southwest due to oceanic high pressure systems in the southern hemisphere. From its geographic situation, the country is classified as part of the Sudanian climatic zone (J. Richard Molard classification).

Seasonal variations of the climate are:

- * a dry season, generally stretching from mid-November to mid-April;

- * a lead-in transitory season, with alternately drier and more humid atmosphere conditions from mid-April to mid-June;
- * a rainy season, from mid-June to mid-September, with higher rainfalls in August;
- * a second transitional season, much like the first, from mid-September to mid-November.

This general outline varies according to latitude. A meridional subzone (limited by the 1000 mm isohyet), or Sudano-Guinean is characterized by more than six months rainfall and a fairly narrow variation of annual temperatures. A central subzone (located between the 1000 and 650 mm isohyets), or Sudano-Sahelian, where precipitation is not spread over more than six months. A northern subzone (beyond the 650 mm isohyet), or Sahelian, is characterized by a shorter rainy season and great variability in precipitation, dryness aggravated by tremendous evaporation, and large amplitude of diurnal and annual temperatures.

The rainy season is shorter in the north than in the south. It begins about April 25 in the extreme southwest, between May 25 and June 1 in the center of the country, and between June 15 and 30 in the north. This relatively slow progression takes 10 to 11 weeks. The end of the season, on the other hand, is fairly quick.

Average rainfall in the extreme southwest is about 1400 mm, but is not more than 500 mm in the extreme north; the rainiest months are July, August, and September in the south and center, July and August in the north.

Going from south to north, the number of days with rainfall and the length of the rainy season vary: 80 to 95 days over five to seven months in the extreme southwest, 60 to 70 days, over four to five months in the center of the country, and 40 to 50 days over three and a half months in the north.

There are two cool seasons (December to February and August), and two periods of intense heat, one before the rainy season (March, April, and May) and the other immediately after the rainy season (October).

- d. Vegetation. In the Sahelian area this consists of spotted thickets, and tree- and bush-covered steppes. In the Sudanian area there is savannah with trees and bushes as well as savannah forests and woodlands. In the Sudano-Guinean area there are wooded savannah, light forests, and small stretches of dry, dense forest and forest galleries.
- e. Hydrography. Upper Volta can be divided into three main sloping basins: the Voltas, Comoé, and Niger basins. The source of the main rivers (the Black Volta and the Comoé) is in the rainy Banfora area; the rivers flow in opposite directions. The Black Volta runs north to Dedougou before going down towards Ghana. The other rivers begin in areas where the rainfall is much less and their flow is slight or intermittent. This network of waterways keeps water resources in the areas of the country where there is rainfall, rather than sharing them with the dry areas, as is the case in other countries in the region. It is for this reason that irrigable land in Upper Volta is limited (estimated to be only 150,000 ha).

The human environment

There is a resident population and a migrant population. In January 1979, the former group was estimated to be 6.3 million with an average population density of 22.6 per km², one of the highest in Africa. They are spread out unevenly: more than 80 per km² in some parts of the Mossi Plateau, and less than 10 per km² in the north and east. The overall rate of population growth is about 1.6%; for the urban population this figure is 4%. Rural population is estimated to be about 90% of the total, and 95% of the working population. Distribution is uneven throughout the regions.

The migrant population is estimated to be about 1.5 million, or one-fifth of the population. These are generally the most active and live outside the country temporarily. This migration is directed particularly towards the Ivory Coast (80%) and the other bordering countries.

Although the country has 60 ethnic groups, the Mossis make up half of the population. The Peulhs, who form the second largest group (10%), are primarily animal raisers and nomads.

The rate of school attendance in Upper Volta is low, (about 14% in January 1979) for a population of school-age children of 1,932,500. Only 1% of the youth between 12 and 17 years of age are enrolled in secondary schools. The Rural Education Centers (Centres d'Education Rurale, CER) and the Training Centers for Young Farmers (Centre de Formation des Jeunes Agriculteurs, CFJA) provide a complementary education in the rural setting for children beyond school age.

The food base is cereals (sorghum and millet). In the west and southwest, however, tubers and corn play an important role in the diet. Milk consumption is fairly high in the animal production areas (Sahel). Fruit and vegetable consumption remains seasonal, especially in rural areas. Rice is consumed mainly in the cities. According to the World Bank, Upper Volta meets 95% of its cereal needs and the greater part of its edible oil needs.

2.1.2 Place of Agriculture in the National Economy

The availability of economic statistics is relatively limited. National data are not available for all years, and many figures relating to exports, perhaps one-third, are not recorded. Consequently, this summary on the national economy situation is incomplete and in part speculative.

The gross national product (GNP) per inhabitant in 1979 was estimated to be US\$130. In the same year the annual revenue in rural areas was not more than US\$105; a level of poverty insufficient to ensure basic food supplies and the purchase of nonfood goods.

There are no complete figures available concerning the number of persons living in total poverty, but indicators point toward a malnutrition which is evident, and a food level which only meets 80% of the energy needs required for a normal active life. However, it is estimated that during normal years, the country can reach its national objective for food self-sufficiency, as the food deficit is only 5%. The problem lies more in the area of internal food surplus distribution and storage capacity to

meet needs during years when climatic conditions or other factors prevent sufficient production.

According to World Bank estimates, the rate of growth of the GNP from 1977 to 1979 was 4.7% in real terms, however, in the long run the tendency is less promising. From 1960 to 1979, the real GNP per inhabitant only increased by 0.4% per year. In recent years, total imports accounted for nearly one-third of gross domestic product (GDP). Exports, almost entirely agricultural products, are not enough to pay the imports bill; the result is a commercial deficit approaching 20% of GDP. This deficit is, nevertheless, covered for the most part, but not totally, by revenues sent in by a relatively large number of migrants and by foreign aid, mainly from bilateral institutions.

The contribution of the agricultural sector to the national account has decreased progressively, from 62% of GNP in 1960 to 38% in recent years (Table 1).

Agricultural exports are shown in Table 2. The increase to more than four times the percentage held in 1960-62 is mainly the result of the enormous success of the cotton sector. Cotton production represented 2% of all exports 20 years ago, and increased to more than 37% during the period 1975-77 (Table 2).

Statistics on exports of livestock products are not available. Unpublished figures (World Bank) indicate, however, that in the early seventies, livestock and its products represented about 25% of all exports. This study also shows that in decades to come, the livestock sector will be able to grow to about 35% of all the country's exports, with an annual growth rate of 2.5 to 3.5% in real terms. The agricultural sector, including livestock, should be able to make up about 85% of all exports in the future.

Even though the agricultural sector in Upper Volta is the main support of the national economy, and the rural sector actually receives a net share of public returns, it seems unlikely that this situation can be improved with a view to making the rural sector more productive. However, a net transfer of public returns to the rural sector might be considered justifiable; but one must be sure that these inputs would be truly productive, could result in profits, and increase or at least maintain real revenues. In the short and medium term, support is justified for financing research and development activities with a view to eliminating certain constraints which presently limit productivity, economic development, and the financial viability of existing production systems.

In addition to the primary objective of ensuring food self-sufficiency and increasing production of export crops, the long-term agricultural economic development plan of Upper Volta must ensure the stability of farming systems, the protection of the environment, the conservation of soil fertility, and the capacity to retain water. This calls for an intensification of planning and coordination efforts at both the ministerial and interministerial levels for better integration of animals, plants, and forests into more coherent production systems.

Table 1. The place of agriculture in the national account
(in millions of current CFAF).

	Gross national product	Gross development product	Crops		Livestock		Fishing and forestry		Agriculture total	
			CFAF	GNP (%)	CFAF	GNP (%)	CFAF	GNP (%)	CFAF	GNP (%)
1960	57.5	50.0	na ¹	na	na	na	na	na	na	62
1976-78 ²	175.0	150.0	35.3	23.5	15.1	10.0	6.6	4.4	57.0	38

¹ na = figures not available

² figures from World Bank

Table 2. Export of agricultural products (value FOB and in millions of current CFAF).

Period (three years)	TOTAL	Cotton ¹		Cereals ²		Oil Products ³		Fruits and Vegetables		Total Agricul- tural Exports	
	CFAF	CFAF	Proportion (%)	CFAF	Proportion (%)	CFA	Proportion (%)	CFAF	Proportion (%)	CFAF	Proportion (%)
1960/62	1,174	20 ⁵	2	0	-	119	10	53	5	192	16
1963/65	3,096	143	5	9	-	307	10	88	3	547	18
1966/68	4,529	762	17	8	-	591	13	127	3	1,488	33
1969/71	6,480	1,324	27	9	-	989	20	226	5	2,548	52
1972/74	6,480	1,419	22	5	-	1,434	22	204	3	3,062	48
1975/77	11,891	4,434	37	94	1	2,826	24	388	3	742	65

1 Including cotton fiber, grains, and meals.

2 Including flour.

3 Including groundnuts, sesame, karite, groundnut oils, and karite shea butter.

4 Primarily green beans, onions, and mangoes.

5 Raw cotton only.

2.1.3 Plant Production

General situation

Agriculture's share in the GDP has decreased from 62% in 1962 to 38% at the beginning of the seventies; in 1980 it climbed again to 43%. Crops take a 24% share in the agricultural sector. Among these, food crops have increased in volume by 2.0% (1969-71 to 1977-80), while nonfood crops have grown by 7.2% for the same period. Expressed in percentage per inhabitant, this growth provides 0.4% for food crops for the same period and 5.6% for nonfood crops, or 0.5% in total, a very low figure in comparison with a population growth rate of 1.6% (1960 to 1979). Plant production uses about 2.5 million hectares, or about 25-30% of Upper Volta's arable land. Nearly 90% of this area is used for cereals, which make up about 80% of the worth of agricultural production, clearly showing Upper Volta's agriculture dependence upon two cereal crops, sorghum and millet.

The evolution of plant production

The evolution of the country's main crops from independence until 1979 is given in Table 3. Crop production can be grouped in four categories: cereals, oils, fibers, and fruits and vegetables.

- a. Cereals, together with the root crops and grain legumes which are grown with them, are the largest group. Sorghum and millet are the most common crops over the entire country because of their good adaptation to agroclimatic variations. Corn and rice are limited due to the low rainfall and lack of irrigation (particularly the case for rice). Outside the southwest, corn is raised in "kitchen gardens" where fertility is higher. The fonio is a subsistence crop of minor importance which is highly appreciated for its earliness.
- b. Niebe, a grain legume generally grown with cereals, is produced in small quantities.
- c. Root crops, such as yam and cassava, are not considered major crops, even though they are well adapted to agroclimatic conditions in the southwest and southeast.
- d. Karite, the second largest exported crop, is only gathered in the Sudanian and Sudano-Guinean parts of the country. Groundnuts, the most important oil crop, can be raised almost everywhere in the country. Groundnuts occupy about 140,000 ha, with great variations. Despite the country's real production potential, this crop does not benefit from any production or marketing support policies. Sesame is a traditional oil crop of minor importance.
- e. Cotton is the country's only export crop. The area given over to cotton has gone from 23,000 to 80,000 ha between 1961 and 1979, whereas production increased from 23,000 to 75,000 tons for the same period. The production area has gradually shifted from the center of the country towards the southeast, where the higher rainfall ensures larger and more stable yields.

Table 3. Production evolution of various crops in Upper Volta

Year	Sorghum			Millet			Corn			Rice			Groundnuts			Sesame			Cotton		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1961	908	411	453	615	195	317	149	75	502	54	30	560	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	22.9	2.3	111
1962	1042	508	488	597	261	438	160	78	487	67	45	677	227	113	500	15	5.7	380	36.0	6.6	180
1963	908	460	507	823	316	383	160	109	689	33	25	762	100	50	500	21	4.1	197	45.8	8.0	190
1964	1173	660	563	807	378	469	167	127	761	35	34	977	127	70	551	30	6.0	200	52.5	8.8	170
1965	964	530	550	800	350	438	164	110	667	35	34	986	130	73	562	25	6.0	240	49.7	7.5	140
1966	1018	540	530	800	350	438	165	124	752	35	34	980	136	76	559	25	6.0	240	52.4	16.3	310
1967	1312	604	460	700	300	429	225	124	550	36	44	1215	142	80	563	25	6.0	240	65.4	17.3	260
1968	831	530	638	612	368	601	228	137	600	46	40	871	150	85	567	20	7.9	379	71.6	32.0	450
1969	1094	547	500	867	382	440	100	60	600	40	34	836	137	71	519	22	3.7	171	84.1	36.2	430
1970	1041	563	541	850	378	444	85	55	645	40	34	850	140	68	484	26	6.3	238	80.6	27.5	290
1971	1070	576	538	672	397	591	20	55	655	41	36	891	144	66	458	21	4.0	182	74.1	28.1	380
1972	1051	512	488	711	400	373	81	59	725	32	30	941	105	60	577	34	5.6	166	70.1	32.6	470
1973	1037	481	464	720	253	351	89	58	658	39	31	799	167	63	376	35	5.2	143	66.6	26.7	410
1974	1200	705	588	850	370	435	90	62	683	40	36	906	120	65	382	30	8.0	150	61.5	30.6	500
1975	1200	650	542	850	350	412	90	62	683	42	40	952	180	80	444	40	8.0	175	68.0	50.7	750
1976	1138	717	630	911	406	370	90	46	511	45	41	911	164	87	533	40	7.0	179	79.2	55.3	700
1977	1000	610	610	900	350	350	90	50	556	42	23	548	165	85	515	40	6.0	150	68.8	38.0	550
1978	1100	621	565	910	404	404	150	101	673	40	32	748	170	70	412	40	7.0	175	71.7	60.0	840
1979	n.d.	610	n.d.	n.d.	430.5	n.d.	n.d.	104.5	n.d.	n.d.	47.2	n.d.	144.6	66.9	480	27.1	5.4	200	77.8	75.1	960

- 1 Area in thousands of hectares
- 2 Production in thousands of metric tons
- 3 Yield in kg/ha

- f. Fruits and vegetables are crops with tremendous potential, in which the authorities have only recently become interested (creation of the Union Voltaïque des Coopératives Maraîchères UVOCAM, and establishment of fruit-growing projects). The crops are traditionally grown in kitchen gardens and on bottom valley lands during the dry season.

General trends and perspectives

The changes in the production of major crops show a favorable trend for sorghum. However, the overall increase in food production has remained lower than the rise in population due to the small increase in cultivated land, the stagnation of yields, urbanization, and seasonal migration. Millet, the major cereal grown in the dry areas and in the center of the country, has experienced no increase and yields have decreased. The latter is due to a lack of arable land, a decline in soil fertility in the center of the country, erratic climatic conditions, and possibly to a shift from millet to sorghum in the southwest.

In order to understand this relatively low performance in the crop production sector, the various operational difficulties and constraints must be taken into account: a high rate of illiteracy, lack of land in the Central Plateau, a high rate of migration by the active population, etc. Despite these problems, the country is one of the most successful of the Sahelian region to cope with its food needs (95%). Also its cotton production is increasing.

2.1.4 Animal production

General situation

Livestock raising is one of the pillars of Upper Volta's economy. It accounts for about 25% of exports and contributes 10% to the GDP. The size is estimated at 2.8 million cattle; 4.8 million small ruminants (1.9 million sheep and 2.9 million goats); 0.3 million horses; 0.22 million pigs; 19 million fowl; and 5,000 camels (in the north only).

The Sahelian area in the north (37,000 km²) has 0.7 million cattle and 1.2 million goats/sheep. The Sudanian area in the center of the country (147,000 km²) has 1.4 million cattle, and 2.3 million sheep/goats. The Guinean area in the south (90,000 km²) has 0.7 million cattle and 1.3 million sheep/goat. The number of animals per km² is greater in the north than in the south.

The ruminants are the most important animals, as much in terms of production as use of pasture lands; they represent 90% of the animal load on free range land. This load is relatively heavy for the northern region with less favorable climate and production potential, and the more favorable southern region where trypanosomiasis constitutes a major constraint.

Livestock production system and animal health conditions

A traditional system, still widespread, consists of herds of 30 to 80 head, watched by one to three herdsmen (sometimes children), permanently moving around looking for water and pastures.

adapted and their production levels. But the herder cannot master the environment and produce in an efficient manner because of his extremely low level of technical skills, and the lack of support services and financing. Above these constraints are the problems of finding water and the fact that the people in the countryside do not produce forage reserves and hay for the interseasonal periods.

2.1.5 Fishery and Forestry Productions

Fish production

Fish resources are not developed in Upper Volta. Moreover, fishing is not a traditional activity and the major waterways are used by foreign fishermen. There is no indication of an immediate change in this sector. Dams have been constructed (more than 240 works completed) mainly for retaining irrigation water, without any consideration for fish production. The national policy of food self-sufficiency cannot fail to take advantage of these resources in coming years, as much to provide complementary animal protein as to get a better return on capital investments.

Forestry production

The forest sector has not been developed to any great extent in Upper Volta, despite the research efforts of the Centre Technique Forestier Tropical (CTFT) since 1963. Forest reserves are threatened by a combination of several recent problems:

- * the pressure of desertification since 1968-73;
- * the expansion of livestock production;
- * the extension of crops into marginal areas and valley lands now being cleared of onchocerciasis;
- * the growing demand for firewood around the villages and cities.

Signs of deterioration in the forest environment are visible in the Sahel and Mossi Plateau areas. Waterways, which only a short time ago were running at all times, now dry up in the dry season. The water level in wells is lower, the forest cover has gradually grown smaller; there has been an abnormal destruction of traditionally protected species (such as, Parkia biglobosa, Butyrospermum parkii, and Acacia albida), wild fauna are becoming rarer, and natural open lands are growing poor, particularly in forage bushes.

Reforestation attempts with exotic species (such as, Eucalyptus, Gmelina, Azadirachta, and Anacardium) have not given the expected results. Programs to promote forestry development with local species (such as, Parkia biglobosa and Acacia albida) have as yet had little effect. The Voltaic people are not growers, which does not make it any easier to develop a forest policy.

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2.2 The Organization of the Agricultural Sector

2.2.1 Institutional Structures

The Ministry of Rural Development (MDR) is the main government body responsible for the development of agriculture and the rural environment. The ministry, in the process of being restructured, is the result of a change from the past system whose separate ministries for agriculture, livestock, public works, etc., are now brought under a superministry responsible for all rural development, including public works cooperatives, credit, agricultural education, as well as livestock, water, and forests. Recently (1978), this superministry has been divided into three distinct ministries: the MDR (Ministry of Rural Development), the Environment and Tourism Ministry (MET) and the Ministry of Equipment (ME). Waters and forests were placed under the jurisdiction of MET, and public works under ME.

The Ministry of Rural Development kept its responsibilities in the following areas: agriculture and animal production, development of rural hydraulics, rural credit, rural institutions (village groups, cooperatives, etc.), in addition to lower and intermediate levels of education and agricultural training.

MDR was in the process of defining its new structure during the mission's visit, and most of the management staff of the ministry had only been in their positions for a short time.

The agencies which carry out development activities and operations in the rural environment are the Regional Development Organizations (Organisme Régional de Développement, ORD), of which there are 11, corresponding to the 11 administrative departments of the country (see Figure 1, map of Upper Volta). The director of each ORD receives his authority from the secretary general of MDR. The ORDs are organized into administrative and technical divisions, and operate with geographic units (sectors, subsectors, zones, etc.). These structures are, with some slight variations, identical in all the ORDs. When they were established in 1967, the ORDs had a great deal of responsibility covering all rural development activities. In 1978 these activities were reduced and limited to those which were directly linked to agricultural production, research in the Point d'Appui de Pré vulgarisation et d'Expérimentation (PAPEM) and substations, extension supply of inputs, credit, marketing, and rural organization with village groups. Animal production generally does not fall under the responsibility of the ORDs but that of the Direction for Livestock Services of MDR.

The level of qualification of directors and senior staff of the ORDs is excellent, but that of subordinates leaves something to be desired. In fact, the level of qualification, of supporting staff, who have direct contact with farmers, professional and technical competence, is insufficient.

At the national level, MDR's directorates and services ensure that development policies in their respective domains are put into operation and that the ORDs are supported with all necessary technical services and inputs. In addition to the MDR services, whose main functions are to provide support for ORDs' actions, a Direction of Studies and Projects (Direction des Etudes et Projets (DEP) was created at the level of the

secretary general of MDR. DEP is responsible for the planning and evaluation of MDR's programs and projects; it works with the Ministry of Plans and Planning in setting up the fourth Five-Year Plan.

2.2.2 Agricultural Planning

The third Five-Year Plan ended in 1981, and the government set up the planning and programming procedures for the fourth plan, based upon the work of the Deuxième Conférence des Cadres (June, 1981), where the synthesis work of four commissions set out the major priority options for a plan of action. The Higher Council for National Plans and Planning (Conseil Supérieur du Plan et de la Planification, (CSPPN) and its committee of directors, under the direction of the Ministry of Plans and Planning, are assisted by eight sectoral commissions: Rural and Hydraulics Development; Industrial, Mining, and Artisanal Development; Communications, Infrastructures and Services; Research and Information; Health, Education, and Lifestyle; Means of Public Power; Human Resources, and Financial Means. They are preparing the fourth plan for the period 1982 to 1987. Based upon CSPPN priorities, each commission establishes proposals for projects needed to carry out proposed programs. Each ministry is involved in the commissions concerned with its field responsibilities, and prepares programs and project proposals.

The preparation of proposals relating to the development of agriculture in the Ministry of Rural Development is the responsibility of the Direction of Studies and Projects. After approval by the Commission for Rural and Hydraulics Development, these proposals are submitted to the CSPPN. Proposals relating to agricultural and livestock research are the responsibility of the Ministry of Higher Education and Scientific Research (Ministère de l'Enseignement Supérieur et de la Recherche Scientifique, MESRS.

The MESRS and its institutions, which includes IVRAZ, are actively involved in the fourth commission -- Research-Information -- where project proposals are reviewed and grouped by order of importance. Projects retained by the commission and approved by CSPPN are submitted for approval to the Ministry of Plans and Planning. Approved projects are then negotiated through the Ministry for Foreign Affairs and Cooperation by the respective technical ministries concerned for financing by outside assistance.

2.2.3 The National Contribution and Outside Aid

During the last decade large investments were made in the rural sector, as much for infrastructure as for projects directly involved in developing production.

Operational projects in 1980-81 and those being negotiated or operationalized in 1982, are given in Annexes III and IV. These lists are not exhaustive nor precise by virtue of the multiplicity and diversity of projects in rural development. They simply give an idea of the size of the budgets involved, the variety of objectives, and the diversity of financing sources.

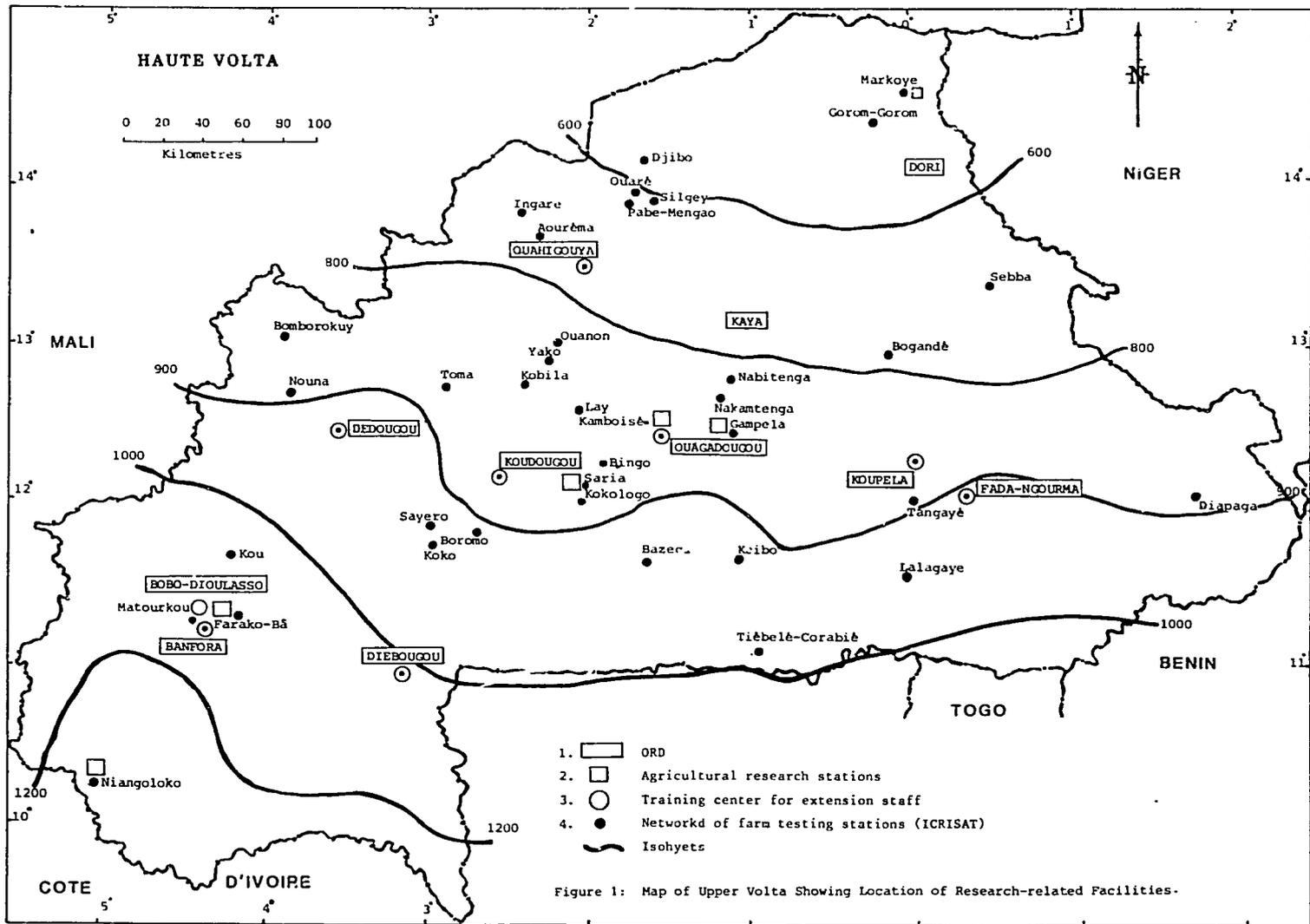
The figures related to project costs are those estimated at the time of negotiations, and are not real expenses. In fact, many of the projects

cover a number of years, and the amounts shown are averages and not real annual costs.

The budgetary figures in these two lists concern only costs covered by outside financing. The government contribution is limited to the provision of available land, buildings, and other infrastructures, and payment of salaries and allowances for personnel of the civil service. This counterpart contribution by the government is approximately equal to MDR's budget. As shown in the Rapport de Synthèse de la Deuxième Conférence des Cadres (June 1982), MDR's budgets were 2,234 million CFAF (1980) and 3,187 million CFAF (1982), representing 5.55% and 6.81%, respectively, of the national budget.

According to the World Bank, the budgets agreed to by the Official Development Assistance (ODA), were US\$214.8 million and US\$239 million for the same years. These figures are the total of all assistance contributions to development, and not only those earmarked for rural development. The rural sector receives about 60% of these funds.

Figure 1. Map of Upper Volta to be inserted



Chapter Three: Agricultural Research

3.1 Historical Evolution

The historical evolution of agricultural research in Upper Volta is characterized by the progressive establishment of bilateral, international, and national institutions and programs, and by the creation of the Ministry of Higher Education and Scientific Research.

In 1960, the four experiment stations at Farako-Bâ, Niangolo, Saria, and Kamboinsé handled the introduction of different varieties, maintenance of collections, and multiplication and distribution of seeds. The General Convention on Scientific Cooperation, established with France in 1960, set up a framework for involvement and reinforcement of the following institutions and programs:

- * Institut des Recherches sur les Huiles et les Oléagineux (IRHO), responsible for promoting groundnut and karite research;
- * Centre Technique Forestier Tropical (CTFT), responsible for the promotion of reforestation and soil conservation;
- * Institut de Recherches sur le Coton et les Textiles (IRCT), entrusted with promoting cotton research;
- * Institut de Recherches Agronomiques Tropicales et des Cultures Vivrières (IRAT), responsible for the promotion and research on food crops, mainly cereals (such as, sorghum, millet, corn, fonio) and market crops;
- * Institut d'Elevage et de Médecine Vétérinaire Tropicale (IEMVT), entrusted with animal health research.

The Office de la Recherche Scientifique et Technique d'Outre-Mer (ORSTOM) was involved in various agricultural research activities and supported particularly development efforts of the Direction for Hydraulics and Rural Engineering Works. In 1970, the Inter-African Committee on Hydraulic Studies (Comité Inter-Africain d'Etudes Hydrauliques (IACHS)) was established, together with Ecolé Interétats d'Ingénieurs et de l'Équipement Rural (EIER). In 1973, the UNDP/FAO project started creating the Center for Rice and Irrigated Crops Experimentation, (Centre d'Expérimentation sur le Riz et les Cultures Irriguées, CERCI), and the West Africa Rice Development Association (WARDA). In 1975, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and in 1977 the International Institute for Tropical

Agriculture (IITA) started their work in Upper Volta at the same time as the first generation programs of the Comité Permanent Interétats pour la Lutte contre la Sécheresse au Sahel (CILSS).

During this entire period there was an agricultural research service at the Ministry of Rural Development in charge of research policies and coordination. However, the agricultural research service remained a relatively small and inefficient unit. Throughout this period, research programs continued to be directed and implemented by different foreign organizations and institutions, as well as through projects financed from outside aid.

A conference, organized by the Centre Voltaïque de Recherche Scientifique (CVRS) and UNESCO in February 1978, recommended that a scientific research delegation be created and that the Statute of Research Workers be promulgated.

In July 1978, the Ministry of Higher Education and Scientific Research (MESRS) was created, regrouping the research institutes (IRAT, IRHO, IRCT, CTFT) to constitute the core of the Institute for Agricultural Research (IRA) which never became operational. However, the international institutions (SAFGRAD, ICRISAT, and IITA) remain attached to the Ministry for Rural Development.

In 1979, a research unit -- Farming Systems Unit (FSU) -- part of the joint SAFGRAD and Purdue University project was set up.

In 1981, IVRAZ was created within the MESRS-CNRST framework (decree of March 16, 1981), regrouping the French institutions (IRAT, IRCT and IRHO), the CERCI Project and the network of research stations (Saria, Kamboinsé, Farako-Bâ and Niangoloko). The international institutions (IITA, ICRISAT, and FSU) and the SAFGRAD's regional program at Kamboinsé were tied to IVRAZ. ORSTOM was attached to the Directeur Général de la Recherche Scientifique et Technique (DGRST) of the Ministry of Higher Education and Scientific Research, and CTFT to the Biological Research and Tropical Ecology Institute (IRBET).

The following institutions and programs remained outside the jurisdiction of the Ministry of Higher Education and Scientific Research and thus, outside IVRAZ:

- * FAO's Fertilizer Project;
- * National Soils Service;
- * Plant Protection Service, responsible for the plant protection laboratory at Bobo-Dioulasso, which is supported by CIDA, and the Integrated Pest Control Project of CILSS, supported by the FAO and USAID;
- * Extension and Experimentation Service with research and development projects in the rural environment;
- * ranches and livestock stations of the Ministry for Rural Development;
- * Agrometeorology Service of the Ministry for Public Works;

- * Research Center for Animal Trypanosomiasis (CRTA) supported by the IEMVT and the CTZ, under the dual leadership of MDR and MESRS.

In 1982, CRNST requested the help of FAO, World Bank, and ISNAR to set up a prospective plan and to provide gradual reinforcement of the national agricultural research system.

3.2 Organization and Programming

The present state of organization and programming of agricultural and livestock research is fairly complex, because of diversified involvement of administrations, institutions, and their respective projects. Responsibility is shared by MESRS, MDR, MET, ME, and the international cooperation institutions (Figure 2).

3.2.1 Ministry of Higher Education and Scientific Research

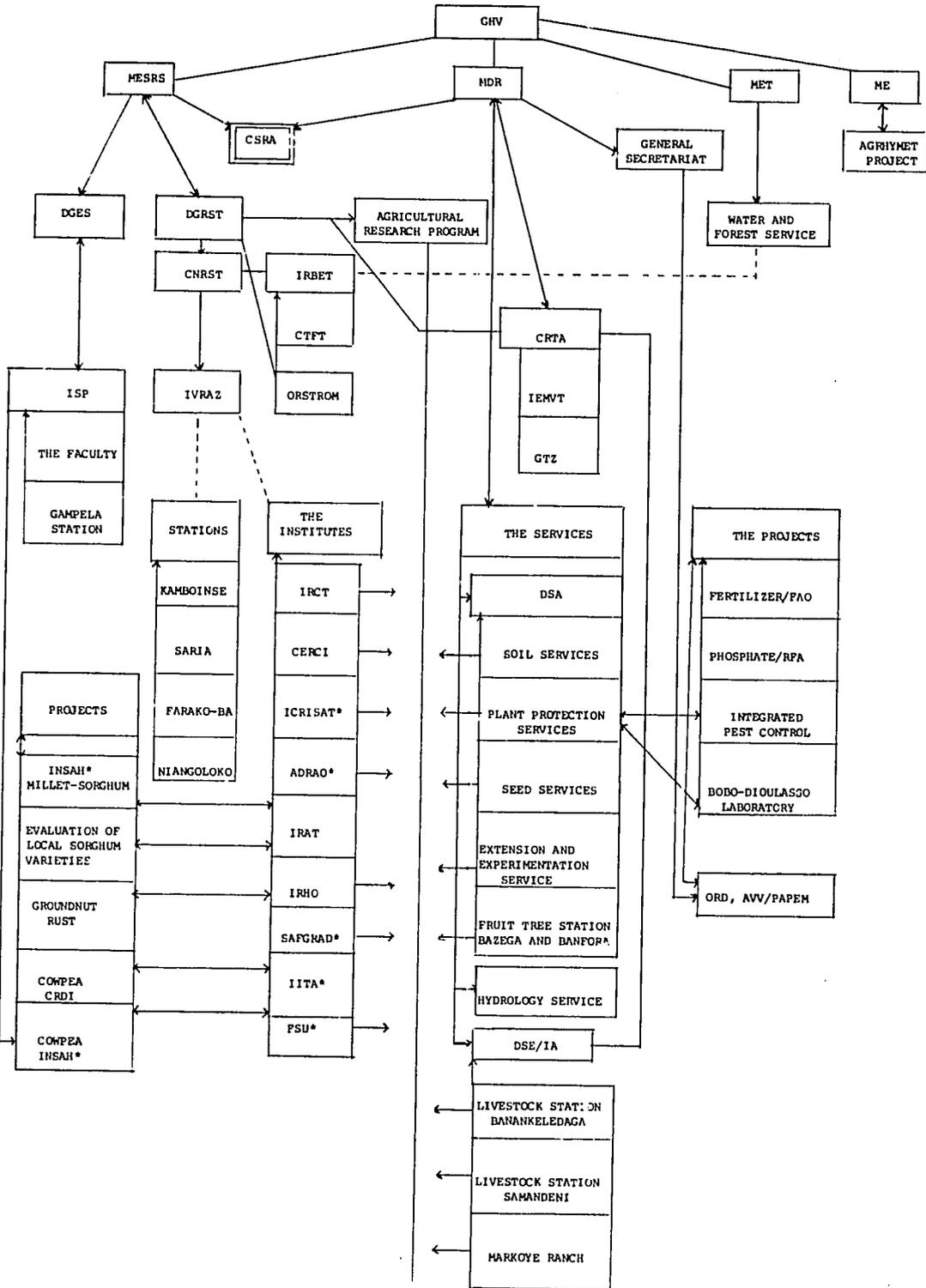
The ministerial cabinet and the Directeur Général de la Recherche Scientifique et Technique (DGRST) are members of the National Council on Higher Education and Scientific Research (CNESRS) and of the Scientific and Technical Research Commission (CRST). The Directeur Général of the Centre National de la Recherche Scientifique et Technologique (CNRST) is also the Directeur Général of the DGRST and thus participates in decisions made at this level.

The Centre National de la Recherche Scientifique et Technologique (CNRST) is responsible for five research institutions: the Agricultural and Livestock Research Institution (IVRAZ), the Institute for Biological Research and Tropical Ecology (IRBET), the Social and Human Sciences Research Institute (IRSSH), the Voltaic Institute for Energy (IVE), and the Institute for Research on Natural Substances (IRSN). It also oversees the Documentation and Publications Service (DDP) of CNRST.

IVRAZ is responsible for managing the Center for Rice and Irrigated Crops Experimentation (CERCI) and for coordinating, on behalf the CNRST, the programs implemented by the Institutes of the Groupement d'Etudes et de Recherches pour le Développement de l'Agronomie Tropicale (GERDAT): the Institute for Research on Tropical Agronomy and Food Crops (IRAT), the Oils Research Institute (IRHO), and the Cotton and Textiles Research Institute (IRCT). These are semiprivate French organizations. In addition, IVRAZ is responsible for the management of four research stations: Saria, Farako-Bâ, Kamboinsé, and Niangoloko.

MESRS handles the technical management of the cooperative agreements between two institutions of the Consultative Group for International Agricultural Research (CGIAR). These are the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Institute for Tropical Agriculture (IITA). This technical management of cooperative agreements is also handled by MESRS for the Office de Recherche Scientifique et Technique d'Outre-Mer (ORSTOM), a French public organization, and the joint project, Farming System Unit (FSU) of Purdue University and SAFGRAD.

Finally, MESRS oversees, administratively and technically, the Centre Technique Forestier Tropical (CTFT) a French semiprivate nonprofit organization, which is integrated into IRBET.



* Structures of an international or regional nature. (See List of Acronyms.)

Figure 2: Present State of Organization and Programming of Agricultural and Livestock Research

3.2.2 The Institut Voltaïque de Recherches Agronomiques et Zootechniques (IVRAZ)

The position of IVRAZ in the Ministry

Figure 3 shows IVRAZ's position in the organization of agricultural research in the framework of MESRS. At present, the institutional set up of IVRAZ is too limited to allow it to manage the research personnel as well as the programs.

IVRAZ has two temporary offices at Ouagadougou. Three services have been created under the director's supervision: an administrative service, a programs service, and a financial service. The secretariat is composed of two typist-secretaries. In October 1982, four heads of scientific departments were appointed (Food Crops and Horticulture, Irrigated Crops, Market Crops, and Industrial Crops). The IVRAZ's statutes also provide for the establishment of a governing council, not yet operational. Researchers, both nationals and expatriates working in the various structures, are considered personnel of IVRAZ. However, responsibility for their management continues to be entrusted to the institutions, organizations, and projects to which they belong.

Although a special statute for personnel has been promulgated, it has not yet been effective, although a number of candidates' files are under study. The management of research stations is still under the direction of the GERDAT institutes, with the exception of the Kamboinsé station for which IVRAZ has a director in post. Most of Kamboinsé's research programs on projects, are nevertheless, the respective responsibilities of the directors of IITA, ICRISAT, and SAFGRAD/FSU-Purdue. A national codirector has been designated for the CERC I program at Farako-Bâ.

As in the past, research programs are discussed or formulated on a commodity or production basis through commissions and subcommissions created when research was still the responsibility of MDR. These commissions work under the aegis of a Special Committee for Agriculture and Livestock Research (CSRAZ). Each year they review the programs and activities in progress, come up with recommendations, and propose new directions for the new programs.

However, neither the subcommissions, the commissions, nor IVRAZ itself, have the authority to change these programs or to exercise any kind of supervision, control, or coordination. The research programs presently carried out are defined separately by each institute (IRAT, IRHO, CERC I, ICRISAT, IRCT, and Purdue) or project (CERC I and SAFGRAD).

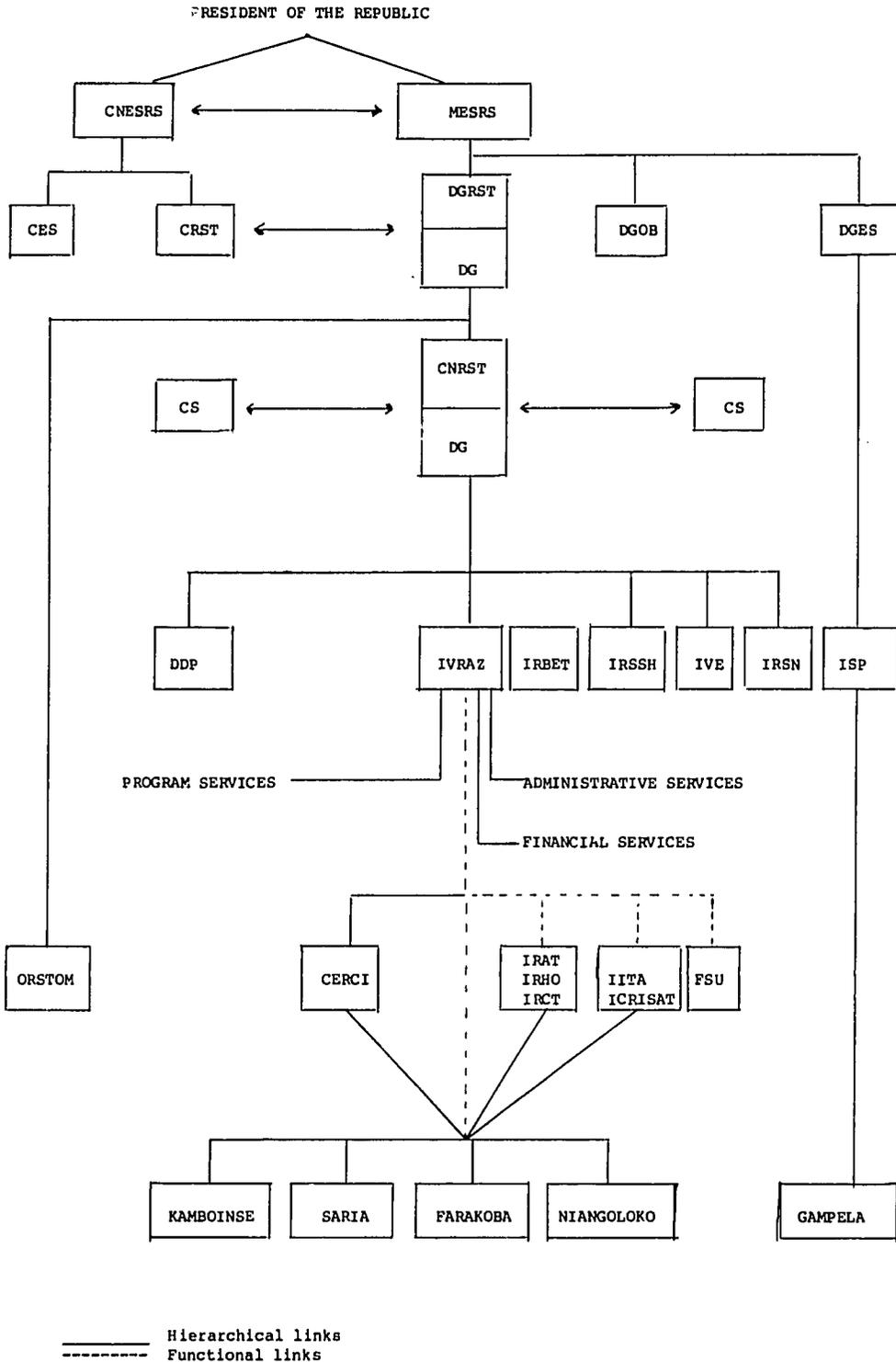


Figure 3: The Position of IVRAZ Within the MESRS.

Possible interactions between institutions or groups of research workers are achieved mainly through personal relations, and in some cases these relations provide a better cohesion between similar or complementary programs. No efficient mechanism exists to ensure better coordination and complementing of programs to avoid duplication or even competition (Annex V).

IVRAZ's budget for 1982 amounted to 15 million CFAF, excluding salaries and social charges for local personnel. Of this IVRAZ budget, 4 million CFAF have been allocated for financing rice seed production at Kamboinsé for the Ministry of Rural Development; the remaining 11 million CFAF are to cover administrative costs and headquarters personnel for IVRAZ at Ouagadougou. IVRAZ does not manage the operating budgets allocated to GERDAT under the institutes' bilateral cooperation agreements,

Agricultural research stations and their programs

Four stations are administered primarily by GERDAT, the international institutes, and CERICI:

- a. Saria is located 23 km from Koudougou in the ecological zone which receives 800-900 mm of rainfall per year. It was originally a cotton plantation but, under the auspices of IRAT, it became an agricultural experimentat substation of Bambey (Senegal) in 1961. It covers 420 ha; and its soils are not representative of the Mossi Plateau.

There are serious isolation problems there due to the lack of infrastructure (lodging, laboratories) and equipment (not linked to an electrical network).

Several institutes work at Saria:

- * IRAT with millet and sorghum programs, soil studies, and studies of crop production systems;
- * IRCT with a cotton subprogram;
- * IRHO with annual oil crops programs (groundnut, sesame, and soya);
- * ICRISAT with millet and sorghum subprograms;
- * CILSS/USAID/FAO/MDR Integrated Pest Control Project to control insects, diseases, parasites and weeds in production systems;
- * FAC/CIEH project for biodigestor development research.

The station has infrastructures to keep a small number of animals (about 30 cows, for example). IRAT takes charge of administering the station. The research personnel consists of 12 researchers (five are expatriates) and 11 technicians/assistants. The station's operating budget is 75 to 80 million CFAF, to which the above institutes and the Government of Upper Volta contribute.

- b. Farako-Bâ is located 10 km from Bobo-Dioulasso, in the ecological zone with 1000-1100 mm rainfall per year. Originally a substation of Bambey, in Senegal, Farako-Bâ has become a food crop station. In 1962, IRCT began cotton research there. The station covers 475 ha,

has stables for about 30 cows, all water and electricity facilities, and is linked by tarmac road to Bobo-Dioulasso. The station has been greatly developed since 1972 with the following programs:

- * IRAT with maize, vegetable crops, and tubers (ignames, manioc, etc.) programs, crops systems, trypano-tolerant oxen for farm work;
- * IRCT with the national cotton program;
- * A regional head office of ADRAO;
- * ICRISAT with adaptative tests for varieties of millet and sorghum;
- * IITA/CRDI with adaptative tests for cowpea;
- * CERC project for rice programs, and other crops under irrigation (maize, fodder crops, vegetable crops);
- * CILSS/USAID/FAO/MDR Integrated Pest Control Project to control insects, diseases, parasites and weeds in crop production systems.

IRAT manages the station, whose research staff is made up of 26 scientists (11 are expatriates) and a few technicians. IRAT's operating budget is 90 million CFAF. The other budgets have not been disclosed. CERC manages an experimentation program in the Kou Valley, 25 km from Bobo-Dioulasso.

c. Kamboinsé is located 15 km from Ouagadougou in the same ecological zone as Saria, with 100 ha of land on heterogeneous soils enclosed within a village. Its development has been spurred with the installation of ICRISAT and IITA. Today Kamboinsé has one of Upper Volta's two important agricultural research centers, with the following programs:

- * ICRISAT with sorghum and millet selection programs, cropping techniques, with emphasis on water conservation. There is one research unit dealing with farming systems;
- * IITA with maize and cowpea selection programs, and cropping techniques, with the accent upon water conservation and studies on niebe storage techniques;
- * CILSS/USAID/FAO/MDR Integrated Pest Control Project to control insects, diseases, parasites, and weeds of crop production systems.

The station is administered by IVRAZ. It is headquarters for the Farming System Unit program and the base for RPAA-SAFGRAD, which is working on a scheme to link research to development in Upper Volta. It also produces irrigated rice seeds and vegetable crops for the Ministry of Rural Development. Twenty-one researchers (16 are expatriates) work at Kamboinsé. IVRAZ provides symbolic support of four million CFAF for the station's operation (seed production) and

covers the salaries of Voltaïc researchers, while the international institutes and projects operate with outside financing (SAFGRAD, CRDI, PNUD, USAID, etc.).

- d. Niangoloko, located 130 km south of Bobo-Dioulasso in the far southwest of Upper Volta, in the ecological zone with 1200 mm annual rainfall, was created in 1949 for karite research. It then became a substation of Saria for groundnut research which is still its main activity. Today, soya, sesame, and sunflower tests are also conducted in Niangoloko. The station has only 35-40 ha, with available land to expand. However, the farm buildings and equipment are in a very poor condition. It is administered by IRHO, with two expatriate scientists and two technicians.
- e. Gampela, an ISP station, is located 17 km east of Ouagadougou. It covers 400 ha, with farm buildings and a center for 50 trainees. Various projects are already underway there:
 - * CRDI/IITA project for the storage of cowpea;
 - * INSAH/IITA project for the improvement of cowpea;
 - * INSAH/IRAT project to evaluate local varieties of sorghum and millet;
 - * IRHO project for the conservation of rust resistant groundnut varieties.
- f. The laboratory villages. ICRISAT and FSU have selected villages where they conduct tests in the rural setting with farmers, either to study and perfect techniques and production systems, or to collect socioeconomic data on rural development. Without calling them laboratory villages, IRAT is also involved in about 50 villages, either to collect socioeconomic data or to study traditional agrosystems.

3.2.3 Ministry for Rural Development (MDR)

Several research programs remain at MDR, under the aegis of the Direction of Agricultural Services (DSA) or the Direction of Livestock Services and the Animal Industry (DSE/IA).

The services of the DSA

- a. The Soils Service is responsible for the National Institute of Soils (PNUD/FAO project). This is equipped with analytical laboratories (soils, water, and plant) and has responsibility for research in the related fields: water and soil conservation, study of mineral deficiencies and fertilization, soil erosion control, etc.
- b. The Plant Protection Service is responsible for controlling migratory insects and general phytosanitary protection. It supervises two research projects:
 - * the Integrated Pest Control Project (CILSS/USAID/FAO/MDR), initiated in 1981 with the objective of designing systems, which integrate cropping and biological control practices, with a view

to reducing the use of pesticides (the Saria, Kamboinsé and Farako-Bâ stations are participating in this experiment);

- * the Plant Protection Laboratory of Bobo-Dioulasso (PNUD Project for the control of cotton phyllodia, picked up and extended over the whole of phytosanitary problems by the Canadian Agency for International Development (CIDA)) is completing a first phase of its program with three scientists (one is an expatriate).
- c. The Extension and Experimentation Service provides technical support to the Regional Development Organizations (ORD). The service is just established and its role in experimentation is not yet well defined.
- d. Fruit-tree stations at Bazega and Banfora have been entrusted to the Institut de Recherche sur les Fruits et Agrumes (GERDAT Institute) for management. They conduct tests and keep collections of fruit species. The better species are multiplied and distributed for commercial production.
- e. Points d'Appui de Prévulgarisation et d'Expérimentation Multilocale (PAPEM) answer administratively to the Ministry for Rural Development. They are, however, used by IRAT and IRCT to improve cropping techniques and production systems for extension. Since 1966, seven PAPEM have been created.
- f. Lastly, MDR has responsibility for the FAO fertilizer project, the RFA phosphate project (West German), and the CIEH project for the development of biogas as a source of energy.

The services of the Direction of Livestock Services

- a. The Veterinary Laboratory collects samples and analyzes the different parasitoses in order to draw epidemiological maps. The microbiology and serology sections plan to undertake surveys in order to put together epidemiological maps of infectious diseases.
- b. The Animal Production Service conducts tests in several stations, particularly at the livestock stations at Banankeledaga, Samandeni and Markoye. The work was interrupted due to lack of financial resources, and the results were not used. IEMVT conducted and then abandoned cattle fattening at the Saria station.
- c. The livestock research stations. The Animal Production Service is planning to launch research activities again, in particular at the following stations:
 - * Samandeni Station was created in 1957 with the intention of determining how well the Mere and N'dama breeds hold up against trypanosomiasis. The station, which covers 1,100 ha and is located 45 km from Bobo-Dioulasso, has one technician and five labourers. There are three houses, two stables (one for cattle and one for sheep), and four wells with pumping equipment. The herd at present is composed of 71 cattle, Mere and N'dama breeds, and 30 sheep of the local type.
 - * Banankélédag Station covers 30 ha and is located 20 km from Bobo-Dioulasso. It was designed for studying the potential of species and breeds and for supplying high quality breeder

females to farmers. The station has space for pig, fowl, sheep, and cattle.

- * Markoye Station covers 3,000 ha and is in the Sahelian zone. The purpose of this station has been to study the potential of Azwak pure lines, per se, and in cross-breeding. This station also supplies genitor cattle and goats to producers.

- d. Centre de Recherche sur les Trypanosomoses Animales (CRTA). The Ministry for Rural Development and MESRS are jointly responsible administratively for the Bobo-Dioulasso Centre de Recherche sur les Trypanosomoses Animales. The center was set up in 1975, following a 1972 agreement between the governments of France and Upper Volta, to which West Germany became a party in 1973. It consists of several buildings for rearing tsetse flies and laboratory animals, an irradiator of 12,400 curies, various laboratories (entomology, cell cultures, immunology, biochemistry, serology) and all the scientific equipment necessary for high quality work. The center has 220 heads of cattle needed for raising experimental animals at Banankeledaga.

The center's staff is made up of 18 expatriate researchers (GTZ-IEMVT) and 6 Voltaic employees (an entomologist, a veterinarian, a biochemist from IVRAZ, two livestock specialists, and a specialist male nurse).

3.3 The National Contribution and Outside Aid

The national contribution and outside finance earmarked for setting up livestock research programs are given in Table 4. Data relating to research personnel show that about half are expatriates; of these, 90% are employed within the CNRST structures. About 50% of the Voltaic personnel belong to structures administered by IVRAZ, by other MESRS institutions, and about 40% to institutions under ministries other than MESRS. As far as the number of researchers is concerned, Upper Volta is better off than other African countries. However, the cost per research worker is extremely high in Upper Volta, about double that for other West African countries. Information relating to budgetary figures shows a less favorable situation because more than 90% of all expenses, even those which include payment for civil servants, are covered by funds from outside sources.

It has not been possible to obtain complete data for budgetary expenses for agricultural research because of the complexity of sources and regrouping of funds which originally came from diverse sources; the large number of donors involved; and the difficulty of separating research funds from development funds. Since 1973, large investments have been made over a very great number of agricultural projects (more than 340 missions to Upper Volta annually) by bilateral, multilateral, and international technical assistance groups. It is impossible to determine the distribution of investment between research, extension, and rural development. In fact, most agricultural development projects include 1% to 2% for "support research." The increase in the number of financing sources, the competition for them and duplication of jobs, and the different objectives of similar programs made it impossible, in the time allotted for the mission, to gain a clear view of the goals and objectives

pursued, the multiple origins or levels of financing, or the budgetary costs of programs and projects from which agricultural research might benefit.

It should be noted that the uncontrolled growth of outside help and the lack of coordination create grave problems, particularly at the level of the capacity to absorb them. Reasons which can be cited are:

- * the plethora of missions, individual visits by various aid programs and small projects;
- * the lack of centralization and coordination of the offers;
- * the tendency of government agencies and assistance agencies to work independently of one another;
- * the impossibility of integrating assistance programs into a national framework for technical and financial management, which permits the government counterparts the opportunity to provide a reliable equivalent for obligations and recurring expenses which are often greater than the total budget of the state.

A careful study is needed of the present state of research financing, of where budgetary resources are headed, and of the budget systems, along with measures to improve overall management of the research system.

A more detailed description of research programs in progress is given in Annex VI.

3.4 The Impact of Agricultural Research on Agricultural Production

It is generally acknowledged that agricultural research is highly profitable. However, its impact upon a country's agricultural production depends upon a number of factors, which often have nothing to do with the quality of research results. Agricultural research results are often presented in the form of isolated technical subjects (varieties, fertilizer formulas, cropping techniques, treatment methods, etc.). Their full use at farming system levels implies the delivery of a "technological package" which alone could result in optimal production.

This technological package, including a coherent combination of technical inputs, must take into account the socioeconomic aspects of the traditional farming systems, otherwise it will be rejected by the farmers. In the following, the mission gives some examples of the impact of research on production.

Agricultural research on food production in Upper Volta has produced results applicable to extension. Different selected varieties were proposed for production, in particular 11 varieties of sorghum, five varieties of millet, and four of maize. The yield potentials for these varieties exceed 2.5 tons per hectare for millet, 4 tons per hectare for sorghum, and 6 tons per hectare for maize. It is difficult to estimate the impact of these varieties on the country's overall production. Cereal production per inhabitant has remained constant (205 kg average since 1965). The cropping area devoted to cereal crops has only risen 0.4% per year, while the population has grown by 1.6% per year. Cereal

Table 4. Agriculture and livestock research organization, personnel, and budget.

Organization	Scientists ¹		Technicians	Annual Budget ²		Remarks
	Expatriate	National		Millions CFA(3)	% External Financing	
MESRS/CNRST						
IVRAZ	0	3	-	15.0	0	Personnel de la direction
IRAT	7	9	11	185.2	39	
IRHO	3	2	-	71.9	50	
IRCT	2	3	-	86.4	54	
CERCI	5	8	6	334.5	90	
ICKISAT	9	4	12	210.0	100	
IITA	5	3	10)		
FSU (Purdue)	4	1	9)725.0	100	
SAFGRAD/RPAA	0	1	-)		
CRDI	1	-	-	-	-	
CILSS/INSAH	0	0	0	4.0	100	Implemented by IVRAZ/IPAT, district coordination, see CTFT
ADRAO	-	-	-	-	-	
IRBET	pm	pm	pm	pm	pm	
CTFT	2	0	-	-	-	
ORSTOM	-	-	-	-	-	
CIEH	-	-	-	-	-	
MESRS/MDR						
CRTA	16	6	-	450.0	100	
MDR						
DSA						
Pedology	2	8(4)	5	240.0	100	See Project AGRHYMET
Hydrology	pm	pm	pm	pm	pm	
Seeds	-	2	-	6.0	100	
Crops Protection	4	13(4)	-	292.0	100	
Experiments and Support Studies	-	-	-	-	-	Including Bobo Dioulasso Lab and Integrated Pest Control Lab Recent service
DSE/IA						
Laboratory	-	-	-	-	-	
Station	-	-	-	-	-	
ORD/PAPEM	-	-	-	-	-	
AVV/PAPEM	1	-	-	-	-	
Projects MDR						
CILSS/FAO	1	-	-	1.3	100	
FAO/Fertilizer)	3	0	-	73.0	100	
RFA/Phosphate)						
ME						
Agrometeorology Division (AGRHYMET)	1	7(4)	14	161.5	64	Regional Project, including also Hydrology Service
TOTAL	59	64	67	2,879.8		

Notes:

- Data not available.

- (1) Data on personnel came from recent reports by each organization, and from verbal communications with those in charge in each organization. These data are approximate; figures obtained verbally did not always tally with figures quoted in reports.
- (2) Budget figures are those found in reports, or given by organization representatives. Dollars US have been converted to CFAF on the basis of 300 CFAF to one dollar. Some budget figures in projects are no more than an estimate of total cost, divided by number of years planned for the project. Budgets for some MDR units are total budget, and not research budget only.
- (3) Budget figures do not include salaries and expenses paid to national staff. These expenses would represent approximately 111 million CFAF per year, on the basis of 1.2 million CFAF per scientist, and 0.6 million CFAF per technician.
- (4) These figures refer to the total number of professional level staff. All are not necessarily active in research, however, they represent a potential source of recruitment for research

production must have increased in terms of yield per land unit, thanks to technologies developed by agricultural research.

For rice, research has released more than four varieties to extension. These are now widely used in irrigation development schemes such as in the Kou valley.

Rosette disease was the major constraint on groundnut production during the fifties in the southern part of the country. Consequently, potential yield in the Banfora region dropped considerably. Groundnut cultivation was on the point of being abandoned in this area. The creation of varieties resistant to rosette, and improved fertilization methods and cultivation techniques helped production stay at its present level. Six varieties adapted to different ecological zones in the country are presently available for use by the extension service. The recent development of groundnut blight requires a reinforcement of research in progress on varietal improvements and resistance to this disease in the southwestern region. Programs are underway to bring the disease under control.

Table 5 shows the evolution of cotton production and cropped areas since 1951, that is over a period of more than 30 years. This gives an example of the unarguable positive effect of research upon production. In terms of average yields, for example, the shift from the Allen 333 variety to the BJA 592 between 1965 and 1970 doubled yield; the shift from BJA 592 to BJA SM 67 between 1970 and 1975 had the same effect.

Table 5 Evolution of cropped area and production of cotton.

Year	Area (ha)	Production (t)	Yield (kg/ha)	Dominant variety
1951	300	52	165	Alleen 33
1955	8,720	824	94	Alleen 33
1960	20,560	2,772	134	Alleen 33
1965	49,720	7,463	137	Alleen 33
1970	80,557	23,484	291	BJA 592
1975	61,520	30,563	497	BJA SM 67
1980	74,948	62,539	834	BJA SM 67
1982	75,500	68,000	900	MK 73

Source: IRCT synthesis note, 1982.

These varieties have been released with appropriate technological packages (fertilization manure, phytosanitary treatments, cropping practices, etc.). Producers benefited from supply and marketing services, all of which are behind these spectacular results.

Research, whatever the quality of results at experimental stations, only reaches its goal when it is adopted by the farmer, and it is only at this time that research actually ends. Research in isolation has no practical value; there must be good interaction between research and development if the former is to be fully effective.

3.5 The Strengths and Constraints of the System

An in-depth review of the structures and programs of the research effort has led the mission to draw up its observations in the form of strengths and constraints of the present agricultural research effort in Upper Volta.

3.5.1 Strengths

Up until now research has benefited from a number of positive facts:

- a. The government has perceived the necessity of more dynamic involvement in planning, programming, and direction of activities in agricultural research. In order to implement this, laws have been passed calling for the creation of Institut Voltaïque de Recherches Agronomiques et Zootechniques (IVRAZ), as well as a statute for the research personnel.
- b. A number of agricultural research programs and projects are underway. Food crops, (sorghum, millet, corn, rice, cowpea, etc.), should be mentioned, as well as cash crops (cotton, groundnut), soils studies, plant protection, animal trypanosomiasis, and the study of production systems and socioeconomic research in the rural environment.
- c. Numerous bilateral or multilateral cooperative agreements have already permitted, and continue to allow, the setting up or financing of research programs. They are a sign of the special attention given to Upper Volta by a number of donor organizations, such as UNDP, FAO, the World Bank, the European Development Fund, and bilateral cooperation agencies (French, American, German, Dutch, Canadian, Swiss, etc.).
- d. In addition to having numerous national research programs and projects, Upper Volta is the seat for a number of regional organizations (CILSS, SAFGRAD, CRTA, etc.) and international programs (IITA, ICRISAT, WARDA, etc.).
- e. There are a fair number of physical resources in the country which permit agricultural research works. The most important are the four IVRAZ research stations, of which two are particularly well equipped (Kamboinsé and Karako-Bâ); the National Soils Institute; the plant Protection Service (Ouagadougou and Bobo-Dioulasso); the Animal Trypanosomiasis Research Center and the ISP Station at Gampela.

- f. The existence of good decentralized structures for development services (the 11 regional development organizations) makes it possible to develop research projects adapted to the ecosystems and local sociological conditions, which could take into consideration farmers' needs when planning research programs (the PAPEM, for example).

3.5.2 Constraints

The full development of IVRAZ and the implementation of priority agricultural research programs presently runs up against a series of constraints; among these the following are particularly notable:

Resources and national responsibilities

- a. There are a limited number of nationals (researchers and technicians) trained to carry out or manage research work. Numerous projects financed by foreign cooperation organizations do not yet have counterparts.
- b. There are limitations in infrastructure (e.g., the housing capacity at the Saria Station), equipment, adequate investment and operating budgets. For example, stations equipped with generators have electricity only for a few hours a day. The operating budget is too small, and financial resources are not available to link up with the electrical network.
- c. Research responsibilities are dispersed in the agricultural sector within various ministries (MESRS, MDR, Environment, Public Works), within IVRAZ, and even within each research station.
- d. Responsibilities are scattered at conceptual, programming, and operational levels.
- e. Coordination structures have been defined to some extent but are not yet operational.
- f. There is an absence of workable methodologies in planning, programming, and program implementation procedures:
 - * lack of methodology to define research priorities and to evaluate programs;
 - * lack of sufficiently close relationships between research programming and agricultural development priorities policy;
 - * absence of functional relationships among numerous institutions organized and structured by type of production (commodities);
 - * research planning with little emphasis on organization based on the structures of scientific disciplines;
 - * a very limited scope of socioeconomic factors in program orientation and evaluation.
- g. The human resources potential and physical facilities for agricultural research of ISP are not being used.

- h. Frequently, there is confusion between the terms "basic research" and "applied research."
- i. In the development sector, there is a large diversity of resources and orientations at ORD center, and major differences in approaches to link research and extension for example, different conceptions of the role, organization, and responsibilities of the PPEMs.
- j. Problems arise in the transfer of technology to the farmer, especially problems of getting information back to research, because ORD and research institutions have adopted different research-development strategies.
- k. There is a disproportion between the number of researchers and the number of qualified technicians, the latter group showing the more serious weaknesses.
- l. There is a lack of solid training for extension personnel and, therefore, the lack of the workers' credibility by the farmers.
- m. The advisors (encadreurs) have a low level of technical skill in relation to that of farmers.

Interaction with foreign aid organizations

- a. There is a diversity of agreements with foreign aid organizations, as much in terms of the nature and duration of the programs as in terms of their financing and the national counterpart contribution.
- b. Coordination of research programs among foreign aid organizations is lacking, and this results in frequent duplication of research subjects.
- c. The overlapping of national and international programs leads to confusion about the respective responsibilities. Moreover, frequent ignorance of the international organizations' mandates results in a delicate situation in the management or coordination of the international programs.

The programs themselves

- a. There is a geographic imbalance between the country's regions as regards the number or importance of the present programs. The north and east have been disadvantaged in comparison with the central and southwestern regions.
- b. There is an imbalance in the nature of research programs, with an abundance of projects tied to food or industrial crops, but few programs with emphasis on livestock topics, intermediate technology (storage and conservation of crops), agroforestry, or agro-socioeconomic studies (especially in farming systems).
- c. An imbalance also exists between national production needs and the nature of research programs; two of Upper Volta's three major export commodities (karite and livestock) have no research programs.

Chapter Four: Proposals for the Organization, Operation, and Development of the Structures and Programs

4.1. General Considerations on Research Programming and Structural Design of Research

4.1.1 Considerations in terms of programming

Nature of the programs

With very limited resources, but with the aid of various donors, Upper Volta has undertaken considerable efforts in agricultural research. To be used efficiently, these resources must be allocated for the solution of priority agricultural development problems within the framework of a national agricultural research program.

The establishment of such a program must be based upon priority objectives for the social and economic development of the country. This means food selfsufficiency and raising the standard of living for the rural population. The Second Conference des Cadres of the Ministry for Rural Development has made these objectives part of the strategy of the CILSS and the Sahel Club, recommending:

- * increasing production, mainly through cropping intensification;
- * intensifying agriculture, without loss of soil fertility or disrupting the socioeconomic balance;
- * promoting new agricultural development activities in structurally deficient regions.

Based on those national goals and in close cooperation with those responsible for development, the most important task of the program is to define specific objectives of the production sector, and to work out priority research programs to meet development needs.

To be pragmatic, this programming must take into account what already exists. Therefore, the mission suggests that it should develop simultaneously in three directions:

- * a disciplinary approach to solve general problems, such as knowledge of the natural environment and ecosystems, the inventory and conservation of resources, and the study of water dynamics in soil profiles.
- * a commodity approach where the type of product is viewed as a program led by a team of specialists from various disciplines according to program objectives (for example, the maize improvement program with regional subprograms and the groundnut improvement program with a rust resistance subprogram);

- * a systems approach where the program is designed around multidisciplinary team activities conducted in the actual farming environment to identify development constraints, introduce new technologies, and study farming systems development at various levels (i.e., traditional production systems improvement program under rainfed conditions; crop-livestock integration in the eastern region).

Program deadlines

The time span of a research program depends on the type of research problem. Major programs are generally medium-term (five to ten years) or long-term (10 to 15 years or more). Program elements, projects, and research operations evolve mainly on short-term bases (three to five years). However, no matter what length of time is foreseen, these should generally be approved for a three-year period. In the area of agricultural research, one can scarcely expect significant results in a shorter period. Moreover, in terms of program implementation, it is unrealistic to foresee longer deadlines, or to anticipate changes or required modifications beyond this period. This principle being adopted, it is neither necessary nor desirable to reevaluate all operations and research activities in progress every year. For each program, progress evaluation every three years for all its operations and activities seems reasonable, using these reassessments as a new starting point to decide whether to discontinue some operations, or to pursue or redirect others for a new period.

Programs diversification

Formal and institutionalized programming has its limitations because research cannot, without danger, dedicate itself exclusively to short-term needs and development support research activities. Despite the great importance which must be given to formal research programming based upon priorities (essential to avoid disorder and isolation of research activities from the realities of the farming world), it is hazardous to limit research to only the most urgent and high priority problems. One of the major difficulty facing agricultural research planning is the complexity, diversity, and interdependence of various disciplines, and the need to mobilize multidisciplinary teams to solve its problems.

The available resources to perform problem-related research are not always in competition. On the contrary, they are large, complementary and are closely interrelated, a fact which cannot be overlooked when planning a research program. Even if the immediate interest must lie in certain priority areas, in terms of short-term development policy, a balanced research program remains indispensable. No scientific research area can be neglected without impairing long-term research objectives.

Research efforts must also be devoted to medium- and long-term problems, and must perceive unconventional scientific, technical, economic, and social dynamic changes, and their impact on the overall development of agriculture. Research must also investigate new ways, open new horizons, foresee exceptional situations, and contribute to training its own scientific and technical staff. This is the purpose of exploratory or prospective research, which has a legitimate role in agricultural research and should be actively encouraged.

This is also the purpose of preventive research for dealing with exceptional situations (i.e., epidemic diseases or drought) involving research topics which cannot be assessed in terms of economic implications. Like an insurance, preventive research is undertaken with the hope that its results will never have to be used.

Finally, educational research is a necessary component for training scientists and specialized staff, and is an essential prerequisite for conducting an efficient national research program, performing on-the-job training in various specialized fields, and strengthening research-training links (IVRAZ-ISP).

In order to ensure a balanced research program (which takes into account both medium- and long-term needs and exploratory, preventive, and educational research), it is suggested that a definite proportion of the whole research budget (i.e., 10 to 20%) be removed from the control of programming commissions and used at the discretion of the board of directors of CNRST and IVRAZ, with the approval of the scientific and technological research commission of CNESRS.

4.1.2 Consideration in relation to structures

The starting point for working out a master plan for IVRAZ should be the general outline of an ideal organizational structure and managerial means of agricultural research in Upper Volta. This is a design whose final achievement through progressive adjustments may lead to an efficient national agricultural research system that is capable of responding to evolving agricultural development needs, conducting priority programs and major national research activities by agro-ecological zones and regions, and providing technical solutions to farmers' problems and the development of the agricultural sector of the country.

The factors which must be taken into consideration are numerous. Among them are the political and administrative organizations, the range of agro-socioeconomic conditions, the balance in development between ecological zones and agricultural development as defined by government policies and strategies, and all constraints related to natural, social, and economic environments.

The mission reviewed three possible organizational options for IVRAZ, with the understanding that any structural organization is the result of an evolving process. The three options are as follows:

- * structure based on commodity departments;
- * structure based on disciplinary departments;
- * mixed structure.

Each option is presented below with its advantages and disadvantages.

Structure based on commodity departments

This is the one presently adopted by IVRAZ and some other institutes. This kind of research organization is structured by commodities, such as corn, sorghum, groundnut, or by groups of crops (industrial crops, marketing crops, etc.). Each structure must call upon different

scientific and agricultural disciplines (genetic, phytopathology, etc.), which are present in each commodity structure.

Such structure has the merit of being known and practiced in the country. It is easy to manage when the departments are not numerous, given the obvious parallels between programs and structures. It coincides with straightforward development objectives, and therefore is attractive to ministries in charge of agricultural development. It is acceptable to certain donors interested in financing research activities by commodities or types of production.

On the other hand, commodity structure has the great inconvenience of being oriented towards one production only, whereas many priority programs are concerned instead with more general problems (i.e. study of water-soil-plant relations or soil fertility) or those related to production systems.

Oriented toward individual crops, the multidisciplinary teams might be incomplete (lack of specialists in a given discipline, such as plant physiology), or dispersed because members of the team belong to different schools or different sources of financing. Such structures might be forced to appoint scientists that a single crop department cannot justify on a full-time basis.

Frequently, commodity-oriented research must turn to highly specialized scientists (biological pest control, physiology, etc.) who either belong to other institutions or to other ministries, thus creating budgetary problems or requiring agreements between institutions. This structure also leads easily to a duplication of research efforts. For example, there are at least five research programs on sorghum in Upper Volta, each one independently financed and implemented (IRAT, INSAH, ISP, ICRISAT, and CERCI).

A structure based on commodities makes it difficult to carry out research on production systems and in particular, research related to the improvement of traditional farming systems which vary from one region to another in the country. Finally, this structure becomes too cumbersome with increasing numbers of crops or crop production types.

Structure based on disciplinary departments

This structure is based on departments by disciplines that is, regrouping all the scientific and agricultural research activities that are concerned with several or all crop productions, and that simultaneously share common laboratory services and facilities. The research workers are assigned to the departments by disciplines or groups of related scientific disciplines. The number and composition of the departments vary from one institution to another. A plant protection department may be split into phytopathology, entomology, and nematology sections; an agropedology department may be divided into sections relating to soil fertility, biology, physics, and taxonomy of soils. A phytotechnic department might be subdivided by cropping systems (rotations) or production systems (rainfed, irrigation, "bas-fonds", etc.).

Such a structure offers a number of advantages. It allows distinctions to be made between research structure (departments) and research programs (by thematic subjects, product systems, or by regions). It tends to favor interactions between researchers in related disciplinary fields of

specialization. It insures better support, follow-up, and a more objective evaluation of the work of specialized scientists during their careers. It allows more flexibility in assigning tasks and responsibilities to research workers in different national programs. It ensures more comprehensive approaches to thematic research activities related to several productions, and is better adapted to the multidisciplinary approach required to study farming systems. Finally, this structure makes it easier to define and manage research programs organized by themes, by crop, or by crops associated in production systems, and leads to more rigorous and therefore more efficient programming.

Note, however, that in the early development stages of a research institute, with insufficient critical mass of scientists in different fields of specialization, it is difficult to establish disciplinary departments. This structure is not well adapted to a situation such as the one that presently prevails in Upper Volta, where research activities are coordinated and implemented on an ad hoc basis, and are geared towards a wide range of different crops.

In addition, the applicability of the research results is not always clearly perceived by those responsible for development. Sometimes the results appear to be too theoretical.

Mixed structure

A mixed structure is a combination of the two preceding options, involving departments organized by disciplines (i.e., agropedology, phytopathology) and others by crops, commodities, or type of production (i.e., cereal crops, industrial crops). Research programs are carried out by ad hoc, polyvalent teams of research workers from disciplinary and commodity departments, according to the nature of the problems to be solved. This third option should be considered an intermediate stage, which might evolve into one or the other preceding options, according to the organizational structure finally adapted.

The mixed structure, however, offers some advantages mainly during the intermediate development stages of a research institute. It gives great flexibility to the institute for organizing its research activities, and allows for rational use of scientific and technical skills as well as available resources.

On the other hand, it does not make a clear distinction between structures and programs, and thus combines the advantages and disadvantages of the two preceding options. However, as the institute's programs develop, mixed structure becomes too cumbersome and too complicated to manage.

4.1.3 Organization of the Structures and Programs of IVRAZ

Presently, IVRAZ is organized by production departments. However, the mission feels that in the long-term, this structure should evolve progressively towards an organizational structure based on departments by scientific disciplines, and programs geared towards commodities, types of production, production systems and thematic subject areas.

Stable structures to serve programs

Scientific disciplines, and consequently the departments grouped by disciplines, are permanent. They move ahead, are developed and perfected unendingly. On the other hand, research programs show great variability over time, and are highly specific as far as the space factor is concerned (regionalization). Their evolution depends on political and economic circumstances and priorities, and the social milieu and the progress made in the sciences and their techniques. To solve a great number of problems, a research program must be adaptable. It must consequently be able to be changed or modified very quickly, depending upon the circumstances. A department, on the other hand, once installed, becomes indispensable and quasi-permanent, whatever the evolution or orientation of specific and well-defined programs may be.

With the exception of production systems based on large perennial plantations of industrial crops (coffee, cocoa, oil-palm, rubber, etc.), which is not the case in Upper Volta, it seems preferable, when the number of staff and resources will allow it, to organize research around permanent disciplinary structures. It will then be easier to establish, reinforce, or dissolve multidisciplinary teams as required by the evolution and necessities of programs (regional priorities and production systems by agricultural regions). In reality, the scientific and agricultural disciplines are common to all types of commodities or products, and can form the skeleton of permanent departmental structures. Departments based on different types of crops are forced to evolve in time, even to be dissolved, according to changes in economic situations and research priorities, as they are practically identical to national commodity programs.

It is on such a conceptual basis that the mission analysed gradual schemes for setting up the structures and programs that it would recommend for IVRAZ (Section 4.2 below).

Once the master plan, the "ideal" plan, is established as the basic framework for the agricultural research system (Figure 4), the achievement of which must be viewed on a long-term basis, one strives progressively to integrate the units, the services, the structures, and programs presently scattered and relatively independent, into a more consolidated national program and into more functional structures. This leaves freedom for partially modification of the master plan in keeping with the necessary adjustments to new scientific and technical progress, and the normal evolution of progressive adjustments of research to new situations in agricultural development.

Flexible programs tailored to problems

Programs have to solve many different problems, always too numerous and beyond available resources. The priority programs must be established in proportion to means and to well-defined time schedules. In view of the limited resources of Upper Volta, IVRAZ must comply with the following:

- * defining essential priorities, research topics, and programs strictly concerned with the most crucial aspects that must be taken up by research, and that will give results applicable in the short term;
- * building up research units capable of ensuring a multidisciplinary approach to the solution of the most important problems;

- * establishing structures that anticipate the required levels and qualifications of the scientific staff needed to conduct on a permanent basis essential agricultural research activities -- manpower planning (this calls for a critical mass of permanent staff in all major agricultural research disciplines);
- * anticipating the possibility that a core staff of scientists may need to be enlarged quickly when urgent study of new problems arises.

The organization of agricultural research must ensure continuity to the permanent activities of its scientific disciplines, and adaptability to fluctuating needs of its research programs.

To comply with such a dual requirement, the core research staff of IVRAZ must be able to conduct the long-term national program, and be capable of addressing itself to new problems or those to be solved on a short-term basis by integrating additional, temporary research workers and technicians. This supplementary staff could be supplied from young scientists (being trained at the Institut Supérieur Polytechnique, for example), research workers on sabbatical leave, and from scientists under contract with bilateral or international technical assistance groups. Once a particular research operation has been achieved, the ad hoc research team can be dismissed; the research workers of the IVRAZ permanent core group return to their respective departments and become available for new research operations.

This system ensures the stability and continuity of permanent activities within each research discipline, and the flexibility needed to set up programs which can be changed or modified according to obtained results or their impact on agricultural development.

In addition, an advantage of this system is that it avoids an increase in core staff with each new project, and prevents an over-staffed and unbalanced organization which, in the absence of a well-defined national program, would lead to more and more chaotic and often uncontrollable situations.

The presentation of a sound and realistic plan for the organization of IVRAZ and its research programming, and one that copes with priorities set by the development plan and in line with the country's needs and capacities, might be the best way to mobilize funds needed for its implementation.

4.2 Master Plan for the Structures of IVRAZ

4.2.1 Long-Term Master Plan

The structures (national, bilateral, and international) described and analyzed in Chapter 3 (Figure 1 and 2) show that within Upper Volta's present agricultural research system, research structures are widely scattered, fragmented, and partitioned, leading to a great duplication of effort on the program level.

In other respects, the analysis of the importance and present place of IVRAZ has shown that in reality the institute exercises no control over

either priorities assessment in programming, or the financing of its research. This state of affairs does not allow IVRAZ to coordinate agricultural research on the national level and reduces its efficiency. In fact, the present organizational level of IVRAZ is rather rudimentary within too vast and overorganized an institutional framework. This is why the mission is proposing an organizational plan which allows IVRAZ to incorporate progressively the structures, programs, and national research projects into a more coherent organization.

Such an organizational plan should also permit IVRAZ to manage better its relationships with cooperative groups, and provide better agricultural research. Finally, it should move towards an ideal model, the achievement of which will need several decades, with the intention to developing its structures, services, operations and relationships with partners.

In order to set up a structural and organizational plan to define a series of actions and the time horizon needed for a more reliable structure for IVRAZ, it is essential to design a master plan that includes all essential elements required to perform good management and sound operation of the institute.

The mission proposes a structure including:

- * a research management directorate;
- * an administration and finance management directorate;
- * a bureau of planning, programming, and evaluation;
- \$ a network of research stations;
- * management bodies.

The research management directorate

The research management directorate is made up of a number of scientific departments, and a research development department with three divisions: experimentation in the rural environment, evaluation of research impact on development methodologies, and linkage of research and development with support services (documentation, information, communication, and publications).

- a. The scientific departments are tentatively: agrobioclimatology, soil science, crop protection, chemistry and biochemistry, agricultural technology, animal health, agricultural engineering, and rural socioeconomics. Each department can be subdivided according to program needs. In addition, some departments may establish national laboratories with responsibilities in research, routine analyses, and collection and multiplication of material for research (breeder's seeds, tissue cultures, etc.)

According to the master plan presented in this report, the departments might be organized as follows:

- * Agrobioclimatology
 Sections: hydric balance sheets, evapotranspiration, energy balance, and microclimatology.
 Services: synoptic network and network of IVRAZ stations.

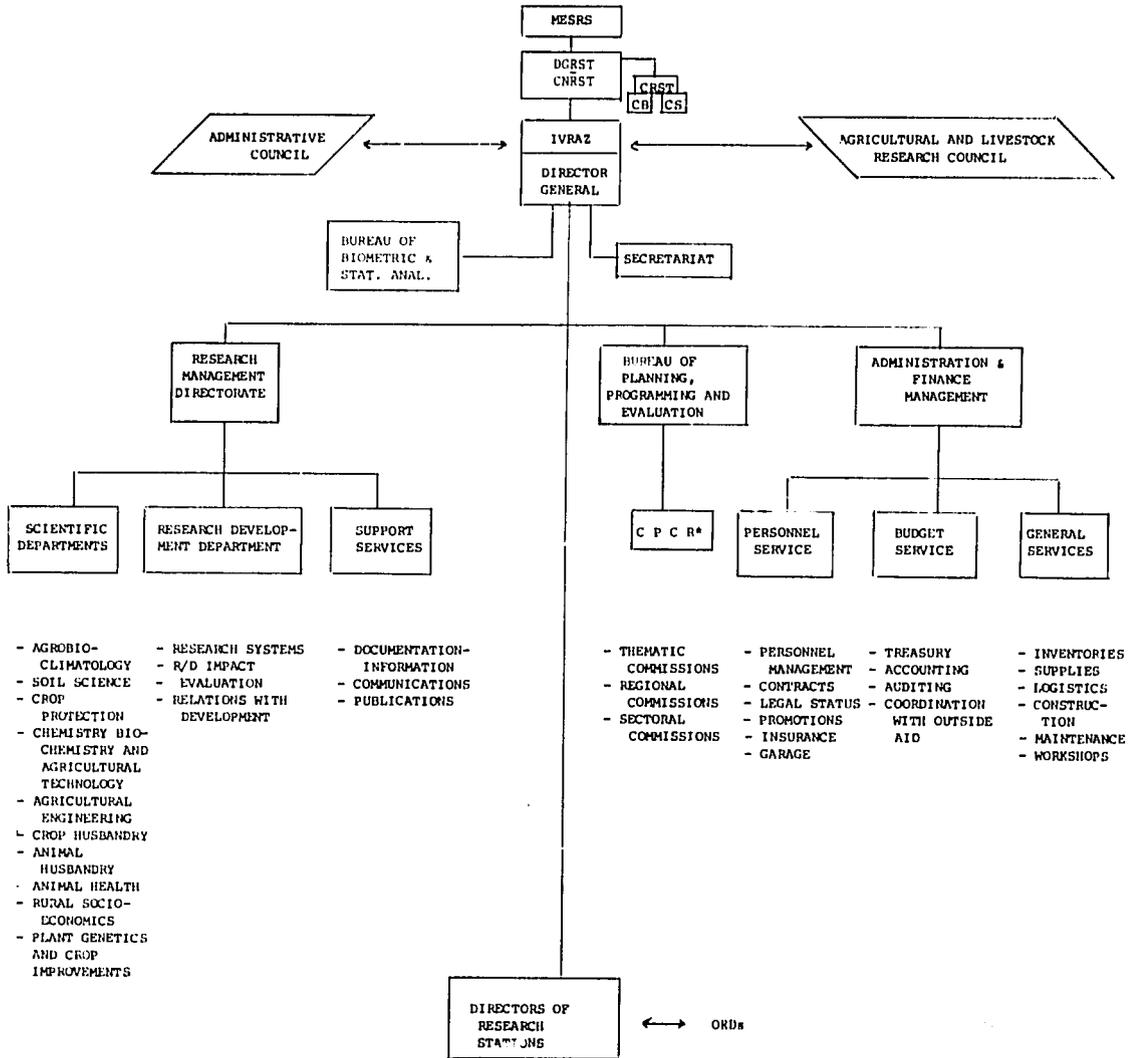


Figure 4: IVRAZ Long-term Organization Master Plan. t=∞

- * Soil science (the present Institut National des Sols).
Sections: water-soil-plant relationships, soil biology and microbiology, soil physics and conservation, soil chemistry and fertility, soil classification, and cartography and surveys.
Services: foliage and soils analyses, and laboratory for trace elements analysis.
 - * Crop protection research now carried out in the laboratories of the Crop Protection Service of MDR.
Sections: phytopathology, entomology, virology, nematology, phytopharmacy, weed sciences, integrated pest control, and rodents and birds.
Services: crops protection, and laboratories for the analysis and identification of crop pests and diseases.
 - * Chemistry, biology and agricultural technology
Sections: food technology, nutrition, bromatology, biochemistry, and applied microbiology.
Services: agricultural chemistry, and biochemical analyses..
 - * Plant genetics and crops improvement
Sections: cytogenetics, genetics, and crop improvement (cereals, legumes, industrial crops, tuber plants and roots, horticultural and vegetable crops, and fodder crops).
Services: plant collections and introductions, seed control and certification, and tissue cultures.
 - * Crop husbandry
Sections: phenology and phenograms, ecophysiology, cropping techniques, agricultural synecology, cropping systems (cereals, legumes, industrial plants, root and tuber plants, horticultural and vegetable crops, and pasture and fodders crops), farming systems under rainfed and irrigation crops, association and mixed cropping, and agroforestry systems.
 - * Animal husbandry
Sections: animal genetics, agrostology and ranges, animal feed and nutrition, physiology of reproduction, livestock production systems and techniques, animal traction, production systems of cattle, pigs, small ruminants, and poultry farming.
 - * Animal health
Sections: epidemiology, and prophylaxis.
Service: Center for Animal Trypanosomiasis.
 - * Agricultural engineering
Sections: agricultural hydraulics, irrigation and drainage techniques, land development, agricultural construction, and agricultural mechanization.
 - * Rural socioeconomics
Sections: rural sociology, rural economy, econometry, micro-economy, and farm management.
- b. The research-development department is responsible for the coordination and liaison between research and development. It is made up of three divisions with one research-development unit in each research station (Section 4.3.3).

The three divisions are:

- * Division for experimentation in the rural environment is in charge of coordinating the research programs on farm sites for systems which are ready for diffusion. The work is conducted by the research-development units seated in the research stations. It is also responsible for studying the methodologies of experimentation.
 - * Division for the evaluation of the impact of research development is responsible for coordinating the evaluation of development programs in order to measure the impact of technological packages and technical messages issued from research before messages are transferred to extension. Such evaluation will be organized through concerted expertise from IVRAZ, ORD, the MDR, and the primary users (farmers and village representatives).
 - * Division of methodologies and linkages of research-development is responsible for the coordination of research activities in support of development and training/information of extension staff. Its programs are carried out by the research-development units of the stations. It is also in charge of conducting research on extension methodologies and evaluating the technical performance of extension personnel.
 - * Research-development units. At each station, these units will be responsible for the execution and the application of the field programs of the department extension.
- c. Research support services. It is of utmost importance to establish a well-structured flow of information with continuous feedback at the various levels in order to take advantage of a wealth of updated documentation. It is also important to disseminate results regularly and efficiently.

A research system must avoid being a closed system. This is why IVRAZ must have access to support services composed at least of a documentation and scientific information service (including a central library). The library materials and scientific documentation in the research stations need to be expanded, and there is a need for establishing a centralized documentation and information exchange service in the areas of agricultural research and development.

The documentation centre of IVRAZ will be responsible for:

- * collecting, cataloguing, and maintaining all documents and archives of publications, reports, and working documents issued from agricultural research;
- * organizing a specialized central library, and regrouping all basic works and main publications, magazines, and periodicals related to agricultural research and the development of agricultural sciences and techniques;
- * setting up a service for the reproduction and the exchange of documents (photocopies, microfiches, etc.) within Upper Volta, and keeping an updated inventory of all bibliographic material

maintained throughout the network of research stations in the country;

- * keeping an updated information system on current programs and research projects in the country, such as background material related to periodical reports, annual reports, mission reports and other technical documents prepared for these projects but generally not issued in the form of a publication;
- * participating in AGRIS, CARIS, FAO and other international, regional, and bilateral documentation networks, and establishing close links and documentation exchanges with African, Latin American, and Asian countries located in similar agro-eco-climatic environments;
- * organizing a computerized central service for selection of the bibliography, and an information service tailor-made to users' profiles and bibliographic needs;
- * providing a communication service (Section 4.3.5);
- * establishing a publication service.

The administration and finances management directorate

This directorate involves three services: the personnel service with eight divisions; the budget service with four divisions, and the general services with six divisions (Figure 4).

The bureau of planning, programming and evaluation

The bureau is an extension of the programming unit set up during IVRAZ's development phase (t=0). It is responsible for management, planning, programming, coordination, control and evaluation of all scientific and technical activities of the institute. The bureau, under the direct responsibility of the research director, will be in charge of preparing, organizing, and coordinating operational programs and research activities in progress or foreseen. The bureau has a limited number of permanent staff (secretariat of the CPGR) and will be composed mainly of the director general of IVRAZ, the research director, the director of administration and finance, the heads of the scientific departments, and research station directors during the sessions and periods of intense activity of the CPGR (at the beginning and end of programming cycles), and for handling all operations of the CPGR. The bureau will function through three commissions: the thematic commission, the regional commission, and the sectorial commission within the framework of CPGR (Section 4.3.2). The members of the commission will come from various departments, services, and divisions of the institute, or from technical assistance groups and foreign institutions working in cooperation with IVRAZ.

The research stations network

The institute should have research stations for carrying out the programs at regional and national levels. Their number and distribution will have to be determined during the successive phases of IVRAZ's development. Each station will have an administrative and financial service,

scientific disciplinary groups in line with program needs, and a farm management service (Section 4.3.6).

Management bodies will be:

- * an administrative council;
- * an agricultural livestock research council (CRAZ);
- * a biometrics and statistics bureau, whose functions will be to support statistical analyses linked to research programming, to establish protocols and experimental designs, and to analyse all data from research and evaluation programs, as well as from administrative (personnel), financial, and general services (Annex VII).

As a result of this organization, IVRAZ will be managed by a director general, a director of research, a director of administration and finances for the bureau of planning, programming, and evaluation, and the directors of research stations.

The organizations proposed for the IVRAZ master plan, are shown in Figure 4.

Although research structures are organized by disciplines, the scientists will participate in the execution of research programs as defined either by commodity or commodity groupings (e.g., corn, sorghum, tuber plants, and vegetable crops), by general interest topics (e.g., water-soil-plant relationships, soil fertility), or by farming or production systems.

4.2.2 Proposals for setting up the master plan

The master plan is a long-term projection (several years) of IVRAZ which will be organized by departments of scientific disciplines (agricultural sciences) with all resources and research capabilities, and well integrated in the rural development sector. The present state of IVRAZ's organization ($t=0$, Figure 5) is far from this concept. This is particularly true when one considers that there is as yet no national agricultural and livestock research program.

Figure 5 to be inserted In this chapter, the mission proposes a series of procedures, measures, and necessary actions to ensure the growth and development of IVRAZ. The process starts with the definition, adoption, and operationalization of a national program, taking into account the present institutional environment of IVRAZ and the need to follow a flexible time schedule in the short- and medium-term

The short-term ($t=1$ and $t=1'$)

During the initial phase (Figure 6, $t=1$), preparatory documents should be drafted in cooperation with technical assistance groups, with a view to negotiating new cooperation agreements and redistributing management and supervision responsibilities with foreign aid and technical assistance groups. Considering its importance, the mission suggests that the following measures be taken immediately:

- a. A research program and coordination unit is to be created with the four recently named departmental heads and research workers (four to

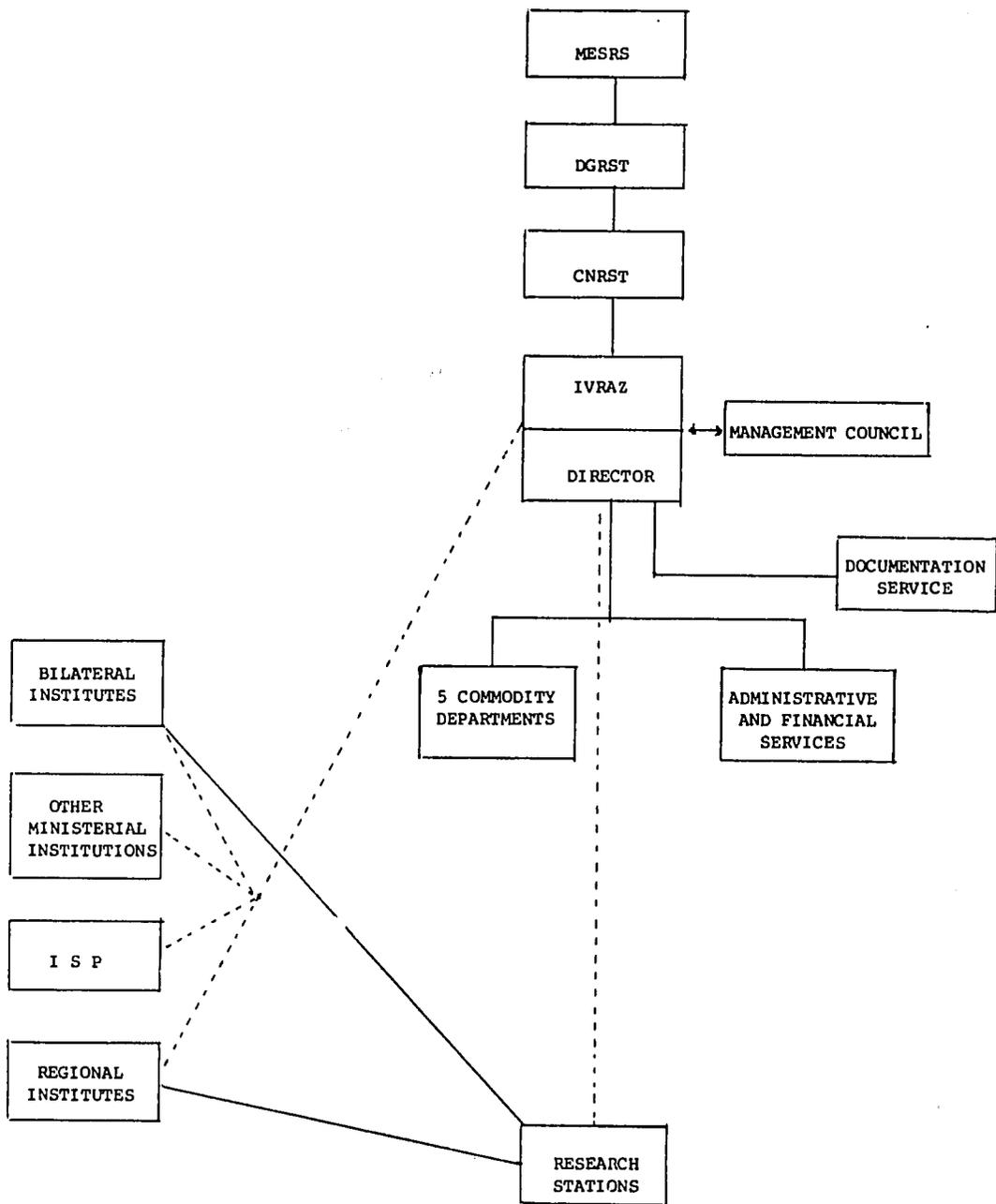


Figure 5: Present State of the Organization of IVRAZ. t=0

six) who have both good research experience and understanding of the agricultural problems of Upper Volta. This team will be chaired by the research director, who will give frequent progress reports to the director of IVRAZ, and who will organize the unit's work. The unit will also be assisted by experts in the various scientific fields, as well as experts in programming and research management who might be assigned to IVRAZ by donors and international institutions (World Bank, FAO, ISNAR, etc.). This unit will elaborate the National Agricultural Research Program, (Programme National de Recherches Agronomiques (PNRA), based on priority programs (Section 4.3.1) and the recommendations related to principles and procedures for planning and programming (Section 4.3.2). The unit will collaborate closely with all scientists now working in Upper Volta, who are the most qualified to design detailed programs adapted to the country's needs, and who will later have the responsibility to implement them. Well coordinated and working normally, the unit should be able to present a first priority PNRA within five to six months.

- b. The national agricultural research program will be the subject of a seminar to discuss the short-, medium- and long-term development perspectives of IVRAZ, to derive a consensus on the present and future research needs, and the respective commitments of the government and its major donors partners to implement the PNRA for the progressive consolidation of the cultural and livestock research systems of Upper Volta. The participants in the seminar will include decision makers for national policies of agricultural development and research (ministries of rural development, planning, finance, environment and tourism, public works, and of higher education and scientific research); the directors of the research programs (international, regional, and bilateral cooperation institutions) conducted in Upper Volta; representatives of bilateral and multilateral assistance groups, donors, and financial organizations (actual and potential) for agricultural research and rural development in Upper Volta; and national directors of extension and agricultural development programs (ORD, AVV, etc.).
- c. Most likely, modifications and structural changes will not take place during the t=1 phase (Figure 6). However, during this phase, IVRAZ will have to establish the nucleus of all research support services, including communication and information service (Section 4.3.5).

The t=1' phase (Figure 7) will immediately follow the t=1 phase, with the following activities:

- * putting programs into operation, and elaborating in more detail the national agricultural research program, with the progressive integration of ongoing activities;
- * integration and participation of bilateral technical assistance programs in the programming;
- * taking over the management of research stations by IVRAZ;
- * setting up core scientific departments as research personnel become available, giving priority to research development, soil science, crop protection, plant genetics and crop improvement, crop husbandry, socioeconomics, animal husbandry and animal health;

- * initiation and establishment of operational links between ORD and the research stations;
- * creation of the bureau of biometrics and statistics;
- * reinforcement of support services by creating a documentation service;
- * progressive reinforcement of the directorate of administration and finances;
- * creation of an experimental station in the east, a forerunner to a fully fledged research station to be developed in this region.

The medium-term (t=2)

The more one moves ahead toward the ideal plan (Figure 4), the more it becomes difficult and speculative to analyze IVRAZ's structural problems and to determine precisely the shape of departments and services. Nevertheless, if everything goes smoothly after the t=1 phase, with the progressive consolidation of the programming system and of the training of manpower, etc., IVRAZ's medium-term (Figure 8, t=2) structuring and programming will make it possible to reach the following specific objectives:

- a. the research programming and coordination unit, with reinforcement of personnel and management capability, will truly become a bureau of research planning, programming, and evaluation, with the creation of the research commission for programming and coordination and its thematic, sectoral and regional commissions.
- b. strengthening cooperation with ISP in research and training (Section 4.3.4);
- c. substantial reinforcement of scientific departments and creation of new departments of agricultural engineering, agroclimatology, chemistry, biochemistry, and food technology;
- d. progressive integration of the former commodity departments into departments by disciplines (e.g., plant genetics and crop improvement, and crop husbandry);
- e. reinforcement of research support services;
- f. consolidation of the eastern experimental station into a research station;
- g. creation of other stations or substations in the north, the central region and the southwest to strengthen research programs in animal husbandry (Section 4.3.6).

Beyond the medium-term

Beyond the medium-term, the mission believes that it is not realistic to make precise forecasts for developing structures and further specifying the implementation processes of the master plan of IVRAZ. It is, however, expected that there will be a mutual reinforcement of structures, staff training, and a mastery of research planning and programming procedures. The availability of financial resources must

also be adequately developed by government efforts and by foreign aid assistance.

4.3 Strategies and Resources Management of IVRAZ

The proposals made in Sections 4.1 and 4.2 concern the structures and modalities for organizing IVRAZ in the short-, medium-, and long-term. With the view to specify major priorities and strategies for resources management, procedures, and various functional relations which are necessary for good programming and management of research, the mission wishes to give in this chapter, a detailed description of the various aspects related to strategy for management.

4.3.1 Priority programs

The mission does not pretend to discuss in detail IVRAZ's short- and medium-term research priorities. It can only provide major priority orientations, based upon its contacts with research workers and Voltaïc farmers, and its own observations of current projects. Therefore, the mission will only suggest the main steps to be followed and identify the most important themes around which IVRAZ could build its first PNRA.

Priority choices

The choice of the main subjects and priority programs must take into account a group of criteria which are sometimes contradictory, opening up alternatives which make the final decisions very difficult to take. The following points must be taken into account:

- * the major policy options and the government's choice of priorities in terms of agricultural development (food self-sufficiency, well-being of the rural population);
- * the needs of the farmers, faced with their constraints and daily preoccupations (food supply security before profitability; the fewest possible risks, and especially bridging the dry season's food gap; storing food reserves to overcome years with poor harvest, etc.);
- * the relative importance of problems as they are seen by the politicians, scientists, businessmen, producers, and consumers, and the manner in which selected priorities can better serve the general interests of the country, and the special interests of different groups of clients, without favoring one at the expense of another;
- * the large number of combined factors relating to natural, physical, human, social, economic, and political constraints; the final choice depending in any case on resources, availability, acceptable deadlines, for obtaining anticipated results, and in relation to their importance and impact on the promotion of people and the society;
- * forecasting as precisely as possible the probability that research results will be adopted by a majority of producers, thousands of families, and millions of farmers (raising by only 5% food crop production of millions of small farmers, or raising by 20% the production of an industrial crop?).

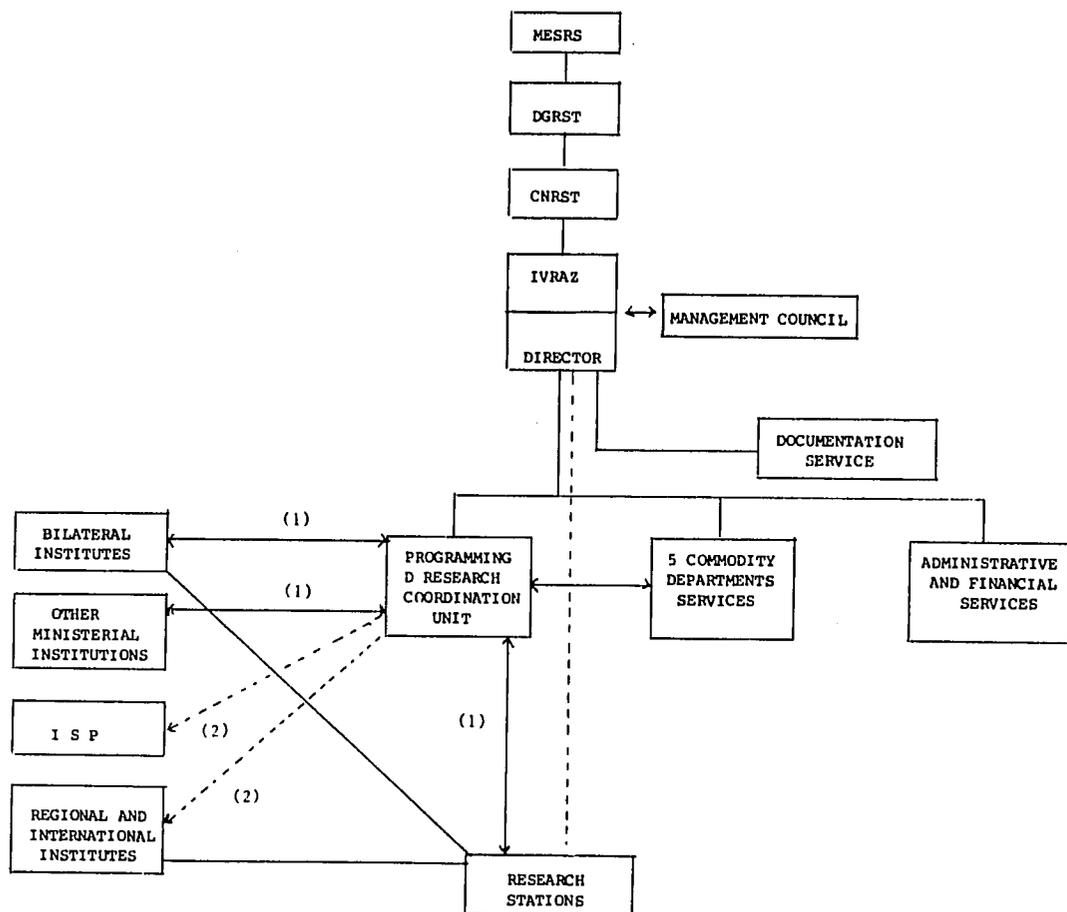
Each problem creates a special situation in terms of the expected economic or social returns. Some research results cannot always be economically exploited as planned, and others do not have the expected impact on social improvements. A technical solution chosen today will not necessarily be the best tomorrow, and it is not always the most refined solutions which are the most worthwhile (two simple technologies, which are economical and easy to adopt or to adapt, are worth more than a single technology which is too complicated, too sophisticated, and difficult for the producer to accept). In Upper Volta, the major geographic regions have special ecological and demographic situations which determine the nature of certain problems. For example, the Mossi Plateau is characterized by heavy demographic pressure and an extremely fragile ecosystem, with harmful effects on the potential productivity of the soils.

Research must, consequently, refine cropping techniques and farming systems to reduce water losses and the deterioration of soil fertility, while inducing soil regeneration. It should not start with improving the productivity potential of new varieties, especially as farmers presently do not benefit from the full genetic potential of their local varieties. The ecosystem remains fragile in the south and southwest, where demographic pressure is less and rainfall higher. In this area, research should emphasize soil conservation and improved cropping techniques to maintain and improve soil fertility and potential productivity. The drier Sudano-Sahelian regions have identical problems to those of the Mossi Plateau because of the progressive encroachment of cropping lands upon the natural grazing lands.

The marginal conditions of production in Upper Volta are induced by three major variables of the natural environment: the irregularity of rainfall (especially at the beginning and end of the seasonal cycles); the systematic variable of the north-south rainfall gradient; and the systematic variable of the toposequence. As a result, there is an extremely wide range of agricultural regions and subregions, greatly differing one from the other.

This large diversification of production conditions (combinations of different crop cycles, levels of fertility, variations in water economy, cultural practices, etc.) seriously complicates the priority choices. Traditional rainfed agriculture is the only system that can presently and on a short-term basis ensure both the country's food self-sufficiency and the well-being of the rural population (the country's two major options). Production constraints require unequivocal choices to favor improvement of:

- * agricultural research;
- ~ low-cost cropping techniques to maintain soil fertility and ensure better use of water;
- * local varieties or new varieties with characteristics close to those of the local varieties, which are well known by farmers for their flexibility and adaptability to the microvariations of the environment;
- * varieties, which are resistant to diseases and drought, partially photosensitive, quick to germinate with strong seedlings, and especially well staggered and adapted to a wide range of phenological cycles (45 to 75 days to flower).



- (1) Careful analysis of various programs and beginning of coordination of all agricultural and livestock research activities by a national programming and research coordination unit of IVRAZ
- (2) Close contacts between IVRAZ, ISP, and regional institutes; design of the respective programs to avoid duplication.

Figure 6: Preliminary Phase of the Organizations of IVRAZ. t=1

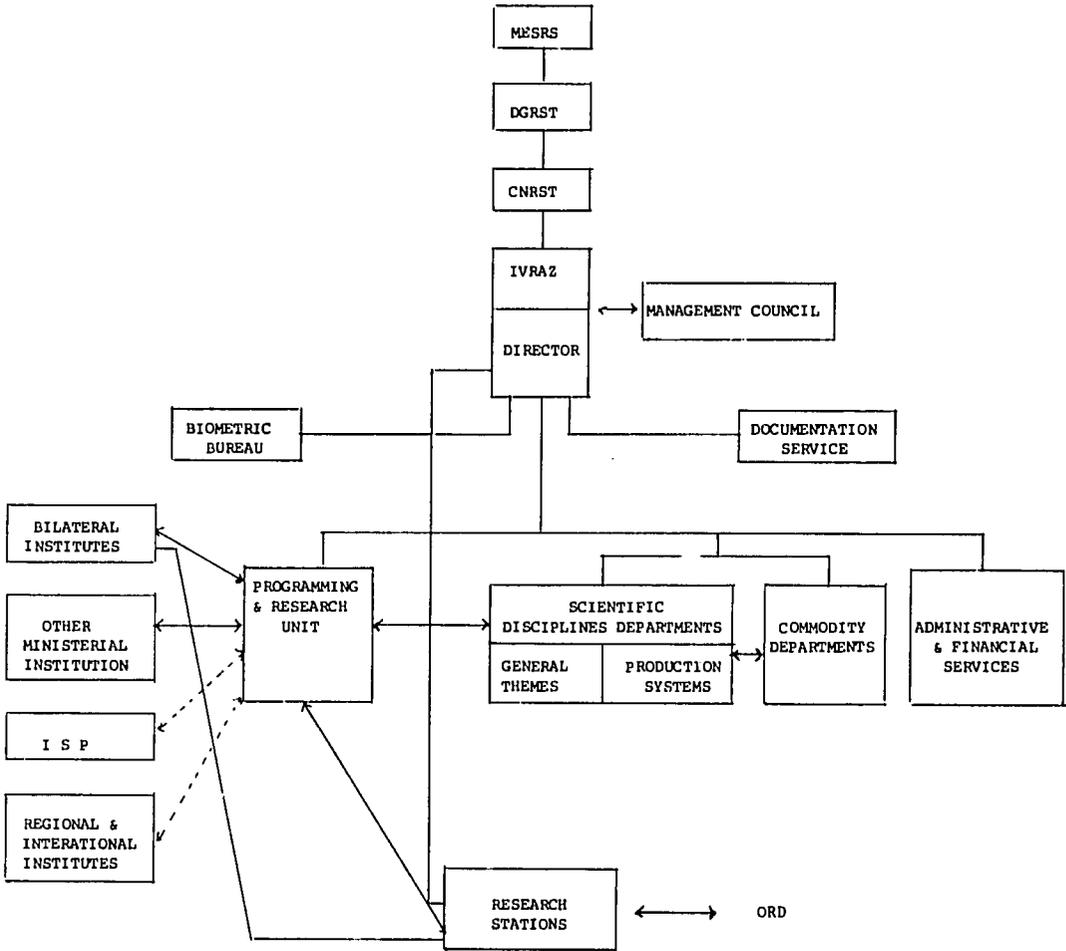
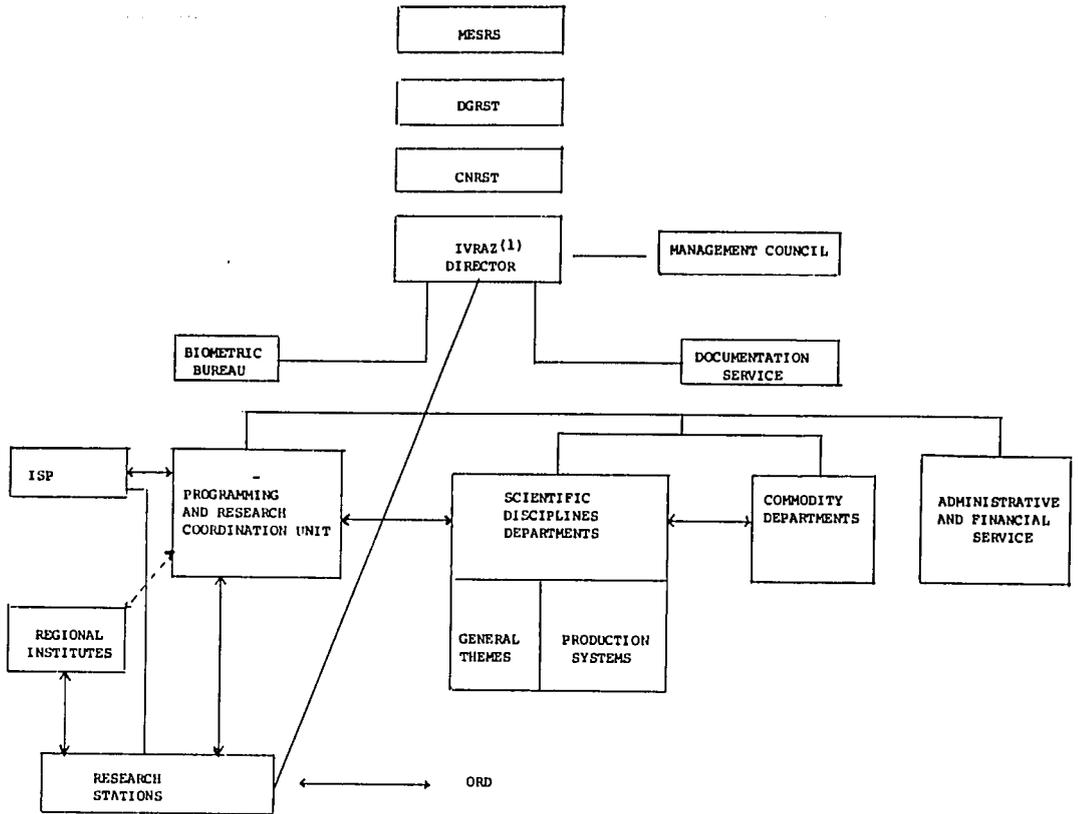


Figure 7: Short-term Organization of IVRAZ. t=1'



(1) IVRAZ expansion with integration of research workers from other ministerial institutions into the programming and execution of research programs

Figure 8: Medium-term Organization of IVRAZ. t=2

The Voltaïc farmer is not looking for performance or for super varieties with extremely high yields. Quite reasonably, he does not believe in miracles. The Mossi or Senoufo farmers, the Lobi or Dagari peasants, are looking only for food security as their first priority. They want varieties which can be mixed to minimize risks and to protect them from the nightmare of famine. The first priority in the future national agricultural research program of Upper Volta is: "the improvement of traditional rainfed agriculture in all the country's regions with a view to ensuring the rapid growth of food production (5 to 15%) by adopting technological packages which do not require too costly financial investments (crop techniques), nor support services which are too large (varieties which are well adapted and accepted), the use of national inputs (Arly phosphates) and the adoption of a policy for prices and production support."

Certainly, a PNRA will not be limited to this program alone. However, the initial PNRA will advantageously concentrate on a limited number of national and regional programs built upon the basis of a rigorous analysis of potentials, needs, resources, and above all, on what is possible and indispensable.

It is not possible and it would at least be presumptuous to wish, in the report of an evaluation mission, to give directives and more precise information on research programming priorities. The most important decisions can only be taken by nationals themselves, because it involves their future. Therefore, the programs proposed below have no other ambition than to make an objective contribution to a number (strictly and voluntarily limited) of basic problems to be solved by research in Upper Volta.

The programs

Taking into account the above comments and observations, the mission suggests gearing agricultural research, in both the short- and medium-term, to the following priority programs:

- a. Water-soil-plant relationships and water economy. Farmers in Upper Volta have adopted cropping systems which vary widely, and are more or less adapted to their situations, in an effort to reduce the drought hazards. It is the responsibility of research to develop techniques which permit:
 - * reduction in water loss by run-off;
 - * extension of the rainy season by better percolation of rainwater;
 - * improvement of the water holding capacity of the soil (organic fertilizers and soil structures);
 - * use of different varieties or strains, in association or in sequence on the same soil during the same cropping season (root architecture, better water balance needs, etc.).

Agricultural research must study all factors, using integrated sectoral and thematic approaches in any given situation, in the design of improved technologies for use in traditional production systems.

- b. Soil fertility. The deficiency in basic mineral elements, the rapid decline of soil productivity potential under cultivation with or without fertilizers (mineral), the decline of fertility by acidification and destruction of soils physical properties (loss of organic matter with negative effects on water-soil-plant relationships) are many factors of concern for the future of Voltaic agriculture. The soil-water-plant research programs and soil fertility research programs are related. These two problems have top priority in the national program (thematic commissions); they are of interest to the whole of Upper Volta and will for a long time remain critical problems for the farmer.

Upper Volta has natural phosphate reserves in the east (Arly phosphates). Because of the acidification of soils under cropping with "cotton fertilizers", and the necessity to give more emphasis to food legumes (cowpea, groundnuts) or to the production of industrial legumes (soya), it is also recommended that research into methods of processing and conditioning the natural phosphates, and their use in traditional production systems (nonacid basic fertilizer) be pursued actively. The use of natural phosphates mixed with other mineral fertilizers makes it possible not only to develop the eastern and east-central regions, but also to save foreign currency, to reduce the cost of using phosphate fertilizers on the farms, and to make better use of subsidies presently given to cotton fertilizer (wholly imported).

- c. Farming systems. Farming systems research has not yet yielded the expected results, despite all efforts. Technical improvements take a long time, and research problems are complex, as much in terms of endogenous constraints as exogenous production factors (agricultural policy and prices, availability of necessary inputs, credit facilities, market availability, etc.). The study of agricultural and production systems is the backbone to all research programs, the main focus of research programming, and the foundation of all the other research programs, making it possible to grasp the global nature of rural development problems. The mission strongly recommends that the structure of PNRA be based upon a careful study of agricultural systems and production systems under rainfed and water controlled conditions, in the different agricultural regions of the country, and at two levels of intensification:

- * an improved traditional level, based upon technological packages, which are economic and well known to farmers (varieties and cultivation practices) under rainfed agriculture and bottom valley agricultural conditions;
- * a more intensive level, based upon slowly and progressively more elaborated technologies (integrated pest control, mechanization, better water control, greater use of fertilizer, organic fertilizer and animal traction, better adapted varieties, more integrated cropping practices, etc), either under rainfed traditional agriculture (kitchen garden, backyard fruit crops) or irrigated agriculture (vegetable crops, food and forage crops in the valleys of the southwest, etc.).

This mission thinks that the first priority of farming systems lies with traditional systems under rainfed conditions. The particular case of farming systems under controlled irrigation merits attention,

but in any event will have less future than rainfed agriculture, because of the limits imposed by agroclimatic conditions. Land under irrigation will always be very limited, because of the shortage of irrigation water during periods of prolonged drought.

Irrigated agriculture is particularly costly, requires financing, and technical and management resources, as well as administrative and logistical organization, to be measured and evaluated in terms of costs/profits assessments and the breadth of irrigable area (150,000 ha is an optimistic assessment).

- d. Livestock research. Livestock is one of Upper Volta's major sources of cash with the greatest prospect for future export. Until now, there has been no serious livestock and grassland research program conducted systematically and on a long-term basis to make a valuable contribution to the development of natural grazing lands; to animals genetic improvements; and to improve adaptation to the Sahelian's arid climate to the poor feeding conditions in the Sudanian region, and to the depressing trypanosomosis conditions in the southwest. Ninety per cent of the farmers are raising animals of some sort: cattle for traction, or meat and milk production; and sheep and goats, particularly for home consumption. Livestock research must have a dual objective: to support the animal production sector (meat, milk production, etc.), and to reinforce research on water-soil-plant relationships, farming systems (crop-animal, integration of forage crops into the farming systems, improvement of animal traction techniques and adaptation of small agricultural tools, use of crop residues and by-products, and organic matter as biological fertilizer. A livestock research program has been designed in detail by FAO under the auspices of a UNDP project. Nevertheless, the policy makers and donors must be aware that even a short-term livestock research program requires at least ten years commitment and continuity of support from aid groups and research efforts.
- e. Genetic improvement of plants and animals. The "miracle" varieties of the Green Revolution do not express their potential yields until production systems have been controlled, and farmers have reached an optimal technical level. The Voltaic farmer has not yet entirely taken advantage of the yield potential of available varieties, either traditional or selected from agricultural research. By priority, crop genetic improvement must create varieties with more stable yields (adapted to the country's major regions and resistant to the main parasites, pests, and to lodging). The selection of high yielding varieties must, however, proceed to anticipate their use and increase the productivity level of production systems.

Research on animal genetics is a long-term activity. It requires the support of preliminary studies to be conducted in the rural environment by following sample animals (statistical and descriptive studies), studies of the natural ecosystems (the Sahel, the Mossi Plateau, the east and southwest), the improvement of livestock production systems and systems integrating crops, and of animal feeding and health problems, by animal species and by natural ecosystem.

Research on genetics and breeding is always long-term. Consequently, it is essential to initiate such research as quickly as possible in a PNRA, and to define clearly from the beginning the precise objectives

to be attained with the users, the farmers, and the herdsmen (organoleptic and culinary tests, storage, fermentation, technology trials, etc. with the consumers, before collecting the background plant genetic material, and constant participation of herdsmen in animal breeding work).

- f. Other priority programs. The above mentioned programs are certainly not the only priorities. However, during the first attempt to establish a PNRA, the mission suggests that the themes outlined above should be taken into account in the core of activities, and should be at the head of programs in the first PNRA to be established by the programming unit of IVRAZ.

Certainly, there are numerous other programs now underway which should not be neglected, buried, or deleted. On the contrary, commodity programs must be actively pursued (cotton, groundnut, soya, and vegetable crops) as well as the programs on root crops, erosion, plant species, agroforestry systems, protection of the environment, plant production for bio-energy, etc. However, the basic priority within the framework of programs and actions outlined above (points a, b, c, d and e) addresses itself mainly to food crops (corn, sorghum, millet, rice, cowpea, and groundnut), to forage and pasture crops, and to the improvement of crop and livestock production systems, based on technologies proportional to the supplied service, and the extraordinary ability of farmers and livestock producers to get the most out of difficult environments.

4.3.2 Programming Principles and Procedures

General considerations

The planning and programming system now in operation as part of the fourth Five-Year Plan is based upon individual project proposals. The system currently under study at various decision-making levels at MESRS, DGRST and CNRST, even though not yet operational, seems relatively heavy and complex due to the number of anticipated structures. As the MESRS planning and programming system has not been decided yet, it is very difficult to suggest detailed planning and programming structures for IVRAZ.

Since the mission is proposing a new long-term structure for IVRAZ (Section 4.2.1), it also proposes a programming system, according to an indicative diagram, to be adapted to the one that will be set up by MESRS in the near future. To avoid confusion, it is necessary to underline the fact that major differences might exist between the structures as presently studied by MESRS, DGRST, and CNRST and those of the proposed diagram for IVRAZ. These differences result from the fact that the structures in the process of being set up will be developed for a number of organizations, while the present proposals are directed only at a single institution, responsible for national agricultural research in the global sense.

Basic principles

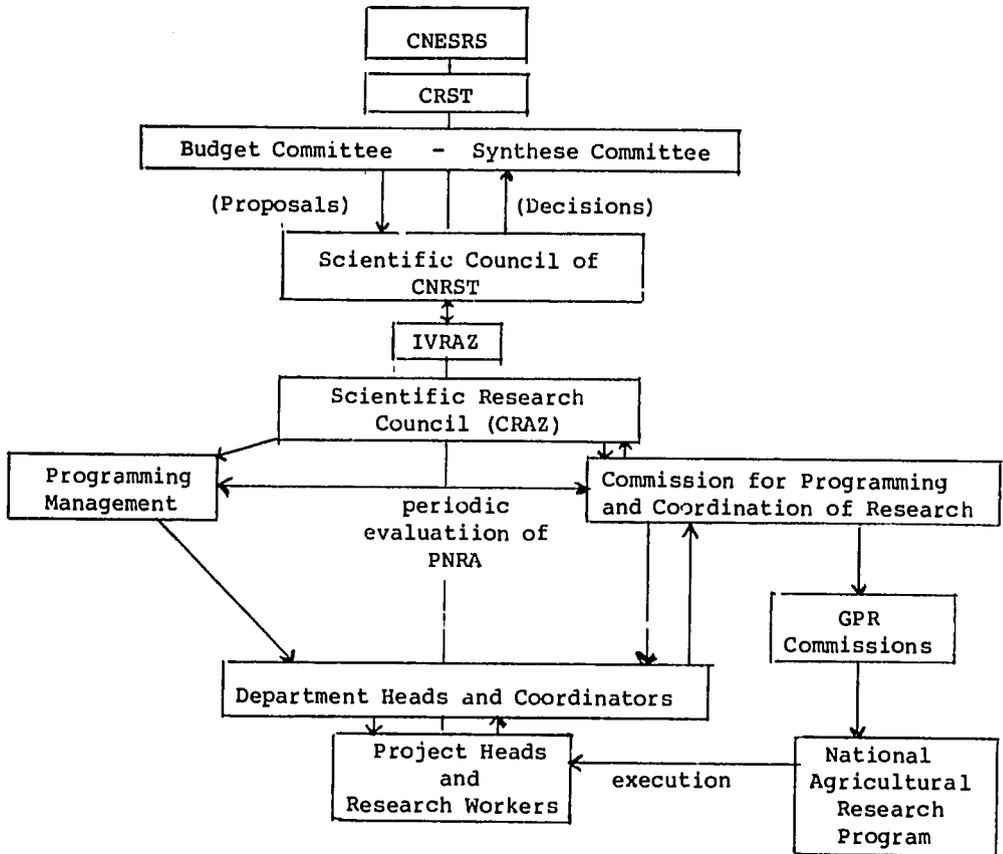
In the present system of MESRS, DGRST, and CNRST, no clear distinctions are being made between political decisions (amount of the research budget, and its breakdown amongst the various institutes and production

sectors), professional decisions (choice of programs, and determination of actions to be taken as a result of priorities defined by the policy decisions of CNESRS and its Commission de la Recherche Scientifique et Technologique (CRST) on the one hand, and the Conseil Scientifique of CNRST on the other), and institutional decisions (modalities of carrying out the programs) which are the main responsibilities of IVRAZ.

- a. Political decisions about research programming. The mission's proposals (Figure 9) assume that the political decisions will be taken at the level of the Commission de la Recherche Scientifique et Technologique (CRST). The Comité de Synthèse includes two committees, the Comité du Budget (CB) and the Comité de Synthèse (CS), which will have the same composition. Professional and institutional decisions (choice of priority programs, regionalization of research) will be made by the planning and programming structures of IVRAZ itself, because the decisions concerning the programs to be proposed and the execution of programs approved by CRST-CNRST, that is, the modalities for implementing the programs, will be the responsibility of IVRAZ itself. If it is normal for CRST to define major priority options and the foreseeable global budget for research undertaken by CNRST and its institutes, it is, nevertheless, essential that the Conseil Scientifique of CNRST make decisions on the financing of each of its institutes (IVRAZ, IRBET, etc.), or on the budget breakdown among various major lines of research in each institute (food crops, cash crops, livestock, etc., for IVRAZ). It is also imperative for the Conseil Scientifique of CNRST to be able to analyze the programs which are proposed by its institutes, to scrutinize them in the light of national priorities and available budgets, and to be in a position to make a final appraisal of how programs will be carried out. The secretary general of CNRST will be responsible for the work of the secretariat of the Comité du Budget and the Comité de Synthèse of the Commission de la Recherche Scientifique et Technologique, ensuring the technical and material preparation of the meetings, and the drafting, and distribution of meeting proceedings.

In order to ensure efficient programming of agricultural research in accordance with the government's development objectives, IVRAZ must be informed of decisions relating to major priorities and to the foreseeable amount of its budget for the forthcoming year (national and outside resources) by the Comité du Budget, at the beginning of the programming cycle.

- b. Professional and institutional decisions of IVRAZ. Programming commissions will have to be set up within IVRAZ in order to assess priorities to problems concerned with major national themes, problems specific of each production sector, and those particular to each region of the country. The problems concerning several or all branches of production, such as production systems, socioeconomic research, soil fertility, water problems (water-soil-plant relationships), irrigation techniques, etc., will be brought to the attention of one or several Commissions Thématiques (CT), which will have to assess the importance of suggested research topics in terms of their impact on several production sectors. Problems concerning various sectors of production, or problems particular to each region of the country, are handled by the Commissions Sectorielles (CS) and the Commissions Régionales (CR). The membership of IVRAZ's programming commissions must reflect the essentially professional



- CNESRS : Conseil National de l'Enseignement Supérieur et de la Recherche Scientifique
 CRST : Commission de la Recherche Scientifique et Technologique du CNESRS
 DGRST : Direction Générale de la Recherche Scientifique et Technologique
 CNRST : Centre National de la Recherche Scientifique et Technologique
 CPCR : Commission de Programmation et de Coordination des Recherches
 PNRA : Programme National de Recherches Agronomiques

Figure 9: Programming of Agricultural Research

nature of its decisions, and include the heads of departments and interested research workers of IVRAZ, scientists from other organizations (Institut Supérieur Polytechnique, MRD, etc.) covering the disciplines involved, and the users (representatives of ORD, extension services, the PAPEM and laboratory villages). The Commissions Thématiques Sectorielles et Régionales operate within the framework of the Commission de Programmation et de Coordination des Recherches.

Programming procedures

- a. At an annual meeting of the Comité du Budget, the director general of IVRAZ presents a brief report on research programs in progress and their results (Figure 9). A detailed analysis of this report and its implications, prepared by the Service de Planification et Programmation of CNRST, will be presented at the same time. Using this report and analysis as a base, and taking account of the objectives of the agricultural development plan, the Comité du Budget informs the director general of IVRAZ, through the CNRST, of priority problems, the importance to be given to different production sectors, and the possible need to start new research programs.

The Comité du Budget will also provide an estimate figure of the budget to be allocated to agricultural research and an indication of how, along what main lines of activities, such a budget should be assigned between general themes, production sectors and regions.

- b. The director general of IVRAZ instructs the director of research, the head of the Bureau of Planning, Programming and Evaluation and the heads of departments of the general directives given by the Comité du Budget and the estimated budget within which each department must operate.
- c. The department heads and program coordinators, as part of their professional responsibility and participation in the works of the CPCR (CT, CS, and CR), ask project leaders and scientists to suggest programs and research activities in line with the general directives of the Comité du Budget. They will also indicate the foreseeable budget and its breakdown, based on current planned operations.
- d. The research workers, and the project leaders or heads of multidisciplinary teams formulate proposals based on CPCR's deliberations at the end of the programming cycle, and the evaluation of results of finished projects.
- e. The department heads and the program coordinators make a review and a tentative selection of proposed programs and activities put forth by the research workers and project leaders, making sure that:

- * the selected topics fit into the general directives formulated by the Comité du Budgets;
- * the proposed topics are relevant to the responsibilities of departments and the competence of participating teams;
- * current technical resources, technical personnel, laboratory services, and equipment are sufficient;

- * the experimental design plan is well conceived and lends itself to statistical analysis (Biometrics Bureau), and that the regional distribution of operations is adequate and well balanced;
- * cost estimates are realistic and compatible with available means or resources that can be reasonably expected.

This first evaluation of research programs, screened on the basis of their scientific, technical, and organizational merits, is generally the responsibility of department heads, and often also program coordinators who can, if they wish, request the advice of other scientists. Once pre-evaluated, proposals can be transmitted to CPCR for priority assessment, and then either rejected or returned to their authors for improvement, modification, or budgetary changes, taking into account observations made during the course of this first evaluation.

- f. Research projects and activities retained at departmental level constitute the research program proposal of each research department. These programs are then submitted to the Commissions Sectorielles, Thématiques et Régionales of the CPCR (Bureau of Planning, Programming, and Evaluation) for evaluation.

These commissions must decide which priority programs are to be kept within the framework of the proposed budget, and if the regional distribution of the programs is well balanced. Sometimes, it will be necessary to turn down a project or to shift the importance given to a particular project, especially if the commission believes that one or several problems, which are considered important, have not been given the attention they call for. All the programs retained by the CPCR's commissions make up the Programme National de Recherches Agronomiques of IVRAZ. The PNRA should not exceed 10 to 20% over the total budget previewed by the Comité du Budgets.

- g. The Programme National, together with the recommendation, is submitted by the Conseil de la Recherche Agronomique et Zootechnique (CRAZ) of IVRAZ through the Comité de Synthèse, which must try to balance the necessary resources required to implement high priority programs with the overall resources at the disposal of IVRAZ.

In such a context, selection of programs will generally mean retaining a number of programs, which have high priority rating by CPCR, within the budget ceiling allocated for each research area. However, it might occur that the review of research proposals by the Comité de Synthèse would reveal the opportunity to move funds from one research area to another, or to reinforce the budget earmarked for certain research programs. In that case, the Conseil Scientifique of CNRST might be called upon to ask the CRST or the Ministry to obtain supplementary outside financing.

The membership of the Comité de Synthèse of CRST, which is identical to that of the Comité du Budget must reflect the essentially political nature of its decisions. Participants are: the representatives of the Ministry for Higher Education and Scientific Research, the technical ministries concerned with the research outputs, the Ministry of Plan, the Ministry of Finance, and the representative of the President of the Republic.

- h. Once the programs have been definitively approved by the Comité de Synthèse, they are communicated, through the Conseil Scientifique of CNRST, to CRAZ of IVRAZ for implementation.

Under the authority of the Bureau of Planning, Programming, and Evaluation of IVRA, the Commissions Sectorielles Thématiques et Régionales of the Commission de Programmation et de Coordination des Recherches operate as an internal program coordination and evaluation organ of IVRAZ, under the authority of the director of research and the administrative responsibility of the director of finance. As a coordinating body, the Commission de Programmation et de Coordination des Recherches, has the following objectives:

- * to organize the implementation of IVRAZ's research programs approved by the Comité de Synthèse;
- * to designate the program coordinators and the project leaders responsible for the organization, the conduct, the control, and the successful execution of programs and projects, the technical coordination of multidisciplinary teams, and the preparation of annual reports by individual programs (coordinators) and research projects (project leaders);
- * to ensure, through the work of the Commission Sectorielle (i.e., the national livestock research program), the Commission thématique (water-soil-plant program, production systems under irrigation, etc.), and Commission Régionale (i.e., the Farako-Bâ research program), the coordination of interaction between programs and projects;
- * to ensure the technical and administrative management of the implementation, monitoring, and evaluation of operational programs and projects.

- i. The monitoring of each project is handled by the project leader (progress report every three months), while the evaluation is the responsibility of the coordinator of the program to which the project belongs. Evaluating a large program or a program of long duration must be achieved at regular intervals (at least every three years). In addition to annual and periodic evaluations of programs underway, and final evaluation of projects and programs as they are terminated, it is also recommended that on a yearly basis an in-depth review be conducted of the state of the advancement of knowledge, the results obtained, and the impact of research on development, in particular on specific thematic (water-soil-plant relationships), sectoral (improved fallow land within the agricultural livestock systems), or regional (present state of animal traction in the central region) research projects.

It is not in the scope of the mission to propose planning and programming structures at the MESRS, DGRST, and CNRST levels, which should be less complex and better defined than the one described in the existing ministerial decrees. Consequently, the proposals relating to the system and planning programming procedures, outlined above for IVRAZ, have only an indicative value. It will evidently be necessary to revise these proposals when the structures and modes of

operations of the scientific policies and programming at the MESRS, DGRST, and CNRST levels have been specified and become operational. Figure 9 will have to be reshaped in the light of a more global study of the whole planning and programming system for the Ministère de l'Enseignement Supérieur et de la Recherche Scientifique. In any event, the present diagram in Figure 9, which refers to IVRAZ structures as described in the master plan, will have to be implemented through progressive adaptations and operational adjustments along with the development of IVRAZ's programs and structures.

4.3.3 Linkages between Research and Development

The present situation

Three situations characterize the present state of relations between agricultural research and agricultural development in Upper Volta:

- a. The cotton sector could be cited as a successful case to describe the outstanding contribution of research to development, with improved varieties that IRCT delivers to the extension service, together with appropriate packages of technology (Section 3.4). It is necessary, however, to call attention to the diversity and the quality of downstream support services to research inputs. Their contribution is highly significant to the high performance of this sector: the support services of crop protection laboratories, the collection and regular payment of harvested products, the state subsidy of production inputs, etc.
- b. Despite the availability of a large range of improved varieties and technological packages, the food production sector has not achieved spectacular success. For example, research has demonstrated the profitability of maize in crop rotation with cotton and the high productivity of irrigated rice varieties, and of rice varieties for bottom valley lands. Does the problem lie with the farmers or with the extension service, with marketing, or the lack of a promotion policy? Unfortunately, farming system research in the rural environment is insufficiently developed and too scattered to identify the real nature of the problems and the constraints hampering promotion of the main subsistence crops.
- c. Livestock production in Upper Volta has had limited support from animal husbandry research. Consequently, it is still difficult to assess farmers problems in raising animals, in livestock and animal production, and especially in the integration of crops and animals at individual farm level.

Research and the farmers

Analysing the research program conducted directly in the rural environment (Chapter 3), the mission recommends that high priority, if not the highest, be given to on-farm research to improve traditional production systems (Section 4.3.1).

On-farm research (laboratory villages) in cooperation with, and active participation of, farmers, is of major importance. Agriculture is the obligatory way of life for 95% of the people of Upper Volta, and one they

know well; support of the Government policy of food self-sufficiency depends entirely on them. The needs and worries of farmers must therefore be present as much in the national policy as with the research objectives.

a. On-farm research is directed at two major goals:

- * Studies and basic surveys (traditional agrosystems, natural ecosystems, agro-economics, sociology, cultural anthropology, etc.) are carried out in order to assess production factors and their relative importance in the establishment of priorities and research criteria; to identify the possible impact of existing technologies; to evaluate the level of technical ability of the farmers, and the available and/or accessible inputs in the traditional rural environment.
- * Research is carried out to improve traditional farming systems to make both studies and basic surveys and research station results more profitable. Research conducted directly in the rural environment and through the farmers is of fundamental importance, as much for the dissemination of research results, which are in principle technically well adapted to farmers' conditions and process of self-extension, as for information transfer from the farmers to the researcher (feedback process).

b. Two aspects of on-farm research should be underlined:

- * Research programs with a global scientific scope, which are related to on-farm research methodology, are presently underway in Upper Volta. Without any doubt, IVRAZ's scientists would do well to participate more actively in this research to master the principles and procedures;
- * These programs, which are conducted by SAFGRAD/ICRISAT/FSU, and implemented in collaboration with farmers, have the advantage not only of establishing a regular dialogue between research workers and their main clients, but also of testing new technologies within the framework of traditional management. These activities, related to farmers behaviour and reactions to technologies they accept to use on an experimental basis, are designed to guide and improve station research programs (improvement of varieties, cropping techniques, etc.). Observations on the behavior and reactions of farmers (individually or collectively by village community), and inventories of availability and use of production factors, etc., are essential elements to define research programs and the extension activities better.

The Research-Development Department of IVRAZ could obtain valuable information from such research, to initiate a constructive dialogue with development services. On-farm research development will further support the dissemination of technical knowledge and the global activities of the Research and Development Department.

The Research-Development Department of IVRAZ

IVRAZ must evaluate the development returns derived from research results, and the impact of new technologies in the rural environment. Research as a financial, human, and physical investment must prove its profitability in the same way as all other national production sectors. It is not enough to reckon the publications, the varieties released to extension, or the time devoted to development assistance (internal terms of evaluation). It is more to the point to assess the contribution of research to increased productivity and to improved living conditions of rural people, to demonstrate real research performance, and to explain how resources have been used to achieve economic development objectives. Such evaluation is performed in farmers' fields by multidisciplinary teams including research workers and development service staff. Well-programmed and conducted, the evaluation of research on development will serve other objectives, such as the lack of institutional relations in the organization of the assistance to farmers. It can also supply elements for reviewing the policies and/or the procedures of research as well as development. The methodology of this evaluation might be designed within the framework of international cooperation programs.

To summarize, the mission proposes that IVRAZ establishes a Research and Development Department (Section 4.2.1) to manage three aspects of research:

- * on-farm experiments to study and improve traditional farming systems and to design new systems;
- * formulation of technical messages for farmers and extension technicians;
- * periodic evaluation of the impact of research on development.

The mission believes that IVRAZ and each of its research stations will have to establish very close ties with the development organizations through a series of actions:

- * creation of Comités Régionaux de Consultation, at the level of research stations in order to ensure permanent contacts between scientists, developers, and farmers within the ORD framework, notably at the end of the cropping season;
- * establishment of direct support services from research laboratories (i.e., crop protection, soils analysis, etc.) to assist development projects;
- * reinforcement of direct relations between research stations and development services, and between research workers and agricultural development leaders (Section 4.3.5).

This set of arrangements merits priority during the first phases of IVRAZ's development.

4.3.4 Linkages between Research and Training

While programming national agricultural research, IVRAZ must take into consideration all available resources and in particular the teaching and

research staff at the Gampela research station of the Institut Supérieur Polytechnique (ISP). Cooperation between the two institutes might achieve three objectives:

- * participation of the teaching and research staff of ISP in national agricultural research efforts;
- * participation of ISP in the training of IVRAZ's research staff;
- * creation of a research and training center at Gampela.

The participation of the teaching and research staff in agricultural research

ISP has some 40 professors, of whom many have post-university degrees. These staff pursue "career-support research". ISP also has an experimental station with 400 ha of land located 17 km from Ouagadougou. This station is not as isolated as Saria, and it has more extensive land reserves and soils more suitable for farming than Kamboinse.

The availability of research personnel and the location of its station at Gampela places ISP in an ideal situation to participate in agricultural research.

IVRAZ will benefit immediately from this supply of personnel (increasing number of researchers and fulfilling research needs to tackle problems of general interest (thematic subjects), and in particular for the Mossi Plateau (reinforcement of departments of scientific disciplines). ISP could also benefit from additional financial resources from the research budget to strengthen its own scientific potential. The association of ISP with IVRAZ's work in the field will allow ISP to intensify and adapt its teaching programs better to the realities of the country.

Manpower development planning of IVRAZ

Together with the development of its national program, IVRAZ will have to undertake the study and development of human resources, addressing itself to three categories of expertise: research management staff, scientific staff, and technical staff. ISP participation in the programs' research development will also have to be extended to the training of research workers. This supposes, evidently, a reinforcement of education research and programs, even the creation of training in specialized fields at the postgraduate level.

Creation of a research and training center

Once the stage of effective and active participation by ISP in national agricultural research has been reached, and staff development programs for IVRAZ have been set up, the next stage will involve the creation of a research and training center at Gampela. It will be an autonomous institution for training at the postgraduate level, and agricultural research where ISP professors and IVRAZ scientists will work together. The center will make it possible, on the one hand, to identify, to follow, and to encourage the most gifted students to go into research, and on the other hand, to make the best use of the competence of professors and students to undertake sectoral inventories, multidisciplinary investigations, or basic studies (soils sciences,

socioeconomic surveys, crop husbandry, etc.), within the framework of IVRAZ's research programs.

IVRAZ and ISP will collaborate in developing and setting up the Gampela research and training center.

As it is understood that IVRAZ intends to establish its permanent headquarters in the immediate vicinity of Ouagadougou, it is highly recommended that it be set up next to the present ISP site at Gampela, in order to facilitate the association described above and the subsequent creation of a research and training center.

4.3.5 The Place and Functions of a Communications System

It is vitally important for an efficient research system to establish a permanent and well-organized flow of information and feedback at various levels, particularly at the following levels:

- * communication at national research level (among different programs, departments, and research institutions);
- * information exchange between national and outside research efforts (international and regional institutions, national institutions in neighboring countries or in similar ecological zones, industrialized countries and others);
- * communication between the research system and the policy-making bodies in the country;
- * communication between the research system and organizations (national or foreign) which make their resources available for research;
- * IVRAZ's internal communication.

Operationally, communication systems differ according to which of these structures they address themselves.

Communication within the research system

a. Intra-institutional communications are currently weak because of:

- * the disparity in activities and the fragmentation of the programs;
- * the partitioning and individuality of research projects;
- * the duplication of efforts and the competitive spirit between scattered teams, rather than collaboration among larger and better organized multidisciplinary teams;
- * the lack of documentation and up-to-date information at the research stations.

b. Inter-institutional communications are almost nonexistent among the various institutions, which are working in isolation, each being organized on a community basis.

c. Documentation

Despite the annual work of the Commissions Techniques du Comité Spécialisé, large and very costly losses occur because of the vertical structure of institutions, the absence of a national documentation effort in agricultural research, and the lack of systematic efforts in publishing the research results obtained by foreign institutions.

All these factors constitute valid arguments for giving primary importance to the establishment of a Service National de Documentation et d'Information de l'IVRAZ.

Information exchanges between national research and research activities outside the country

- a. With the network of international centers and international, multilateral, regional, and bilateral institutions which work in Upper Volta, relationships and scientific information exchanges exist but need to be amplified.
- b. With the international research programs (IITA, ISNAR, CIMMYT, ILCA, IRRI, and ICRISAT), the regional programs (ADRAO, SAFGRAD, etc.) and the international organizations (FAO, UNESCO, etc.), relations and information exchanges must be intensified.
- c. With the national systems (SUD-SUD), cooperative efforts and closer contacts must be intensified (Ivory Coast, Niger, Senegal, etc.).
- d. All these contacts are at present performed by expatriate research workers. In the future, effort must be made by IVRAZ to promote and coordinate these contacts in a more systematic way.

Communication between research, development services, and the clientele (farmers)

Relations between the agricultural research (IVRAZ) and development services are characterized by the heterogeneity of their different approaches (IRAT-PAPEM and ICRISAT laboratory villages). Each ORD has a different interpretation of the role and responsibilities of the PAPEM, and of the way in which to organize its extension activities and dialogues with farmers. The almost total absence of a systematic and institutionalized communication effort with the development services on a national (MESRS-MDR) and on a regional level (IVRAZ Station- PAPEM- ORD) makes it imperative that special attention be given to this problem, during the first phases of the reconstruction of the national research system (IVRAZ) and the establishment of a national agricultural research program in Upper Volta.

Communication between research and policy-makers

It is of the highest importance to improve mutual understanding and establish closer ties between the political decision makers and those responsible for research, particularly with regard to:

- a. the role, the potential and the limits of research as an instrument of agricultural development;

- b. the conditions and limits of the political sector, which affect all decision making for agricultural policy;
- c. the establishment of a more favorable political environment, to make it possible for research to play its role better;
- d. a better understanding of the political power concerning the constraints of agricultural research development and the mobilization of the necessary resources for its implementation.

Communication between research and research financing organizations

Such communications are presently the prerogative of CNRST, DGRST, the MESRS and other ministries (Ministry of Finance, Ministry of the Plan, and Ministry for Foreign Affairs) It is, nevertheless, important for IVRAZ to associate financial donors of agricultural research with its programming efforts, and to prepare clear and precise documents on the necessary resources (financing, human, and physical) needed for the implementation of its priority programs.

IVRAZ's internal communication

IVRAZ must take initiatives in the area of communications and professional liaisons within its own system. This form of management of ideas, concepts, and knowledge is an essential function of any research organization, because it has a multiplier effect not only on other functions, but also on the overall capabilities of IVRAZ itself.

The activities related to communication, information exchange, and knowledge sharing make it possible:

- a. to create an "esprit de corps" and a better sense of teamwork and cooperation among the research workers (national and international teams);
- b. to increase rapidly the overall level of knowledge for all personnel in-service training;
- c. to give the institute a broad-minded attitude to new concepts, original initiatives, working methods, and to the applicability of technologies to local conditions;
- d. to obtain an intellectual enrichment, the only cost of which would be the bringing of personnel together at all levels and on any occasion, so they may learn from one another.

IVRAZ must regularly organize technical meetings or seminars oriented towards PNRA's aspects that call for reflection, critical analysis, and objective appraisal. IVRAZ must take advantage of visiting specialists (340 missions per year to Upper Volta) passing through and of the presence of foreign experts in the country to convene unprepared meetings, ad hoc working sessions, colloquiums and seminars of a scientific, technical, or general interest for all the staff. This is so that all staff can become acquainted with the entire activities of the institutes, and that individuals benefit from the knowledge of others, and are brought up-to-date with the latest developments in science and activities of the international scientific community.

Meetings must also be organized among IVRAZ's research workers in order to inform the personnel regularly of all activities of the institute and what is currently going on or projected for the future. This sort of information contributes greatly to giving each staff member a sense of belonging and a sense of pride at being called upon to participate and to contribute in achieving the institute's objectives.

4.3.6 The Human Resources, Infrastructures, Financing and International Cooperation

Human resources

a. The personnel situation in agricultural research

In Upper Volta, the situation of the scientific and technical personnel in agricultural research is satisfactory in comparison with other African countries. Out of a total of 102 researchers spread among the MESRS and MDR, 43 are nationals and 59 are expatriates.

The national research workers are for the most part agronomists, however, more than 50% are specialists in soil science and phytopathology and, to a lesser degree, in genetics. Thus, there is clearly a deficiency in fields of specialization such as, agroclimatology, agricultural engineering (drainage and irrigation), biomathematics (statistics and biometry), all specializations in livestock production and animal health as well as in socioeconomics, agronomy of farming systems, applied agricultural anthropology, and research management.

There is also a clear deficiency in some fields of specialization and consequently in conducting multidisciplinary research (water-soil-plant relationships), crop eco-physiology, soil microbiology (microfauna and microflora), virology and malherbology, biotechnology, etc. This is also true for postcropping techniques, and technological research on the processing and conditioning of plant and animal products, and by-products.

The satisfactory situation in regard to the number of national research workers becomes less favorable, when the situation of more specialized training at the postgraduate level is considered.

Certainly, better organization of research, reduced dispersion of efforts, and closer cooperation between specialists within multidisciplinary and pluri-institutional teams would make it possible, with the same number and professional level of research workers (102 total, not counting ISP's 45 professors), to implement a broader, more comprehensive, and certainly more efficient research program.

It should further be noted that many expatriate research workers also receive technical and scientific support from their respective organizations.

Another deficiency concerns high level research management staff capabilities, particularly as regards general management; organization and programming; administrative, technical and financial

management; and management of research support services. Most likely, IVRAZ will have to make its greatest efforts in the areas of programs and resources management, because finally everything depends on management, the mastery of decisions, and the wise management of the people and goods. In the time allotted to the mission, it was not possible to obtain precise information on:

- * the number and the fields of specialization of student and fellowship grantees abroad;
- * the stage of advancement of postuniversity studies of fellows abroad, and the time remaining to them before they return to the country;
- * future possibilities for establishing graduate level education at ISP;
- . the number of possible sources of financing, and granting of fellowships offered by technical assistance and foreign aid.

It was not possible to collect more detailed information concerning potential staff needs, nor was it necessary to make a more complete inventory of human resources for agricultural research. A deeper study of manpower planning and capabilities must be based on a working program. A detailed inventory of human and financial resources is needed to put the PNRA into effect.

In other words, planning of scientific and technical staff and manpower training plan for IVRAZ can be effected only after having established the PNRA, the operational phases of its development, and the decisions related to the timetable and operational work plan. The latter concerns as much PNRA work program as the implementation of the master plan. There are no research technicians. This creates a very serious problem and requires a special in-depth study, both at the level of the statute and of the means of training (e.g., higher technical training school).

Pending a separate mission on IVRAZ's manpower planning and development, it is recommended that IVRAZ strengthen the management capabilities of its senior staff and support research staff as quickly as possible.

For the next three years, it is essential to ensure training of senior personnel in scientific and administrative management, particularly for:

- * the director of IVRAZ;
- * the director of research;
- * the director of administration and finance;
- * the directors of the research stations (four);
- * the head of the unit which is to become the Bureau of Planning, Programming and Evaluation, as well as the two specialists in agricultural and livestock research management who will operate the unit and the CPRC;

- * specialists in various fields of administrative and financial management, particularly the management of budget services (accounting and treasury), personnel services, and general services;
- * the head of the Research-Development Department, and various specialists in the socioeconomic fields related to the application and the transfer of knowledge, as well as in the organization of communication and information exchange.

Twelve fellowships will be needed for management training of senior staff, and ten fellowships for administrative services. A more detailed study will have to be undertaken by the director of IVRAZ and the Directeur Général des Bourses of MESRS when the PNRA is planned. This study will be presented during a seminar on agricultural research in Upper Volta, scheduled in 1983.

b. Training of science staff

Higher level education and training is done mainly at ISP. Postsecondary studies started in Upper Volta in 1973 with the creation of the Institut Supérieur Polytechnique (ISP) at Ouagadougou.

ISP undertakes two training cycles:

- * a five-year cycle leading to a degree in agriculture (Ingénieur Agronome), one year of which is devoted to practical work and the preparation of the thesis at the end of study;
- * a three-year cycle leading to a technical degree in rural development (Ingénieur des Travaux Agricoles), with six weeks of practical work during the second and third years;

The first year course is the same for all students. At the beginning of the second year, a choice must be made between three areas: crop husbandry, animal husbandry and forestry (+ water). In 1981, a five-year study program in biological sciences was established.

In 1982, the number of students enrolled in the first year program at ISP was 240, of which 130 want to opt for biological sciences, thus leaving 110 for other orientations.

As most enrolled students enjoy a scholarship, the Commission Nationale d'Orientation des Bourses (MESRS) attempts to guide a maximum number of scholarship holders toward training areas relevant to the country's priority needs.

In 1982, there were 26 and 23 students in the second and third years, respectively, of the five-year study cycle, giving the maximum number of degrees for 1985. There were 50 and 27 students in the second and third years, respectively, of the three-year cycle. A total of 83 new study scholarships were awarded in August 1982; and the scholarships were renewed for 57 first-year students, 21 and 77 for second-year students in the three- and five-year cycles respectively. Finally, 16 scholarships were awarded to students in the fourth year of the five-year cycle for the "Ingénieur Agronome" degree, a degree in agronomy.

As the five-year cycle degree recipients at ISP are encouraged (after supplementary studies abroad) to replace the expatriate professors (presently 14 out of a total of 43), and taking into account other demands on personnel in the agricultural sector, the number of graduates available annually for agricultural research is extremely low, and will not be more than three to five per year starting in 1985. Moreover, the majority of these three to five graduates for research will need from one to five years additional study abroad (M.Sc. or Ph.D. in various disciplines) before undertaking research assignments or taking up major responsibilities.

Meanwhile, 21 students are now in France; 19 in Dakar, Senegal; 11 in the Soviet Union; 9 in the United States; and 4 in Benin. They are specializing in various disciplines of agricultural sciences, socioeconomics, biology, chemistry, and social sciences. These students are all at various stages of their studies. There is also an undetermined number of students (data were not available during the mission's stay) on fellowships granted by various donors within the framework of their respective projects. However, these scholarships are for complementary training rather than for undergraduate or postgraduate university education, and consequently, contribute to a small degree to increasing the number of research personnel.

A careful analysis of recruitment and training facilities, as well as a prospective study of scientific and technical personnel, must be conducted following a government decision regarding the development phases of programs and structures of IVRAZ. Any study in the interim period would be theoretical and without practical interest.

In the present state of affairs, the mission believes that from now until 1995, the probable availability of agricultural research positions will not be more than three to five per year, approximately twice the number of national scientists presently available. At the moment, there are 43 Voltaic research workers and 54 expatriates, but the development of programs and of IVRAZ itself will necessitate, most likely, twice the present total of national research workers and expatriates together. It is almost certain that of a total of about 200 research workers foreseen for the consolidation phase of IVRAZ, about 50% will be national personnel. To this figure can be added about 20 senior posts for high level managerial staff.

For the near future, the important point remains the establishment of a plan to reinforce management capabilities (scientific, technical, and administrative) of IVRAZ's higher level professional staff. This is indispensable for the implementation of the first stages (t=1 and t=1') of the master plan, the execution of the PNRA, and the development of agricultural research strategies as suggested in this report.

The mission suggests that in the near future, the government, in cooperation with competent organizations, conduct a detailed and careful study on personnel and training needs in research management, including a prospective plan and specific training profiles. The establishment of prospective needs in personnel, and their specific training profiles should take place, together with the approval of

the PNRA by government and donors, during a round table seminar recommended by the mission to take place in 1983.

The Infrastructures

The organization of research and the execution of research program, require large investments in infrastructures and scientific equipment for:

- * a national network of research stations;
- * IVRAZ headquarters;
- * regional stations;
- * a new regional station in the central-eastern area at Fada-Gourma;
- * substations, field support bases, and laboratory villages.

a. The national network of research stations

Research stations are pluri-disciplinary centers equipped with laboratories and services, and capable of supporting research programs conducted by research workers from various scientific disciplines regrouped into different multidisciplinary teams according to the number and nature of programs.

Each regional station, in addition to its responsibilities for conducting specific research activities in the whole region, will also be invested with national responsibilities in one or several research area or commodities depending on local importance. This will prevent the fragmentation of research and duplication of functions resulting from research regionalization, and will force the maintaining of linkage and operational interaction between the stations.

Workers located permanently or assigned temporarily for the duration of a research activity to a regional station will depend on two different levels of command. They will be responsible to the station director for all administrative and disciplinary matters, and professionally and technically to the head of the research department to which they belong.

b. IVRAZ headquarters

One of the regional stations primus inter pares will be selected to serve as IVRAZ head office, in addition to its regional responsibilities. The directorate, the main departments, and central services of the institute will be located there, thus becoming the central headquarters or the main station, while maintaining responsibility as a regional station for the region where it is located. For a number of administrative, economic, and logistical reasons, IVRAZ head office will be in Ouagadougou, in the vicinity of the Kamboinsé Station (MESRS), the Soils and Plant Protection Institutions and Laboratories (MDR), and the ISP station at Gampela. In order to concentrate all of existing facilities in one area and those to be created in the future, the mission recommends that IVRAZ head office and all of its departments and services be located near the site of Gampela. The choice of Gampela is dictated by its

proximity to Ouagadougou and Kamboinsé, a current concern for economy, and the longer but important objective of close association between university teaching (ISP) and research (IVRAZ), easier integration of research workers, university teachers, and professors in research programs, even the possibility of establishing in the future a research and training center for Upper Volta at Gampela (section 4.3.4).

There are different options for the establishment of a head office for IVRAZ at Ouagadougou. However, a careful study is necessary in order to analyse the pros and cons of the different possible alternatives, as well as short- and long-term levels of investments, operating costs, recurring expenses, and all other technical and logistical aspects.

c. The regional stations

The regionalization of research is indispensable because of the range of ecological conditions, the agro-pedological and seasonal variations (crop cycles), and other ethno-socioeconomic components characteristic of different agricultural regions beyond the major ecological regions of the country. In addition to these criteria, the decentralization of research must take the following into account:

- * to limit the number of stations and regional infrastructures to a minimum, compatible with the needs of experimentation, but sufficient to cover a complete range of diversified ecological (agroclimatic) and most significant social (ethno-socioeconomic) situations to solve the problems of agricultural development;
- * to ensure optimal polyvalence of each regional station with a view to favoring the largest possible diversification of programs, and gathering together a minimum number of research workers (critical mass) in each station in order to avoid intellectual and scientific isolation of scientific and technical personnel in the countryside (i.e., small very isolated stations, with only one or two researchers);
- * to facilitate the establishment of multidisciplinary teams, to encourage research on cropping systems and farming systems, and finally, perhaps more importantly, to provide comfortable living conditions for personnel and their families (lodging, education, medical care, social life, essential amenities, etc.);
- * to avoid the isolation and scattering of research by ensuring close links between the regional stations, between the stations and their own experimental network (substations, support testing sites, and laboratory villages), and between the stations and the ORDS.

If in addition to the responsibilities and duties for its region, a regional station has also a responsibility for one or several programs at the national level, the other regional stations will be dependent on that station for the national programs. This situation thus creates constraints at the planning and programming levels (Commissions Thématiques et Sectorielles) and research coordination (Commissions Régionales) for the PNRA to be operational.

Most regional stations are already in place (Section 3.2.2 and Figure 1). However, to complete the coverage of the network of regional stations, it is important to envisage, when possible, the creation of a regional station in the central-eastern part of the country at Fada Gourma, thus reinforcing the Saria station and the Ranch de Markoye.

The reinforcement of the Saria station is presently under study. As for the establishment of a livestock research program including the Ranch de Markoye, FAO, within the framework of UNDP, made this the object of a separate project.

d. A new regional station at Fada-Gourma

As mentioned earlier in this report, the eastern region of Upper Volta is very neglected, despite the relatively large agricultural potential. This region, east of the central plateau and in the southeast, is the least densely populated (6.8 inhabitants per km²). This situation, coupled with a relatively high rainfall, the existence of bottom valley lands (bas-fonds), and less exhausted soils, gives the entire eastern region a fairly good potential not yet exploited. Besides research on farming systems and the main food crops, millet, groundnut, and sorghum (the best sorghum varieties come from this region), the central-eastern and the southeast parts of the region are suitable for the production of soya and for rainfed or bottom valley rice. The low land tenure permits longer fallows to rebuild and maintain soil fertility, and leaves large stretches of grazing lands. The setting up of mixed, semi-intensive crop and livestock production systems, the introduction of forage crops in the rotation, and the expansion of livestock production (sheeps, guinea fowl, and turkeys) seem to be important lines of action for a livestock research program.

The eradication of onchocercosis in this area makes it possible to consider development of the great valleys' potential and of the heavy soils of the southeastern marshlands.

This region is self-sufficient from the point of view of cereals, but the production of cash crops is very low. In the future, the main objectives will be geared toward increased production of millet and sorghum, the development of animal production, increased production of rice in bottom valley lands, of groundnuts, cotton, maize, and cowpea in the southern area with better rainfalls (1000 mm, more or less).

The building of a rock-phosphate extraction and processing factory in the Arly area, in the far eastern part of the region, will make it possible to develop a network of communications and markets for this somewhat forgotten corner of Upper Volta.

e. The research substations and laboratories

The substations are strategically located for studying the problems of subregions (Kou valley) or sometimes specific production. They are administratively dependent on a regional station. In the long term, it will probably be necessary to create some substations and support testing sites in the northwest, the central-western area, the

southeast and the southwest of the country, depending on development needs. However, in view of the relatively high investment and recurring costs involved, it is recommended that the number of substations and experimental sites be to a minimum. The cost of scattered structures not essential for efficient research and development would in the long term be a heavy and unjustifiable burden.

The conduct of trials in the farmers' fields, the participation of farmers in carrying out trials in their villages, or the direct and voluntary cooperation of farmers and livestock producers in conducting activities of an experimental nature (farmers' trials) in the villages seem to be, not only a more economical solution, but also scientifically more reliable and socially more acceptable than substations.

It is highly recommended that each regional station lacking the benefit of a network of substations or well selected experimental sites should at least have access to a large network of laboratory villages, located in various ecological, sociocultural, and socioeconomic situations, and well representative of farming conditions of the region.

f. The infrastructures and equipment

In the present state of research programs and station fragmentation, it is not surprising to observe tremendous duplications in infrastructures and equipment, with the consequence that each institution or project does not have all the facilities and scientific equipment needed to conduct its activities. It was not possible for the mission to undertake a detailed study of infrastructures (buildings, laboratories, etc.) and equipment (scientific and logistical) of each station, section, program, and project. Moreover, it would be premature to perform such a study before knowing what system of organization and management will be adopted, and more especially what will be the scope and magnitude of IVRAZ's research program.

It is, nevertheless, recommended that an inventory, as complete as possible, be made of all infrastructures (construction, buildings, laboratories, etc.), as well as scientific and other equipment of each IVRAZ station, laboratory, and research service of other ministries located in the immediate vicinity of each station (Farako-Bâ and CRTA, plant protection laboratory at Bobo-Dioulasso, etc.).

Laboratory services must be centralized to a degree as great as possible in order to share costly and fragile equipments. The research facilities for phytopathology at Farako-Bâ and Bobo-Dioulasso, which are separated by just a few kilometers, provide a case in point which shows the enormous waste of laboratory equipment and multiplication of operating costs.

Financing and international cooperation

The development of IVRAZ and a national agricultural research program in the short and medium terms will to a large extent depend on financial and technical support from foreign aid organizations.

As mentioned in Table 5, research programs and projects now being carried out are 90% financed by aid. In addition, foreign aid, including the international agricultural research centers, supplies about 50% of the more qualified and experienced research personnel.

The progressive integration of single action oriented projects, which are presently established in an ad hoc way, financed, and conducted by foreign aid within a national programming system, and coordinated and managed mainly by nationals will require profound modifications and reformulations of cooperation agreements between the government and the donors.

The establishment of a coherent PNRA to replace the present large number of isolated programs and ad hoc projects will require much closer technical and scientific cooperation between the personnel of IVRAZ and those of foreign institutions and projects supported by various donors. Likewise, closer cooperation must take place at the highest level between the government departments responsible for political and financial decisions and the representatives of foreign aid agencies to prepare new proposals, terms of assistance, and conditions better adapted to the financing of programs packages than to individual projects.

Actually, the problem is to find a modus operandi which, while safeguarding the national sovereignty and IVRAZ's desire to assume its own responsibilities, will allow foreign assistance agencies to cooperate more efficiently together, and to ensure a better complementarity of actions and financial commitments on a broader and longer term basis. It is also a matter of recognizing the legitimate aspirations of national research workers to assume management responsibilities and to run their organization, while keeping in mind the no less legitimate aspirations of expatriate scientists to maintain their sense of initiative and to express freely their creativity and imagination.

The main obstacles to the development and efficiency of a research system are the lack of operating budget, the shortage of experienced national personnel, and unattractive conditions or terms of service (salaries, allowances, isolation, indemnities, promotions based on scientific merit or the impact of research performance, etc.).

A Research Worker Statute exists in Upper Volta, which will probably make it possible to overcome some problems of scientific research personnel, but not those of technical personnel (Statute for Research Technicians).

As far as operating and equipment budgets are concerned, it is obvious that the government's national budget cannot afford to cover more than a small portion of the necessary expenditures to operate and develop IVRAZ and its research network. Consequently, short- and medium-term financing of a very large part of the operational budget will be required from foreign aid agencies.

Recently, a number of donor countries under the umbrella of CDA* have been concerned with cooperation, coordination, and financing problems, particularly in agricultural research in Africa. While these discussions are still under review, the idea of donors and beneficiaries consulting for more efficient management of human and financial resources merits special attention.

The effective participation of donors in building up IVRAZ, by strengthening its management, planning, programming and resources effort to develop a national agricultural research program and to reinforce the capabilities of its scientific and technical staff is an assurance of success for the future of research and the development of Upper Volta's agriculture. Better harmonization of foreign aid, particularly of major donors, within the framework of a national program and a long-term perspective plan for research development must be established at the government's initiative. In case of an initiative taken by several donors to harmonize assistance, the mission recommends the government, MESRS, and especially IVRAZ set up reliable consultation mechanisms favoring more effective participation and better integration of donors in research planning and programming structures (programming unit), and coordination and research program evaluation (CPCR).

The active participation of foreign aid agencies in the establishment of a national agricultural research program and the close cooperation of regional programs (SAFGRAD) as well as international programs (CGIAR, FAO, World Bank, ISNAR, etc.) in its formulation are essential, as much to ensure coordination between IVRAZ and international organizations as to ensure the financial and human resources required to carry out the program and progressive development of the institute in the long term.

*CDA (Cooperation for Development in Africa) is an association of seven donor countries (Belgium, Canada, France, Federal Republic of Germany, Italy, United Kingdom, and the United States) created for the purpose of establishing close cooperation among them and with the African countries, to carry out programs whose breadth is greater than the resources of each individual donor. Agricultural research is one of the areas in which CDA is presently interested.

Composition of the Mission

ANNEX 1

V. Abarca	Agronomist, specialist in livestock and veterinary medicine. FAO September 30 to October 29
P. Antoine	Soil scientist, specialist in research and training. FAO consultant, head of the mission. September 30 to October 29
G. Beye	Soil scientist, specialist in research organization, programming and planning FAO October 9 to October 29
N. Bosso	Agrogenetics, specialist in research-development ISNAR consultant September 30 to October 29
R. Devred	Agronomist, forestry, and botany, specialist in research organization, management, and programming ISNAR September 30 to October 29
A. Green	Agronomist, specialist in tropical agronomy World Bank October 2 to October 16; October 25 to October 29
F. LeBeau	Phytopathologist, specialist in research organization, management, and rural development ISNAR consultant September 30 to October 29
I. Serejski	Agronomist, specialist in research organization and management World Bank October 2 to October 8

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Calendar of the Mission

ANNEX II

- September 30, 1982 Arrived in Ouagadougou: P. Antoine, V. Abarca, F. LeBeau, N. Bosso and R. Devred
Welcomed by: G. Philippe-Auguste, FAO representative; A. Djigma, IVRAZ Director, and P.C. Belem from IVRAZ.
- October 1 - Information meeting at the offices of FAO with G. Philippe-Auguste, FAO representative in Upper Volta, A. Djigma and P.C. Belem from IVRAZ; collection of documents and preparation of itinerary and visits.
- Meeting (unofficial) with E.G. Boukougou, Director General of CNRST.
- October 2 - Reading of documentation and general discussions.
- Arrival of I. Serejski and A. Green of World Bank.
- October 3 - Working sessions to set up a first layout for the report of the mission, and to discuss documents received.
- October 4 Official visit to Ministry for Higher Education and Scientific Research with His Excellency the Minister, Faustin Sie Sib; and C. Somda, Directeur de Cabinet, E. G. Boukougou, Ouangnawa, A. Djigma and P.C. Belem from IVRAZ.
- Visit to Ministry for Rural Development, with His Excellency, the Minister, Major Compaoré A. Roch; Diallo Saydou, Secretary General of the Ministry for Rural Development; Kaboré Joseph, Upper Volta Representative to FAO; Ouédraogo Konka Edouard, Director of Studies and Planning of MDR; Nikiema Dieudonné, Secretary of State for Hydraulics; and A. Djigma and P.C. Belem of IVRAZ.
- October 5 - Official visit to E.G. Boukougou, Director General of CNRST.
- Visit to IVRAZ; discussions relating to itinerary and IVRAZ's structure with A. Djigma and P.C. Belem.
- Official reception (cocktail) for the mission with His Excellency, the Minister for Higher Education and Scientific Research, at the invitation of E.G. Boukougou at CNRST.
- October 6 - Meeting at IVRAZ of the entire team with A. Djigma, Director; P.C. Belem, Head of Programming; Sedogo Michel, agropedologist and fertilization specialist

for IRAT at Saria; Abou François, Co-Director of CERIC; and J. Sawadogo, agronomy and cropping techniques for rice at CERIC.

- Meeting at the Ministry for Rural Development, Agricultural Services Direction (DSA) with A. Tatieta, Director of DSA; D. Dyemkouma, Head of the Extension Service; Yago Koumassi, Head of National Seed Service; J. Nebie, Head of Plant Protection Service; Diasso M. Cecile, from Extension Service; Bado Laurent, Head of National Soils Service; N. Sourabie, pedologist; and A. Djigma and P.C. Belem from IVRAZ.
- Round-up meeting.
- Meeting of the team with P. Miache, Assistant Director of CTFT.
- Meeting with E. Papsoa, Director of DEP of MDR and F. LeBeau, A. Green, and R. Devred.
- Meeting with R. Nicou, Director of IRAT in Upper Volta and P. Antoine, I. Serejski, N. Bosso, and V. Abarca.
- Meeting at EDF with M. Ebersheerg, Delegate of EDF, and M. Huaux and R. Devred, I. Serejski, F. LeBeau and N. Bosso.
- Meeting with R. Nicou, Director of IRAT and I. Serejski, F. LeBeau, and A. Green.
- Meeting with Ly Boubakar Sadou, Director of DSEIA and N. Bosso and V. Abarca.
- Meeting with C. Picasso of IRHO and P. Antoine, R. Devred, and A. Djigma from IVRAZ.
- Visit to Dr. R.M. Tall, Executive Secretary of the Communauté Economique du Bétail et de la Viande and N. Bosso, V. Abarca, and P. Green.
- Visit to M. Champanet, Director of the French Cooperation Mission in Upper Volta.
- Visit to J. Claude, Director of ORSTOM.
- Visit to E. Malavez, USAID Director and J. Becker, USAID Agricultural Development Officer by F. LeBeau, P. Antoine, A. Green, N. Bosso, and R. Devred.
- Visit to J. Madinga, assistant to the Executive Secretary of CILSS and M. Barry, livestock manager for the Programs and Projects Service, with A. Djigma and P.C. Belem of IVRAZ, by F. LeBeau, V. Abarca, P. Antoine, and R. Devred.

- October 8 - Information meeting with E.G. Boukougou and P. Antoine, R. Devred, I. Serejski, F. LeBeau, and N. Bosso.
- Visit to A. Gitéra, Assistant Director of UNDP
- October 9 - Visit to the Agricultural Research Station at Kamboinsé;
 J. Belem, Director of the station (IVRAZ); A. Djigma, IVRAZ Director; P.C. Belem (IVRAZ); V. Asnani, Director of IITA in Upper Volta; H. Drissa, IITA corn breeder; V.D. Aggarwal, IITA niebe breeder; T.A. Alowa, IITA corn breeder; D. Issa, IITA niebe agronomist; Y.S. Rathore, IITA entomologist; M.S. Rodriguez, IITA corn agronomy; P. Matlon, ICRISAT economist; S. Paco, ICRISAT phytopathologist; H. Vierich, ICRISAT anthropologist; S.N. Lonani, ICRISAT millet breeder; C.M. Pattanayak, ICRISAT Director Upper Volta, and sorghum breeder; N.A. Stoop, ICRISAT consultant from Royal Tropical Institute; K.V. Ramaian, cereal/striga breeder with ICRISAT; C. Bergmark, SAFGRAD agronomist; B. Mounini, IVRAZ agronomist at Kamboinsé; R.P. Cantrell, Head of FSU-SAFGRAD and agronomist; W.K. Jaeger FSU-SAFGRAD economist; G. Maklon Lang, FSU-SAFGRAD economist; and B.S. Sanyang, student.
- Morning: Presentation of IITA, ICRISAT, and FSU and visit of the station, experimental fields and farmer tests.
 Afternoon: general discussion.
- Arrival of Gora Beye of FAO.
- October 10 - Working day: meeting of the team and editing of preliminary notes.
- October 11 - Departure for Saria station.
- Visit to Saria station with R. Nicou, Director of IRAT in Upper Volta; P. Morant, Director of Saria station; P. Sapin, sorghum breeder; B.L. Some, IRAT; M. Sedogo, IRAT; P. Dagué, IRAT Research Development S; Sami, IRHO; C. Picasso, Director of IRHO in Upper Volta; D. Paré, Integrated Pest Control Project; A. Guedraogo, Integrated Pest Control Project; and P.C. Belem, IVRAZ.
- Visit to ORD, Koudougou with A. Belem, Director; T. Kaniba, Head of Vegetable Production; I. Komon, Head of Planning; A. Zongo, Head of Extension; and P.C. Belem, IVRAZ.
- Visit to Farako-Bâ station, with R. Nicou Director of IRAT; J. d'Arhondel, Director of the Station and Head of Vegetable Crops; D. Sauvaire, corn, sorghum and millet; B. Nébie; G. Traore; P. Morant, Director of Saria; L. Somé; F. Abou, Director of CERCI; E.

Vanounou, Director of CERIC project; J.A. Oreuna
FAO-CERIC; B. Nébie, CERIC; C. Combassere, CERIC; A.
Rouamba, CERIC; D. Dotchev, Head of Irrigated Crops
Section, CERIC; D. Tran, rice crops, CERIC; M. Sonbo,
CERIC; R. Melcher, seed production, CERIC; M. Diarite,
WARDA coordinator; F. Bernard, IRCT representative in
Upper Volta; M. Berger, IRCT agronomist; V. Hien,
IRCT; and P.C. Belem, IVRAZ.

- Visit to Centre Agricole Polyvalent de Matourkou with
F.M. Sinarg, Director; V. Djiguimole, Assistant
Director; J. Bassana, Head of Plant Production, and
P.C. Belem, IVRAZ.
- Visit to phytopathology laboratory of the Department
of Agricultural Services of MDR, with A.S. Sawadogo,
head of the service; Ly Van Kuoan, phytopharmacist;
Kno Abdowahme, Phytomathologist; A. Traoré,
entomologist; P.C. Belem, IVRAZ.

October 13

- Visit to Centre de Recherche sur les Trypanosomoses
Animales (CRTA), with D. Cuisance, Scientific Director
of Glossines Program; G. Roelands, scientific director
of trypanotolerance program; R. Gides, CRTA Director;
H. Politzar, Assistant Director of CRTA; and P.C.
Belem, IVRAZ.
- Visit to CERIC center in Kou valley with D. Dotchev,
D. Tran, and M. Somba; M. Melcher, CERIC, and P.C.
Belem, IVRAZ.
- Visit to Kou Valley Cooperative, with E. Traoré,
assistant director; and P.C. Belem, IVRAZ.
- Visit to livestock project at the livestock station at
Banankeledaga by V. Abarca.
- Visit to samandeni livestock station of the livestock
direction by V. Abarca.
- Visit to west Volta livestock project of the World
Bank, with Dr. Balima, Director and Coordinator by V.
Abarca and N. Bosso.

October 14

- Visit to PAPEM, Tianskoura.
- Visit to ORD, Diébougou with M. Yacouba Coulibaly,
Director; Samidon Palé, Head of Follow-up and
Evaluation; and Traoré Sibiri, Head of Research
Service;

B. Tharé, Head of Plant Production Section, and P.C.
Belem, IVRAZ.
- Departure of I. Seresjki for Washington.
- Meeting of team at Bobo-Dioulasso.

- October 15
- Visit to Niangoloko station with C. Picasso, IRHO Director; C. Grange, Station Head; F. Balfourier; and P.C. Belem, IVRAZ.
 - Visit to IRHO farmers' fields.
 - Visit to Banfora ORD with M. Moressa Sereme, Director; M. Aboud-Draba, Training Section; A. Ouattara, Office of Animal Traction; A. Karama, Cooperation Service; K.A. Zongo, Banfora Sector; A. Hema, Plant Production Service; Y. Sakon, G. Raymond Rice Operation; and P.C. Belem, IVRAZ.
 - Meeting of the team at Bobo-Dioulasso.
 - Departure of A. Green for Ouagadougou and the Ivory Coast.
- October 16
- Departure from Bobo-Dioulasso for Ouagadougou.
 - Visit to the village of Koho and farmers tests of the ICRISAT network with P. Matlon, agro-economist of ICRISAT; village leaders and farmers involved in on-farm testing; and P.C. Belem, IVRAZ.
- October 17
- Working day for the entire team at Ouagadougou.
 - Discussions about work relating to the master plan for IVRAZ, and problems to do with research development.
- October 18
- Visit to National Soils Service of MDR with Bado Laurent, Head of Soils Service; Sourabie Noubie, fertilization; D. Hubert, Head of the Soil Laboratory; A. Djigma; and P.C. Belem, IVRAZ.
 - Visit to Plant Protection Service of MDR with M. Sanourmousa, Head of Plant Protection Service; J. Nébié, Director of Integrated Pest Control Project of CILSS-USAID-FAO; S. Vodjadani, FAO expert from Integrated Pest Control Project; A. Djigma, and P.C. Belem, IVRAZ.
 - Visit to Ministry of the Environment and Tourism with D.M. Ouoba, Director of Studies and Programs; and A. Djigma, IVRAZ (N. Bosso).
 - Visit to SAFGRAD, K.P. Kpotufe, OAU/CSTR controller, with M. Hughes, Director of USAID for SAFGRAD projects, and A. Djigma and P.C. Belem, IVRAZ by F. LeBeau, N. Posso, G. Beye, and P. Antoine.
 - Meeting with J.P. Carbonner, DGRST technical consultant on research planning and programming, and R. Devred.
 - Departure of mission for Ouahigouya.

- October 19 - Visit to ORD of Yatenga at Ouahigouya with G. Soubeiga, Director; M. Kondabo, Head of Plant Production; M. P. Duqui, IRAT; Djigma and P.C. Belem, IVRAZ by V. Abarca, F. Lebeau, N. Bosso, and Gora Beye.
- Visit to Prefecture of Yatenga, A. Sawadogo; A. Palenfo, Secretary General of the Department; G. Soukeiga, Director of Yatenga ORD; A. Djigma and P.C. Belem, IVRAZ.
- October 20 - Departure for Djibo.
- Visit to Djibo sector, ORD of Sahel with M. Sadou, sector head; D. Moussa, assistant chief; J. Bazié, head of crops; and A. Djigma, IVRAZ.
- ORD visit to Kaya, with M. Coulibaly, Director; M.H. Bazi, Manager of Plant Production; and P.C. Belem, IVRAZ.
- Visit to Village-Laboratoire of ICRISAT at Silgey with H. Vierich, ICRISAT anthropologist; P. Matlon, ICRISAT economist; and A. Djigma, IVRAZ.
- Visit to Village-Laboratoire of FSU-SAFGRAD at Bamgasse with S. Sawadogo, Controller; H. Ouedraogo, president of the group; I. Ouedraogo, field technician; C. Bergmark, FSU; and Cantrell, Director of the FSU-SAFGRAD Project;
- October 21 - Visit to Office National des Barrages et de l'Irrigation with A. Nombre, Director General; F. Ouedraogo, Director of Operations, and A. Djigma, IVRAZ.
- Visit to ORD, Ouagadougou, with BV.E. Kafando, Director; K. Zouré, Director of Production; and A. Djigma, IVRAZ.
- Visit to Autorité des Aménagements des Vallées des Voltas with J.D. Traoré, Director General; A. Ouedraogo, principal technical consultant; B. Ouedraogo, Director; and A. Djigma, IVRAZ.
- October 22 - Visit to eastern ORD at Fada-Gourma with S. Traoré, Director; D. Zombo, Head of Bureau of Economic Analysis and Planning; J.M. Kambiré, Assistant Chief, and P.C. Belem, IVRAZ by N. Bosso, G. Beye, and V. Abarca.
- Visit to departmental livestock service at Fada, with M. Coulibaly, Head; and P.C. Belem, Ivraz by N. Bosso, G. Beye, and V. Abarca.
- Visit to central-eastern ORD at Koupela with S. Traoré, Head of Production Service and P.C. Belem, IVRAZ by N. Bosso, G. Beye, and V. Abarca.

- Visit to Institut Supérieur Polytechnique with K.A. Sawadogo, ISP Director by F. LeBeau, P. Antoine, and R. Devred.
- Visit to OFNACER, with K.A. Sawadogo, Director, by P. Antoine and F. LeBeau.
- October 23 - Meeting of the entire team at IRAT Headquarters to prepare the October 25 round table.
- October 24 - Drafting of report project.
- October 25 - Round table preparatory meeting.
- First round table meeting in the presence of E.G. Boukougou, Director General of CNRST; A. Djigma, Director of IVRAZ; P.C. Belem, Head of Programming, IVRAZ; D. Ouadraogo, IVRAZ administrative service; P.M. Sedogo, Saria agronomist; F. Abou, CERCI; J. Sawadogo, CERCI; and Y. Sere, phytopathologist at Farako-Bâ.
- October 26 - Second round table meeting (same CNRST-IVRAZ representatives present as at the round table, October 25).
- Plenary round table with representatives of MESRS, IVRAZ, bilateral research institutions, and the Ministry of Rural Development, and representatives of regional and international institutions and programs; E.G. Boukougou, Director General of CNRST; A. Djigma, IVRAZ Director; P.C. Belem, Head of Programming, IVRAZ; E. Vanounou, Director of CERCI/UNDP FAO project, IVRAZ; R. Nicou, Director of IRAT in Upper Volta; M. Sedogo, IVRAZ agronomist at Saria; Y. Sou, IVRAZ agronomist Farako-Bâ; P. Morant of IRAT, Director of IVRAZ station at Saria; F. Bernard, IRCT Director; C. Picasso, IRHO Director; D. Dyemkouma, Head of Extension Service at DSA-MDR; R. Iwanson, SAFGRAD/FSU/Purdue; C.M. Pattanayak, ICRISAT Director in Upper Volta; and J.P. Carbonnel, Technical Consultant to DGRST.
- October 27 - Official visit to the Ministry of Rural Development with His Excellency, Chef d'Escadron Compaoré A. Roch.
- Official visit to the Ministry of Higher Education and Scientific Research with His Excellency, the Minister Faustin Sie Sib.
- Official visit at the end of the mission to the representative of FAO, F. Philippe-Auguste.

- October 28 - Meeting of the mission.
- Meeting with E.G. Boukougou, Director General of the Centre National de la Recherche Scientifique et Technologique.
- Official visit at the end of the mission to the representative of the World Bank, Mamadou Dia.
- Official reception organized by the Ministry for Higher Education and Scientific Research on the occasion of the mission's departure.
- October 29 - Departure from Ouagadougou, at 12 25. A.M.

**Foreign Assistance Projects for Rural Development
-- Underway in 1980-81**

ANNEX III

Project	Donor	Amount in	Duration	Remarks
Centre Polyvalent de Matourkou	PNUD	US\$ 1,942	1972-80	
Centre d'Expérimentation du Riz et des Cultures irriguées (CERCI)	PNUD	US\$ 2,730	1972-	3rd phase planned in 1982
Assistance to Rural Development	PNUD	US\$ 1,374	1972-81	
Bougouriba Project	World Bank	US\$ 17,600	1974-	2nd phase in 1982
Rural and Integrated Development, Eastern ORD	USAID	US\$ 4,902	1975-81	2nd phase negotiations.
Seed multiplication	USAID	US\$ 2,572	1975	2nd phase in 1982
Reforestation around Ouagadougou in the Sahelian Region	West Germany	DM 11,100	1975-82	
Livestock project West Volta	World Bank		1975-81	Amount not determined
Development of village livestock	USAID	US\$ 1,994	1976-	A 2nd phase is forecast
Rural Development Project	World Bank	US\$ 23,000	1976-	
Agricultural fertilizers and Inputs Project	FAO	US\$ 416	1976-80	

Project	Donor	Amount in	Duration	Remarks
Anti-tsetse school of Bobo-Dioulasso	FAC/ West Germany	FF 884	1976-82	
Reinforcement of Structure Nationale de Production de Matériel Agricole	Switzerland	FS 1,900	1977-80	
National Soils Service	PNUP	US\$ 606	1977-81	
Soils Study of the Bougouriba Valley	PNUD	US\$ 154	1977-81	
Reinforcement of the Role of Women in Rural Development	USAID	US\$ 1,056	1977-81	
Promotion of Basic Foods Production	RFA	DM 15,000	1977-80	
West Volta Project	World Bank	US\$ 15,000	1977-	
Livestock Research Project (Sondre-East-AVV)	The Netherlands	DFL 85	1977-81	
Atelier de Fabrication d'Aliments pour Bétail	RFA	DM 192	1977-	
Plant Protection	ACDI	US\$ 5,788	1978-	
Integrated Rural Development in Yatenga, Séguenga Sector	USAID	US\$ 5,956	1978	
Training of Women in the ORD of the Sahel	USAID	US\$ 1,700	1978	
Development of Forage Crops in the Sudano-Sahelian Region	FAO	US\$ 538	1978-80	

Project	Donor	Amount in	Duration	Remarks
Improvement of Storage and Conditions of the OFNACER	FAO	US\$ 907	1978-81	
Development of the Valleys of the Voltas	UNICEF	US\$ 219	1978-80	
Community Development	UNICEF	US\$ 1,851	1978-80	
Development of Human Resources in Agriculture	USAID	US\$ 9,457	1978-	
Veterinary Laboratory Service Improvement	West Germany	DM 1,000	1978-81	
Animal Traction Equipment	FAO	US\$ 500	1978-81	
Development of the Production of Certified Groundnut Seeds	CEAO	CFAF 228,000	1978-82	
Trypanosomiasis Immunology Project	West Germany	DM 1,000	1978-80	
Crop production and Extension in Eastern ORD	PNUD	US\$ 1,705	1978-80	
Development of Small Ruminants Husbandry	FED	CFAF 128,000	1978-82	2nd phase to FED
Livestock development in ORD of the Sahel	FED	CFAF 450,000	1978-	
Meat Markets in the Main Urban Centers	The Netherlands	DFL 520	1978-82	
12 TCP Projects	FAO	US\$ 424		engaged 1978-81

Project	Donor	Amount in	Duration	Remarks
Training and Development in Forestry	USAID	US\$ 5,958	1979-	
Development of Aviculture	France	CFAF 150,000	1979-81	
Development of Sericulture and Apiculture	PNUD	US\$ 287	1979-80	
Development of Forestry Resources and Reinforcement of the Forestry Service	PNUD	US\$ 711	1979-81	
AVV support (3rd round)	France	CFAF 400,000	1979-	
Creation of an Irrigated Scheme in the Bagré Region	France	CFAF 118,000	1979-	
Bagré Irrigated Scheme	France	CFAF 472,000	1979-	
Fruit Tree Pilot Project	France	CFAF 984,000	1979-	
West Volta Food Crop Project	France	CFAF 800,000	1979-	
Assistance to ONERA	The Netherlands	CFAF 640,000	1979-	
Assistance to AVV	The Netherlands	CFAF 1995,000	1979	
Creation of two Vegetable Crops Schemes (Savena and Pouziga)	The Netherlands	CFAF 252,000	1979-	
Village Woods Project	The Netherlands	CFAF 137,000	1979-	

Project	Donor	Amount in	Duration	Remarks
Wheat Experimentation Project at Sourou	The Netherlands	CFAF 550,000	1979-	
Rural Development of the Southwestern ORD	FED/ECC	CFAF 533,000	1979-	
Development of 150 ha Rural Downstream Land	FED/ECC	CFAF 181,200	1979-	
Vegetable Development of Crops at Bazega	FED/ECC	CFAF 90,000	1979-	
Assistance to the ORD at Yatenga	FED/ECC	CFAF 410,000	1979-	
Development of 150 ha of Downstream Land Rural Dams	FED/ECC	CFAF 181,200	1979-	
Development of vegetable crops at Bazega	FED/ECC	CFAF 90,000	1979-	
Assistance to the Yatenga ORD	FED/ECC	CFAF 410,000	1979-	
Improvement of Traditional Livestock Husbandry at Banfora	FED/EEC	CFAF 264,152	1979-	
Development of Rice Production in the ORD of Comoé	FED/ECC	CFAF 830,000	1979-	
Development of Live-stock Husbandry in the Sahel's ORD	FED/ECC	CFAF 450,000	1979-	
Project Water Management and Use of Plastic Materials in Agriculture	ONUDI	CFAF 210,000	1979-	

Project	Donor	Amount in	Duration	Remarks
Rice Crop Cooperation Project in the Kou Valley	BOAD	CFAF 312,000	1979-	
Kampenga Pluri-disciplinary Project	World Bank	US\$ 20,000	1979-	
Development of the Naro Forest	World Bank	US\$ 14,500	1979-	
Strengthening of the OFD of Koudougou	World Bank	US\$ 30,200	1979-	
Development of Traditional and suburban agriculture	FAC	FF 275	1979-81	
Improvement of the Frigorific Slaughterhouse, Dryers; etc.	The Netherlands	DFL 568	1979-81	
Loumbila Waiting Area and Health Park	FED	CFAF 98,500	1979-81	
Construction of an ARCOMA at Ouagadougou	Switzerland	FS 1,095	Length not determined	
Agricultural Development of Western Volta	Switzerland	FS 9,550	Length not determined	
Financial contribution to AVV	West Germany	DM 4,500	Length not determined	
Study for the Development of the Niéna-Dionkéle Plain	France	CFAF 115,000	1980-	
Glossine Area Project (CRTA)	West Germany	DM 5,000	1980-81	
Phosphate Extraction	West Germany	DM 4,000	1980-81	
Regional personnel training center for the control of tsetse fly	West Germany	DM 3,500	1980-82	

Project	Donor	Amount in	Duration	Remarks
Development of Cereals Marketing	USAID	US\$ 6,938	1980-	
Support project to Statistical and Documentation Services	CEAO	CFAF 28,000	1980-82	
Refrigeration equipment (Refrigerated Trucks for Transporting Meat)	The Netherlands	DFL 170	1980-81	
Assistance to the Matourkou Center's Operation	USAID		1980-82	Ended in December, 1982
Cowpea Storage Project	Canada	CFAF 3,437	1980-85	1st phase 2nd phase in progress
Food Supply Project in Eastern ORD	USAID	US\$ 3,000	1981-	
Anacardium Crop Development Project	France	CFAF 408,000	1981-84	
Niena Dionkélé Project	World Bank	CFAF 2275,000	1981-85	
Project to Improve an Evaluation Method of the Quality of Millet, Sorghum, Cowpea, Maize, Fonio	FAO	CFAF 4,575	1981-82	
Development of Pasture lands area of Sondre-East	The Netherlands	CFAF 82,000	1981-	
Improvement of Traditional Livestock Husbandry in Comoé	FED	CFAF 586,000	1981-	

Project	Donor	Amount in	Duration	Remarks
Livestock Project in ORD of upper basins and the Comoé (Sidéradougou)	France	CFAF 550,000	1981-	
Development of Forage Crops and Improving Crops in the Sudano- Sahelian Region (phase II)	Switzerland	FS 400	1981-	
Integrate Pest Control Glossines in the Sidéradougou Region	FAC/West Germany	CFAF 600,000	1981-	
Use of Phosphates in Agriculture in Upper Volta	West Germany	FCFA 500,000	1981-83	2nd phase in progress
Village hydraulics (wells and drilling)	FAC	US\$ 5,459	1981-	Several projects
Pasture land hydraulic (wells and drilling)	Islamic	US\$ 1,185		Funds Acquired
Village hydraulics (wells and drilling)	ACDI CEAO FAC The Netherlands UNDP EDF OPEC Federal Republic of Germany World Bank UNICEF Conseil de l'Entente Islamic Community Solidarity Fund	US\$ 20,352		Funds Acquired, Projects Being Prepared, All ORDS

Sources:

Summary Report of the second Conférence des Cadres, June 1981. List of Plant Production Projects (IVRAZ). List of Foreign Assistance Projects for Rural Development in Upper Volta (FAO)

**Foreign Assistance Projects for Rural Development
-- Under Negotiation or Being Implemented in 1982**

ANNEX IV

Project	Donor	Amount in CFAF	Duration	Remarks
Production of Foundation Seeds	USAID	560	1982-87	Being carried out
Fertilizer and Related Inputs Project	Belgium	455	1982-86	Being carried out
Phosphate Fertilizer Formulation Unit	PNUD	2,500	1982-87	Being carried out
Fruit-Tree Project	France/CCCE	900	1982-84	3rd phase in progress
Food Crop Project in Eastern ORD	FIDA/USAID	6,088	1982-86	1st phase in progress
Creation of "Institut National des Sols"	Netherlands PNUD	342	1982-83	In progress
National Project for Cowpea Improvement	Canada	33	1982-84	3rd phase
Use of Liquid Fertilizers	UNICEF	10	1982-83	
FAO 2nd Phase Fertilizers Project	Belgium	-	1982-	Being negotiated
Organic Fertilization in Upper Volta	PNUD	291	1982-	Being negotiated
Integrated Pest Control Project	USAID/ CILSS	5,728	1983-88	1st phase in progress
Agricultural Development Project in ORD of Black Volta	FIDA/CCCE FAC/World Bank	5,945	1983-87	1st phase being negotiated

Project	Donor	Amount in CFAF	Duration	Remarks
Plant Protection Project	Canada	2,400	1983-88	3rd phase being negotiated
Settlement at Dakongo ORD of Central Region	BAD	826	1983-86	Being negotiated
Marga Development Unit	The Netherlands	450	1983-	Being negotiated
Mankarga Development Unit	FED	1,300	1983-	Being negotiated
Creation of Institut National des Sols	The Netherlands UNDP	804	1984-86	Being negotiated
Use of Phosphates in Upper Volta's Agriculture	West Germany	500	1984-86	3rd phase
Organization of Roots and Tubers Center in Upper Volta	PNUD	360	3 years	Being negotiated
Agricultural Development Project in Upper Volta	FIDA/CCCE FAC/World Bank	6,575	-	In progress
Koudougou ORD Pilot Project	World Bank	2,205	-	In progress
Extension and Plant Production Project in ORD of the Sahel	PNUD	700	-	In progress
Extension of Vegetable Production Scheme Project at Lanfiera	CCCE	1,000	-	In progress

Project	Donor	Amount in CFAF	Duration	Remarks
Protection of Food Products in Warehouses Project	FENU	89	-	
Rural Development in Central-Eastern Department of Koupela	BAD	3,070	-	Being negotiated
Agricultural Devel- opment Project, West Volta II PDAOV	World Bank/ FIDA	-	-	Project being prepared
Sericulture Project	PNUD/World Bank	245	-	

Source: List of Crop Production Projects, IVRAZ, October, 1982.

Agricultural Research Planning and Program Structures and Modalities

ANNEX V

1. General

Within the Ministry of Higher Education and Scientific Research (MESRS), the planning and programming structures are established by decrees, all relatively recent (1981-82). These structures within MESRS are relatively complicated and exist only on paper. They are neither functioning nor operating yet. Details for procedures and modalities of execution, in fact, are still under study. A planning technical advisor in DGRST is presently defining and setting up an operational planning and programming system for the MESRS, and the whole of CNRST's research organizations (IVRAZ is only one of the five institutes of CNRST).

It should be noted that the whole of the planning, programming, coordination, and evaluation system for scientific research, which includes agricultural research, is under CNRST's responsibility and jurisdiction, not that of its specialized institutes.

2. MESRS - CNRST

- a. The pyramidal structure of research policy, planning and programming within MESRS includes:
 - * a Conseil National de l'Enseignement Supérieur et de la Recherche Scientifique (CNESRS), interministerial organ of science policy and of decision on the priorities and resources, as well as on the coordination measures between ministries and technical assistance agencies;
 - * two CNESRS Commissions
 - a. a Higher Education Commission;
 - b. a Scientific Research Commission (for processing the studies by the DGRST)
 - * the Direction Générale de l'Orientation et des Bourses which is the central organ for the management of training and scholarships for all personnel of higher education and scientific research under MESRS statute;
 - * the Centre National de la Recherche Scientifique et Technologique (CNRST) who answers to both MESRS and the Ministry of Finance (the director general of CNRST is also the director general of DGRST. CNRST determines priority scientific objectives, develops and carries out programs, and ensures the diffusion of information and application of knowledge to development.);

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CNRST carries the management of all research programs of the institutes through:

- . a Conseil Scientifique for the scientific orientation of the institutes' programs (CS);
- . a Conseil de Direction (CD) to review and approve the center's budgets, to define the major lines of research, to approve the institutes' research programs, and to evaluate and control their implementation.

Thus, the management council and the general secretariat of CNRST make up the management bodies orientation and priorities, evaluation, control, statute of research workers, etc. CNRST also handles documentation, information, and relations with foreign research organizations. CNRST decides and approves the budget of its institutes.

- b. Operational procedures and modalities. Proposals relating to the organization of the research system, programming, and budgeting methods, substantive organizational problems and the programming of CNRST scientific activities, as well as those of its institutes, were drawn up by earlier missions.

These proposals have a bearing on the inventory of activities and the programming of research operations by technical commissions and actions concerned with financing, researcher training programs, scientific policy (CNESRS), and evaluation of DGRST's own resources.

The operational modalities recommended for implementing these proposals are worked out by means of a codified system of "fiches programmes" and descriptions ("fiches-opérations") and a series of technical commissions, for organization or organizations grouped by scientific or subject matter fields of direct interest to development.

The proposed structures, procedures, and modalities of research operations are not yet in place. They are now being studied by the technical consultant to DGRST-CNRST. Consequently, it will be difficult to define programming structures for IVRAZ without knowing which of these will finally be adopted by CNRST.

3. IVRAZ

A research planning-programming system does not exist at IVRAZ and cannot obviously be set out until the whole system of CNRST has evolved. On the other hand, an inventory and regrouping of current activities and programs, organized on a commodity basis, has been undertaken this year at the initiative of IVRAZ, within the framework of the Comité spécialisé de la Recherche Agronomique et Zootechnique. This is a first attempt to coordinate efforts and programs nationally.

The Comité Spécialisé, which does not appear in the present decrees and statutes, neither of IVRAZ nor of CNRST, is a coordinating structure left over from the period when agricultural research was part of MDR.

The Comité spécialisé meets at the joint initiative of MESRS and MDR. It is made up of the following five technical commissions:

- * Commission 1: food crops, including three subcommissions: plant improvement; agronomy and cropping techniques; crops protection.
- * Commission 2: industrial crops
- * Commission 3: horticulture
- * Commission 4: livestock
- * Commission 5: research-development.

Each commission or subcommission brings together for a few days the managers of research programs and MDR representatives directly concerned (DSA-ORD, etc.).

The results obtained during preceding campaigns and major lines of anticipated program for the following campaigns are presented, institute by institute, and briefly discussed. The reports of each commission and subcommission endeavor to present a set of very general recommendations. For example, the Agronomy and Cropping Techniques Subcommission takes note of the statements presented by IRAT, SAFGRAD/IITA, ICRISAT, CERCI, the MDR phosphate project, the FAO fertilizer program, SAFGRAD/FSU, the MDR Soils Institute and ORSTOM. There is no attempt to integrate or to coordinate research activities and farming in the same disciplinary, ecological zone or system levels.

The Research-Development Commission is mainly concerned with development farming systems research (IRAT-SAFGRAD-FSU), study of natural ecosystems (ORSTOM), problems relating to the transfer of technologies, tests and demonstrations in the rural environment (CERCI), problems raised by the extension service (DSA-AVV-ORD), national seed service, phosphate projects, and all constraints encountered when improved techniques and research results are applied in the rural environment. The commission's report draws up a set of general recommendations with a view to improving the relationship between research development services. Each IVRAZ commission and subcommission prepares a report regrouping the statements of each organization working with IVRAZ, or involved in research programs similar to those conducted by organizations attached to IVRAZ or to other ministries. The proceedings are followed by a list of ill-matched recommendations, too general or too specific to serve as a basis for reshaping or eliminating duplications in current programs. The commissions' reports are reviewed for two or three days during a plenary session of the Comité Spécialisé which adopts the recommendations and publishes it in a "Document de Synthèse".

In addition to the reports of the Comité Spécialisé and its technical commissions, IVRAZ, at the request of MESRS, prepared a special report called "La Mise à Disposition des Acquis de la Recherche aux Producteurs", Septembre 1982 (Research Results Ready for Farmers Use).

This document indicates, station by station, the programs in progress, and the main results obtained by each institution and by commodities. It also covers the results obtained in the PPEM of MDR and the laboratory villages of ICRISAT-FSU. The idea of these commissions was especially that of using existing structures (from the time when research was under MDR) and to line them up with the production departments of IVRAZ.

In reality, the present IVRAZ commissions, not legalized by official texts, are perpetuating and reinforcing the compartmentalization of departments by commodities and the isolation of programs conducted by each institution.

Obviously these commissions by commodity production have not contributed to better integration of programs and teams, or to better coordination between institutions or programs they still pursue independently. The coordination and integration must be organized at the time when programs are formulated, before and not after their implementation, and certainly not at the occasion of confrontation of achieved results (Section 4.3.2).

Agricultural Research Programs

ANNEX VI

Research on Plant Production

Table A-1 summarizes the research programs underway in the area of crop production: food crops (sorghum, millet, and rice), grain legumes (cowpea, groundnuts and soya), cash crops (cotton), and vegetable crops. breeding, agronomy, and crop protection are three subjects generally studied.

The improvement of varieties involves: collection maintenance and introduction of geneplasm and creation of varieties and hybrids, selection of varieties resistant to disease, insects, and drought, as well as to organoleptic qualities. Agronomy involves studies of cropping techniques, date, density and techniques of sowing; mineral and organic fertilization, crop rotation, cropping systems, crops association, use of harvest residues, etc. Crops protection concerns entomology, phytopathology, and weed control involving the inventory of harmful vectors, study of population dynamic, chemical, and biological control.

The table shows that some research programs are being implemented simultaneously by several organizations:

- * the sorghum and millet programs by IRAT and ICRISAT for all themes;
- * the maize program by IRAT and IITA/SAFGRAD for all disciplines except phytopathology;
- * the rice program almost exclusively by CERIC, except for rainfed rice protection, where IRAT is also involved;
- * irrigated crops agronomy by CERIC;
- * the cowpea program by IITA, with CRDI financing for varietal improvement, agronomy, and entomology;
- * the oil crops by IRHO for all themes on groundnuts; improvement of varieties, agronomy, and entomology for soya; and varietal improvement of sesame;
- * cotton research by IRCT;
- * vegetable crops by IRAT at the Farako-Bâ station for the improvement of varieties, and CERIC (third phase of project) for crop protection;
- * tubers (yam and cassava) by IRAT, during the past two years.

Table A-1. Organizations participating in on-going research (per discipline and per crop product)

DISCIPLINES	CROP PRODUCTS					
	SORGHUM	MILLET	CORN	IRRIGATED RICE	RAINFED RICE	OTHERS, IRRIGATED
Variety improvement	IRAT; ICRISAT	IRAT; ICRISAT	IRAT; IITA/SAFGRAD	CERCI	CERCI	
Agronomy	IRAT; ICRISAT	IRAT; ICRISAT	IRAT; IITA/SAFGRAD	CERCI	CERCI	CERCI
Crop protection						
- entomology	IRAT; ICRISAT	IRAT; ICRISAT	IRAT; IITA/SAFGRAD	CERCI	IRAT; CERCI	
- phytopathology	IRAT; ICRISAT	IRAT; ICRISAT	IRAT	CERCI	IRAT; CERCI	
- weed control						
Research and Development	IRAT; ICRISAT	IRAT; ICRISAT	IRAT	CERCI	CERCI	

DISCIPLINES	CULTURES					
	COWPEA	GROUNDNUT	SOYA	SESAME	COTTON	VEGETABLES (MARACHAIRES)
Variety improvement	IITA/CRDI	IRHO	IRHO	IRHO	IRCT	IRAT/CERCI
Agronomy	IITA/CRDI	IRHO	IRHO		IRCT	IRAT/CERCI
Crop protection			IRHO		IRCT	IRAT/CERCI
- entomology		IRHO			IRCT	
- phytopathology		IRHO			IRCT	IRAT/CERCI
- weed control					IRCT	
Research and Development	IITA/CRDI	IRHO			IRCT	IRAT/CERCI

Programmes of general interest

- Agrometeorology: Ministry of Equipment
- Water economy: IRAT; ICRISAT; IITA
- Production systems: IRAT; ICRISAT; FSU/SAFGRAD
- Socioeconomics: IRAT; ICRISAT; FSU/SAFGRAD
- Crop Protection (MDR): Project Integrated Pest Control
Project Laboratory for Crop Protection,
Bobo-Dioulasso

Source: 1981 IVRAZ Activities Report

2. Research on Livestock Production

The Centre de Recherche sur les Trypanosomoses Animales (CRTA) runs comprehensive investigation programs on integrated biological control of tsetse flies at Sidéradoukou (1981-1984) and cattle trypanotolerance, as well as the rearing of tsetse (G. tachinoides, G. palpalis gambiensis and G. morsitans submorsitans) on animals (i.e., guinea pigs and rabbits) and on membranes.

The work of CRTA, particularly in immunology, is of high scientific standard, and goes far beyond problems of eradicating trypanosomes in Upper Volta. Most of the results obtained are applicable to almost all West Africa. Moreover, CRTA works in close collaboration with the Avédonou center in Togo, and ILRAD in Nairobi, Kenya.

The Centre d'Expérimentation sur le Riz et les Cultures Irriguées (CERCI) in the Kou and Sourou valleys conducts comparative trials on varieties of legume pastures; cereals and fodders; cropping techniques under irrigation; fattening; and research on hay conservation.

The Farako-Bâ research station has some 30 cattles for a breeding program, with the view to creating a large size trypano-tolerant draught animal. It is to be noted that the present number of animals is too small to meet the programs' objectives.

The Veterinary Laboratory of the Direction des Services de l'Élevage is responsible for analyzing animal samples and for preparing an epidemiological map of parasitoses. Microbiological and serological surveys are also planned.

3. Forestry research

This has been going on since 1963 in Upper volta, on the following subjects:

- * introduction of Eucalyptus spp; the conduct of various trials have made it possible to promote Eucalyptus camaldulensis;
- * trials with exotic species other than Eucalyptus spp, such as Gméline arborea, Tectonia grandis, and Anacardium occidentale);
- * since 1953, research on local species, including Parkia biglobosa and Acacia albida;
- * regeneration of natural forest stands in order to define a simple management method to develop natural forests around cities and rural communities for firewood and possibly timber production;
- * soil protection and restoration, and water and soil conservation (this research stopped recently).

The last three subjects are of paramount importance for the study of agro-sylvo-pastoral systems.

It should be noted that it is IRBET, rather than IVRAZ, which is responsible for forestry research. On the other hand, IVRAZ should not disregard the importance of forest cover or simply of fallows, for wind and water erosion control, as well as for the conservation and regeneration of soil fertility and structure. Moreover, IVRAZ must be concerned with the fact that cereal straw is presently removed in large quantities from the crop fields for use as fire fuel, most of forests resources being quickly exhausted. This practice is harmful to the achievement of a policy of restitution of crop residues for the regeneration of soil organic matter. IVRAZ must at least be concerned with the technical progress made in the forestry sector, so that the negative pressure exercised by farmers on their soil can be reduced. IVRAZ must, therefore, integrate forestry data in its conceptualization of production systems and develop appropriate agroforestry or agro-sylvo-pastoral systems.

4. Farming System and On-farm Research

Several research programs are underway in Upper Volta on farming systems and socioeconomic production factors (studies of ecosystems in the natural environment by ORSTOM, socioeconomic surveys and on-farm research with farmers by IRAT, ICRISAT, FSU-SAFGRAD, CIDR, and CILSS/FAO regional project).

ORSTOM is studying the Sahelian ecosystems in order to describe the constraints and potentials of traditional agropastoral systems in the region. This work will make it possible to understand the relationships between herdsmen and farmers, whose interests often conflict, and to design new production systems to preserve and/or to improve environmental conditions.

The work of IRAT is concerned with cropping technical production systems, the study of traditional agrosystems and the improvement of more advanced techniques to be recommended to various farming systems. IRAT also conducts trials on various crop rotations and crop associations at stations and substations (PAPEM) as well as on farmer's land, with the view to the development of technological packages for the extension service, both to maintain soil fertility and to ensure good returns to farmers. The results confirm the fact that some improvement in the cropping techniques must be secured before varieties (traditional or selected hybrids) can reach their yield potentials.

The ICRISAT research-development team, which includes an agro-economist, an anthropologist, and an agronomist, works directly with farmers through a large network of laboratory villages in the three main ecological zones of the country (north, central, and southwest), on two topics:

- . development of farming systems with varieties (improved and traditional) of sorghum and millet;

background surveys to identify the various socioeconomic factors including exogenous factors and production constraints in the traditional environment. The research results will be evaluated globally in 1983-84.

The FSU-SAFGRAD team works in its own network of villages on the following six topics:

- . basic surveys on practical production techniques by farmers;
- . base line studies on traditional agrobusiness of family units;
- . pre-extension activities to assess the economic impact of new agricultural technologies;
- . study models and the decision-making processes within farm production units;
- . evaluation of the potential of some agricultural production technologies;
- . design of new production technologies.

Research activities of IRAT, ICRISAT, and FSU-SAFGRAD are all relatively recent and will not lend themselves to overall evaluation until 1984-85. However, two major elements of these programs need to be emphasized:

- . on-farm research and trials (farmers'trials) are conducted directly within villages to improve farming systems under real conditions and specific local environments of agriculture development;
- . a direct dialogue is engaged in between research workers and farmers in order to obtain a better understanding of socioeconomic and technical problems of rural development, and guide the choice of research priorities better.

The CILSS/FAO regional project on forage crops (Dosi and Sebba) is designed to increase the production of forage crops in the Sahelian area in order to facilitate the integration of crop and livestock production (animal traction, small-scale fattening schemes, milk production, etc.);

The IDRC project on crop and livestock integration around Gorom-Gorom follows herds in their natural environment in order to measure cattle production and reproduction parameters.

5. Other Research Activities

In addition to the above-mentioned programs, research activities are also

conducted in agrometeorology, soil science, and crop protection by the following organizations:

The Agrometeorology Service of the Ministère de l'Équipement, in addition to the classic climatic observations of temperature, rainfall, and records management of synoptic stations, intends to conduct research in bioclimatology;

The National Soils Institute of MDR intends to conduct soil fertility and fertilization studies, and research on soil and water conservation;

IRAT, IITA, and ICRISAT conduct research on water economy at stations and rural fields, including programs on cropping techniques (ploughing, ridging, etc.), water regions, and erosion control techniques in the toposequence of crop fields.

The Laboratory of the Plant Protection Service at Bobo-Dioulasso conducts research in entomology, phytopathology, phytopharmacy, and nematology on food crops. The Integrated Pest Control Project just initiated research of phytopathology, entomology, and weed control at Saria, Farako-Bâ, and Kamboinsé.

In conclusion, there are numerous duplications in several programs, particularly those of sorghum, millet, and maize, in which IRAT, ICRISAT, and IITA/SAFGRAD are involved independently in almost every aspect. The research program on water economy, which is important for the country, is implemented separately by IRAT, IITA, and ICRISAT without any coordination. It must also be noted that no major program exists on post-harvest technology, weed control (except for cotton), agricultural engineering, and small agricultural tools.

Central Bureau of Biometric and Statistical Analysis

ANNEX VII

This central bureau will have two main functions and orientations:

- * analysis of all statistical data issued from research programs and establishment of protocols and experimental design for all IVRAZ's research programs;
- * support to administrative and financial management and research support services (information, communication, and documentation).

The variability of experimental factors, the growing complexity of statistical analysis using classical models (randomized blocks), more complicated experimental schemes (mixed cropping systems), all requiring the intervention of various treatments at different levels and at different stratas (complex associations of crops with different life cycles) (agroforestry systems), make a claim for the establishment of a central service of biometrical and statistical analysis. The Bureau of Biometrics is above all a scientific service to improve trial protocols and experimental layouts in consultation with researchers and scientists, and to perform analysis and interpretation of the research results. This service also carries out research on the choice and development of statistical methods, applied biometry, or experimental techniques needed for appropriate programs (software). It will also be concerned with sampling problems and the choice of appropriate methods for stratified sample surveys in relation to socioeconomic investigations. This bureau will also be at the disposal of the secretariat of the Commission de Programmation et de Coordination des Recherches.

With time, the organization and management of administrative services tend to become more and more complex. They need computer processing services for personnel management, keeping financial records and account books, logistics, facilities, etc. Therefore, the Central Bureau of Biometrics and Statistical Analysis, generally located at the research organization's headquarters, must be equipped with computer capacity capable of handling the required volume of data per unit of time. This should not prevent the use of small microcomputers at research stations, as their cost does not exceed that of other scientific equipment. Given its dual functions and the important role that the Central Bureau of Biometrics plays in programming and administrative management, it seems logical to propose that the bureau be placed directly under the supervision of the director of IVRAZ.

Depending on availabilities and local arrangements, the agricultural research system should have a biomathematician, two agronomists specialized in statistical analysis, and a programming technician.

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ANNEX VIII

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