

SAFGRAD SUPPORT TO NFSR
PROGRAM OF BURKINA FASO

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PHASE I. - 1985 - 1987 SYNTHESIS
PHASE II. - 1988 - 1991 PROPOSALS

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Prepared by:

SAFGRAD FSR SUPPORT TEAM
TO BURKINA FASO

(T. Kibreab, K. Yilala, C. Prudencio and A.I. Niang)

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A./ - PHASE I. - SYNTHESIS

1. BACKGROUND

Farming Systems Research (FSR) started in Burkina Faso in the 70's. It has been carried out mainly by FSU, ICRISAT and IRAT, each one with its own objectives and approach. The previous FSR programs have carried out mostly cropping systems research. There is a growing awareness on the declining farm resource base of the area as a result of population pressure and that crop productivity improvement is dependent on priority improvement of natural resources of the area. Secondly, the location specificity of farming systems was brought to the forefront and that farming systems research is better conducted by National Research Institutes with the assistance of International Institutes as needed.

In early 1985 a reorganization of the research structure of INERA (Institut d'Etudes et de Recherches Agricoles), the Burkina Faso national agricultural research institut, led to the creation of eight national agricultural research departments within the institute. These are:

1. Farming Systems Research
2. Soil - Water - Fertility and Mechanization
3. Industrial Crops (Coton)
4. Millet - Sorghum - Maize
5. Rice
6. Animal Production
7. Allseeds and Legume Grains
8. Fruits and Vegetables

The Farming Systems Program is viewed within INERA as a "horizontal" department, which is expected to link all the other programmes of the institute to one another, to extension agencies and to farmers so as to increase their efficiency in solving the agricultural development problems of the country.

A National FSR Program was elaborated by INERA and approved by a national seminar (February 11-15, 1985).

1.1. Objectives:

The global objective of the National FSR Program is to present the development of technologies and identify rural - development policy actions that are suited to the conditions of farmers so as to increase food production and achieve national food self - sufficiency. The specific objectives of the program may be summarized as follows:

- a) To study current farming systems in Burkina Faso with multi-disciplinary teams of scientists so as to identify small farmers' problems and particularly the technical and socio-economic constraints on new technology adoption.
- b) To promote a system of communication between farmers, researchers and developers so as to influence the objectives and methodology of researchers and developers such that programs address actual needs of small farmers.
- c) To develop in collaboration with farmers, commodity researchers and extension agencies, farming technologies that are adapted to farmers' conditions and alleviate production constraints.
- d) To propose to development policy - makers elements of agricultural development policies which would improve the productive capacity of the farming community.

The expected output of the program is:

- a) An increase in the general state of knowledge on the technical and socio-économic constraints of farming systems in Burkina Faso.
- b) An improvement in the capacity of thematic agricultural research and development programs to tackle farmers' problems.
- c) The generation of a certain number of technologies to fit farmers' needs so as to promote farming systems with a greater stability and a greater food security.

- d) The training of national scientists and technicians to assume full responsibility in the implementation of the national program, throughout the country.

In a report issued on January 1984, an OAU/STRC/IFAD consultative mission recommended that SAFGRAD strengthen FSR program in Burkina Faso. A protocol of agreement was signed in October 1984 between OAU/STRC and the government of Burkina Faso. The global objectives of the SAFGRAD support (through IFAD funding) is to facilitate the realization of the national objectives by:

- a) providing technical and resource assistance in areas of priority need ;
- b) facilitating the development of an integrated FSR with major focus of establishing continuous interactive cycling of resources;
- c) assisting in the evaluation of technologies and evolving methodologies for adoption;
- d) helping to train national FSR scientific research personnel;
- e) providing technical advisory services to FSR program in particular and the national research in general.

1.2. Installation of Program:

The strategy consists of extending the NFSR activities progressively over the whole country in two phases. During the first phase, two FSR teams were activated, one based at the Kamboinsé station, near Ouagadougou, to cover the Mossi Plateau and the other based at Farako-Bâ, near Bobo-Dioulasso, to cover the western region of the country. The program is expected to extend to the northern and eastern parts during the second phase.

The two regional teams, one based in Kamboinsé and the second in Farako-Bâ are made up of the following disciplines: agronomy/soil science, economics, animal science and agro-forestry. The Kamboinsé team has been

operational since 1985 and the Farako-Bâ one has been launched in 1986. The latter draws its research staff from existing researchers of INERA some of whom are simultaneously attached to disciplinary research departments.

SAFGRAD supports only the team of Kamboinsé covering the central, Mossi Plateau, of the country. There are four OAU/STRC/SAFGRAD scientists as part of the team: a soil scientist, an animal production specialist, an economist and an agro-forester. The first three joined the team in 1985 and the agro-forester in 1987. Two national counterparts (an agronomist and animal scientist) are with the team. The national coordinator (an agro-economist) served as head of the team from 1985 to 1986. A replacement national coordinator has taken up his assignment in August 1987.

2. ACTIVITIES

Research activities were planned for the 1985 rainy season soon after the arrival of two members of the team. The trials were conducted on three of the sites of FSU/SAFGRAD so as:

- not to miss the rainy season;
- profit from infrastructure, and field equipment made available by FSU/SAFGRAD;
- to benefit from existing research data base on the villages.

It was decided to postpone selection of long-term village sites for the NFSR program until more members of the team were installed (late 1985 to early 1986). A series of trials were conducted in 1985, with many of the agronomy ones as follow up of previous work by FSU/SAFGRAD.

2.1. Guidelines for Implementation Strategy:

The team was reinforced by one economist (SAFGRAD supported) and two national counterparts (agronomist and animal scientist) on September 1985. It was then decided to work on a guideline document for the implementation of the NFSR program. The outcome was a draft document entitled

"Projet de Modalités Pratiqués d'Application du Programme National de Recherche sur les Systèmes de Production, Octobre 1985". The draft was submitted to INERA for review and adoption.

2.2. Institutional Linkages:

The team undertook informal discussions with research, extension and development partners from November 1985 to March 1986 on the bases of collaboration and expectation of each partner vis-à-vis NFSR program. The outcome of these meetings are presented in a report "Rencontres Informelles avec les Partenaires de la Recherche et du Développement - INERA, Mars 1986".

2.3. Village Site Selection:

The team carried out a reconnaissance survey on the Mossi Plateau and identified, jointly with the staff of the Rural Development Organization, three villages judged to be representative of the farming systems of the area to serve as sites for research activities. The major constraints to agricultural productivity of the area were reconfirmed:

a) Crop productivity:

- inadequate moisture
- low soil fertility and land degradation
- labor bottlenecks
- low productivity of agricultural implements
- crop pests and diseases.

b) Animal productivity:

- inadequate feed resource and water supply, particularly during the dry season;
- livestock diseases.

c) Agroforestry:

- shortage of water for seedling establishment
- termite attacks

- shortage of seedlings
- cattle straying.

Findings of the reconnaissance survey have been reported in "Reconnaissance Survey of Farming Systems in the Mossi Plateau of Burkina Faso" December 1986.

The NFSR program (Kamboinsé team) has attempted to address the constraints of inadequate moisture, soil fertility, labor bottlenecks, inadequate feed resources and environmental protection. With the arrival of the agro-forester (1987) the activities in the discipline have started. Highlights of findings and work on progress are hereby summarized.

2.4. Highlights of Findings:

2.4.1. Socio-economics:

- a) Reconnaissance survey study was completed. Representative farming systems in the three meso regions of the Mossi Plateau were described and the major constraints to agricultural production were confirmed. Technological and development needs as expressed by farmers were identified. As indicated, earlier three primary research sites were selected.
- b) Analysis of existing baseline survey data. Using computing facilities obtained with a USAID-SAFGRAD grant to the economist existing baseline survey data have been analysed. The research focussed on understanding of farmers soil and crop management practices in Burkina Faso. This led to:
 - modelling of cropping systems in the area (in and outside Mossi Plateau) on the basis of a ring management theory;
 - measurement of the basic resource endowment and resource management parameter of the farming systems;
 - major input-output co-efficients of the cropping systems;
 - soil fertility management effects on labor return;

- farmers' systems adjustment mechanisms vis-à-vis land use intensification pressure;
- major agricultural research and policy implications of the research findings.

c) 1986. In depth Farm Surveys on the newly selected NFSR villages:

In depth surveys in the newly selected NFSR villages were conducted in 1986 on samples of twenty four to thirty five households in each village. The major areas of investigation included:

- crop production (input-output and resource management);
- livestock production (resource endowment and management);
- crop and livestock marketing;
- off farm income generating activities;
- income allocation to expenditure (consumption, purchase of inputs or investments etc.).

Special studies have been undertaken:

- use of forest product (wood) and crop residues as fuel (energy consumption study);
- the study of local crop varieties (characteristics, utilization and adoption criteria).

Parts of the crop production and livestock production data have been analysed and special studies are partly completed. Collection of the other data will continue until 1987 harvest time before analysis begins.

d) Evaluation of elite technologies:

Using partial budget analysis approach the yield difference acceptability to farmers, at various levels of assumed risk aversion of

major elite varieties and of promising management techniques has been evaluated on the basis of the 1986 researcher managed agronomic trials.

2.4.2. Agronomy:

a) Local millet intercropping with cowpea (1985):

In a trial to evaluate grain yield of millet intercropped with cowpea on marginal (follow) land some millet grains yield was harvested while cowpea failed to produce due to insect attack. Legumes for intercropping on marginal land, where little purchased inputs can be used need to be identified.

b) Grain yields of four white sorghum varieties :

Sorghum varieties IRAT 204, ICSV 1002, KANFIAGUI and a local variety in Nedogo (1985) were low under traditional management level (flat planting, no fertilizer application). A mean yield of 264-528 kg/ha was obtained for the four varieties. The difference among varieties was not significant. With improved management (tied ridging plus minimum doses of fertilizers) grain yields were significantly higher (733 to 1924 kg/ha) and differences between varieties were significant. One improved variety (IRAT 204) and a local variety (KANFIAGUI) had highest grain yield.

c) Tied ridging with minimum doses of fertilizer (100 kg/ha NPK) resulted in significant higher grain and straw yields of a white sorghum (ICSV 1002) in Nedogo (1985) compared to the traditional management level.

d) Grain yield of millet to tied ridging and Burkina phosphate was not significant under farmer managed trials in Nedogo (1985). Application of fertilizer without tied ridging did not offer benefits and sizable proportion of farmers would not recover cash output.

e) A red sorghum variety from ICRISAT (FRAMIDA) out performed the farmers local varieties with or without inputs, under farmer managed trials in 1985 (Poedogo), in grain and straw yield. A net revenue grain of 10,000 CFA/ha could be obtained if FRAMIDA

were grown in place of the local variety. This involved no additional labor or fertilizer use.

- g) *Leucaena leucocephala* and pigeon pea planted on fallow marginal land established well. Pigeon peas stayed green up to four months after the rains, grew to a height of 1.60 m and provided good soil cover with leaf fall. *Leucaena leucocephala* seedlings survived the dry season after browsing by animals to bare stem. The next rainy season plants were observed revegetating. It is concluded that legume shrubs or trees which provide soil cover during most of the year for multiple purpose could be found. Work was planned to be pursued over several seasons but due to change of village sites the trials were abandoned.
- h) Experiments with cereal response to tied ridging and fertilizer application were pursued in 1986 on several locations in three village sites. The results were similar to previous findings. Grain and straw yields of white sorghum, red sorghum and grain yields of maize were significantly higher with improved management than under traditional practice. That straw yields can be substantially increased by soil water and fertility improvement implies that scarcity of mulch material can be partially alleviated. Variety performance difference with respect to yield was less marked as the management effect. Some varieties that perform as well as the locals under traditional practice but exceed the locals under improved management are FRAMIDA (red sorghum for Soudanian zone), IRAT 204 and SPV 35 (white sorghum for Soudano-Sahelian zone) and ICSV 1002 and ICSV 16-5 (white sorghum for Soudanian zone). There is evidence that varieties that respond well to management are locally available e.g. KANFIAGUI, from the FADA area).

There was not much difference between maize or millet varieties tested.

The evidence emphasizes that soil and water improvement management technologies would markedly improve crop productivity.

- i) Experiments of legume grains trials on several locations per village site were conducted in 1986. Where the rainfall was low (Soudano-Sahelian zone, 468 mm) grain yields of cowpeas and peanuts were low. Bambara nuts failed. In the Soudanian zone (663-818 mm) legume grain yields responded to phosphate application. The introduced cowpea variety (TVx3236) out performed farmers' varieties.
- j) Intercropping trials with cereal/legume:

Red sorghum intercropped with cowpea gave yields comparable to sorghum monocrop. As a bonus some cowpea grain (less than 300 kg/ha) and cowpea straw (for hay) can be harvested. Intercropped millet grain and straw yield was comparable to that of monocropped millet. At the same time some grain legume can be harvested. More work on species, space and time arrangements to increase benefit from legumes without substantially reducing cereal yields in cereal/legume association is on-going by researchers (IITA/SAFGRAD and NFSR).

Details of findings are reported in 1985 and 1986 annual reports.

2.4.3. Animal production:

The Animal Production component immediately recognized the nutrition aspect of ruminants to be the most essential to be given priority to improve the productivity of animals. Emphasis was, therefore, given to research on feed resources in the first two years and lately followed by a preliminary feeding trial on sheep. The investigation in the main covered aspects of agronomic performance, biomass yield, nutritive value, nodulation and regrowth performance of forage and dual purpose legumes.

As reported in the previous annual report of 1985 and 1986 the research findings are highlighted below:

- a) Considering the pattern of change with stage of growth in dry matter yield, nitrogen, cell wall contents and digestibility the optimum stage of cutting of forage legumes for conservation was

about 75 days (\pm 12 days). This coincided with the period at which the labour requirement for cereal crops is at the low ebb, thus allowing the conservation of the forages at the desired stage of growth.

- b) All the legumes had nitrogen contents well above the critical level (1.12 % N) at all observed stages of growth for use as sources of nitrogen supplement to improve cereal residue utilization by ruminants.
- c) Differences were observed in the solubility and biodegradability of the dry matter in the rumen. This will allow the manipulation of combination of the various ingredients in the formulation of diets.
- d) Due to probably the deep rooting system D. lablab, M. atropurpurium and S. hamata stayed vegetatively green, with good soil cover, for over four weeks after the rainy season. The deep rooting system might help improve the physical structure of soil.
- e) S. hamata and M. atropurpurium regenerated, the former with increased density, in the subsequent rainy season after having been completely grazed by stray animals during the long dry season. These species have the potential to be grown in mixture with grass to improve natural pasture.
- f) Without insecticide application cowpea varieties, tested as dual purpose legume, failed to produce grain due to insect attack but could fit into the system as forage crop. They out-performed all other legumes in the number, size and characteriz of nodules.
- g) Amongst the legumes tested, D. lablab with its good drought tolerance, vegetative growth, delayed onset of flowering and constancy in its nitrogen content as it matures is the legume of choice as forage. However, its failure to set seeds, probably due to its photoperiod sensitivity, unless residual moisture is available after the rains have stopped is a disadvantage.

- h) The regrowth root and shoot organic matter and nitrogen yields of D. lablab, V. unguiculata (CV. KN-1) and P. aureus after harvest for conservation as feed indicated the potential that exist to green manure the soil for subsequent crops.
- i) Conservation of natural pasture and cultivated forage legumes as hay was technically possible under farmers conditions. The conservation as silage demands further investigation.
- j) Intercropping D. lablab with sorghum out performed the sole crop of sorghum in Nitrogen yield and the sole crop of Dolichos in total forage dry matter. Intercropping resulted in a loss in sorghum grain and residue yield as compared to the sole sorghum crop.
- k) The lambs responded to D. lablab and cowpea supplementation of natural pasture hay by increasing the total dry matter intake.
- l) The responses in live weight gain due to D. lablab and cowpea (CV. KN-1) supplementation at low or high levels were below the expected and slightly higher than maintenance. Further investigation was required.
- m) The feeding trial enabled the making of compost using sheep faeces, feed refusals and purchased manure to which was added Burkina rock phosphate to improve the solubility of the latter.

2.4.4. Agroforestry:

The agroforestry component started with pre-diagnosis survey work based on synthesis of existing bibliography and information collected from development and research services since March 1987. Complementary knowledge of the socio-economic and biological environment of the Mossi Plateau which would lead to agro-forestry intervention was synthesised.

A diagnosis survey work was conducted in Kamsi (one of the village sites) and surrounding villages. The survey work (pre-diagnosis and diagnosis) has permitted to work out proposals to identify agro-forestry alternatives to alleviate identified constraints.

2.5. Activities in Progress:

Activities on-going in 1987 are listed below.

2.5.1. Socio-economics:

a) Baseline studies:

- Continuation of resources management studies input/output parameters; labor, land and capital resources management.
- Marketing and agricultural production finance and input supply studies.
Crop and livestock marketing and gift transactions.
- Elaboration of off-farm income.

b) On farm technology evaluation:

This is jointly carried out with the other components of the team.

- evaluation of seed drill ;
- evaluation of ditcher and tied ridger equipments (IITA and ICRISAT);
- elite sorghum variety on farm testing;
- dry season evaluation of livestock feeding and composting techniques.

2.5.2. Agronomy:

- #### a) Cereal crops testing at different levels of soil and water management. Some of the variety and management options found promising in 1986 are being tested under researcher managed trials for the second season and under farmer managed trials for the first season in the new village sites. These are for:

- . Sudano-Sahelian zone: White sorghum and millet.
- . Sudanian zone: Red sorghum, white sorghum, millet and maize.

- b) Legume grain crop evaluation at different levels of management: Response of peanut and cowpeas to sources of phosphate (super phosphate vs Burkina phosphate), and with and without tied ridging.
- c) Effect of mulching and manure with and without tied ridging on white sorghum:

In the case where mulching material can be more available (e.g. through higher biomass production) it can improve soil-moisture storage. Hence the need to test the practice under the farm environment.

- d) Comparison of influence of composted rock phosphate and superphosphate on cowpea grain and forage yield (jointly with animal component).
- e) Influence of rock phosphate cured in compost on millet yield.
- f) Cereal/legume association comparison with mono cropping:
 - . Red sorghum/cowpea
 - . White sorghum/cowpea
 - . Millet/legume grains.

These are carried out under researcher managed trials. All components collaborate on farmer managed trials (préviously listed).

2.5.3. Animal production:

The following activities are in progress:

- a) Effects of phosphorus fertilization and cultivation on the performance of a dual - purpose legume (Jointly with agronomy).
- b) Effects of varying the densities of cowpea as an intercrop with millet in forage and grain yield.

- c) Performance of cowpea and millet in forage and grain yield in an intercropping system.
- d) Comparison of new lines of dual purpose cowpeas in forage and grain yield.
- e) Effects of repeated oversowing of S. hamata and M. atropurpurium on the botanical composition of follow pasture alley cropped with browse.
- f) Production of D. lablab and cowpeas for conservation for feeding trials during the dry season.

2.5.4. Agro-forestry:

- a) Improvement of fodder and tree resources - methods of improving fallow field with fodder tree species.
- b) Establishment of multipurpose tree species along contour bunds to promote bank stabilizations and soil-moisture storage.
- d) Trials on live fencing with tree species for protection of vegetable gardens.

2.6. Institutional Strengthening:

The Kamboinse team of the NFSR program has four profession staff seconded by SAFGRAD and two national counterparts. In addition it has technical, and administrative support personnel. It owns some office, field and transport equipment and with operational funds made available to it is well placed to conduct research activities.

Collaborative links between the team and research university and development partners have been established. The team visits trials of other research staff and development organization and vice versa. Members participate in meetings of Rural Development Organization, attend workshops and carry out field visits, to mention but a few.

Training:

Some training has been conducted:

- Seven technicians attended a one months training course on Farming Systems Research organized by SAFGRAD at the University of Ouagadougou between 19 March - 19 April 1986.
- Through SAFGRAD assistance, the then national coordinator attended Dryland Management Research Tour in USA, July-August, 1985.
- One technician attended a three month training course (April-June, 1986) in computer programming at the National Center for Data Processing in Ouagadougou.
- Two students (one from the Agricultural Polytechnic Center at Matourkou and the second from University in Mali) completed their Senior projects with the assistance of the team (June-Sept., 1986).
- Currently five senior University and one senior Polytechnic students are conducting their research project within the program.
- One national scientist participated in the FSR monitoring tour between 20 Sept.-4 Oct., 1986 by SAFGRAD.

3. SETBACKS FACED IN IMPLEMENTING - PHASE I OF THE NFSR PROGRAM

Setbacks were encountered in the Phase I of the program. Resolution of these problems would have greatly improved the efficiency of the team in identifying promising technologies, faster dissemination of information and in general creating a more conducive work atmosphere. Some of the problems are listed.

a) Different expectation of the program from parties:

A coherent guideline of the role of the SAFGRAD technical assistance team, their relative responsibility to INERA and SAFGRAD, allocation of resources for different operations was desirable. This lacking the team

had to learn from experience. The modality of integration with national programs being specific, a mutually agreed guideline seems necessary. The team submitted a draft proposal (previously cited) to that effect to INERA.

Some of the ambiguous issues can be cited as: reporting procedure of documents, use of operational fund for areas outside the zone of SAFGRAD intervention, relative proportion of resource to be spent for development related activities, whether the FSR work extends from research station upto on farm activities or should deal only with on-farm testing. With respect to research station work some of the team members felt that it was needed to investigate areas in which adequate information is not available at hand. For example aspects of integrated work in crop/livestock/ agroforestry system interactions could be jointly done with disciplinary researchers under controlled conditions to observe complementary effects. Some understanding to that sense has been reached with time.

b) Staff recruitment and management:

The team members (SAFGRAD seconded) joined at different periods: two in March 1985, one in September 1985 and the fourth in March 1987. The national coordinator joined early 1985 but left in 1986. Two nationals joined in 1985. This created some delays.

The nationals could not hire staff in sufficient numbers (at least to match the expatriates) due to administrative delays or national budget restriction. Nearly all the salaries of field assistants is met by SAFGRAD funds.

The ambiguous position of SAFGRAD scientists within the NFSR created serious drawbacks on authority vis-à-vis the national staff during the absence of the national coordinator. This creates inefficiency in executing tasks that are urgent e.g. report typing for reviews, data analysis.

c) Delay in acquiring facilities:

Difficulties of nationals in meeting their obligations as stated in the protocol of agreement, such as, provision of adequate lodging for

technicians in village sites, office space for the team on station.

INERA is a young institution. Hence, it has difficulty meeting the requirements of growth usual at early stage. At the moment an old building is being remodelled to accomodate the team. This will improve the office space soon.

Adequate space for integrated research work on station has not been acquired. This reflects differences in opinion on the need of research station work by FSR program.

d) Delay in fund allocation:

Operational funds for the program arrived to the team between May and June for the three seasons. This is by far too late for serious agricultural research activities in a rainfall period of the area.

Many research topics planned to be carried out during the dry season had to be postponed or abandoned due to insufficient funds between November to May. Not only was fund late but it was much less than the anticipated amount indicated when the team submitted estimates. There was no carry over from year to year. The result was that dry season animal production trials, soil conservation trials and soils investigations were postponed.

Lack of sufficient funds delayed purchase of essential equipment e.g. computer. The socio-economic base line data analysis has not been completed as a result. In 1985 materials left by FSU/SAFGRAD enabled launching the program.

Early and predictable fund release will help the team plan activites accordingly.

e) Problem of avoiding investments:

Some investment in laboratory investigation analysis on research station could help make up for deficiencies in the disciplinary research capacity. This would enchanche in the cooperation between disciplinary researchers and FSR team. Often the cost of having analysis done

by the service sector is much more than is needed to support the institute's laboratory needs.

4. CONCLUSIONS

The NFSR team at Kamboinse has been launched through the support of OAU/STRC/SAFGRAD with IFAD funds. It has accomplished within the short period the following tasks:

- reconnaissance survey
- testing of technologies on station and on-farm sites
- linkage with research and development partners.

The major accomplishment, however, is the launching of a national team which is operational. This being the case, with time and experience, generation of technologies, integrated research work and extension work by the national institute will be rewarding. The second phase of the program can be expected to demonstrate the outcome of the first phase experience.

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B./ PHASE II. OF NFSR PROGRAM PROPOSAL

1. OBJECTIVES AND JUSTIFICATION

The global objectives of the NFSR program, previously listed, remain valid. There will be more emphasis on assisting to launch two teams in new zones, collaborating with the existing Farako-Bâ team, and conducting joint research with disciplinary departments on station. Similarly emphasis will be placed on integration of components in the team. Pre-extension studies of screened technologies will be carried out jointly with the extension department.

Phase I of the NFSR program was an initiation stage. The second phase is a stage of strengthening of the national program:

- Experience and some results are available in order to screen adopted technologies in the second phase.
- Collaborative linkages with research and development partners was started. This will be strengthened further which will permit INERA to take farmers' needs and development objectives into consideration in executing research.
- A successful completion of the FSR goals during the second phase will demonstrate the usefulness of the inter-disciplinary approach and promote it within INERA.
- There is need for more institutional strengthening through acquisition of equipments and specially training of national staff (researcher, technician and extension personnel) to permit continuity of the program.

2. PROJECT DESCRIPTION

2.1. Implementation Strategy:

The implementation strategies is to be achieved through:

- Strengthening on going research activities on the present three sites of the Mossi Plateau and on station.

- Assisting to launch two new FSR teams and collaborating with the third already existing.
- Strengthening collaboration with research and development partners.
- Providing consultancy services required by INERA.

2.2. Project Elements:

The major constraints limiting agricultural productivity remain valid. In depth investigation of secondary constraints is on-going. The research activities already started will, therefore, be pursued with some adjustments as needed.

2.2.1. Continuation of activities started in Phase I.:

The following themes will be pursued into the second phase:

- A) Baseline studies.
- B) Improvement of feed resources availability and animal productivity.
- C) Effect of management practices on dual purpose legumes for grain and forage yield.
- D) Testing of cereal/legume association technologies.
- E) Testing of improved cropping practices - Variety and management combinations.
- F) Testing of technologies to improve soil productivity.
- G) Research on the modalities of introducing tree species in the villages (pour production future, fourragère et ligneuse).
- H) Description of the bio-physical environment and micro-variations at the village level.
- I) Socio-economic evaluation of technologies.

A. BASELINE STUDIES

Justification and objectives:

As opposed to the "top down" approach that characterised most agricultural research and development projects until the early 1970's Farming Systems Research and Development is characterised by a "bottom up" approach to agricultural research and development. As such it first attempts to identify and clearly define the problems/constraints and conditions of agricultural production at the farm level before designing final solutions to resolve or alleviate such problems or constraints. The resulting iterative process of diagnosis - design and test finally results in more "appropriate" solutions to solve the identified problems.

Baseline studies at the farm and village levels are an indispensable instrument to complete the first diagnosis phase of FSR and to identify opportunities for technology development. In socio-economic studies within the INERA/SAFGRAD project started in 1986 and need to be continued during the second phase to reach appreciable results.

The objectives pursued are:

- a) To study the current agricultural production systems so as to acquire more data base and knowledge on small farmers socio-economic, institutional and technical agricultural problems/constraints, with a particular emphasis on the constraints to technology adoption.
- b) To identify the adjustment mechanisms (strategies, technological innovations and others) utilised by farmers as solutions to cope with their agricultural problems.
- c) To identify and define the technological needs of farmers ("appropriate technologies"), and the appropriate types of development actions needed to resolve the existing problems and satisfy farmers' and national goals and objectives in the agricultural sector.

These objectives are attained by monitoring farmers' economic activities in the three primary study sites, by reviewing the results of previous economic studies and FSR programs in Burkina Faso (i.e. FSU-SAFGRAD and ICIRSAT), and by analyzing some of the unanalysed data of such programs.

To meet these objectives the following studies will be carried out.

A.1. Production and Resource Management Studies:

A.1.1. Evaluation of farm resource endowment, accessibility and accumulation.

A.1.2. Studies on inter-activity and inter-temporal farm resource allocation studies within season and between seasons.

A.1.3. Studies of resource allocation within activity (crop production, animal production, off-farm income generating activities etc...).

A.1.4. Identification of traditional technologies and of farmers' technological innovations.

A.1.5. Identification of basic input-output and output-output relationships and parameters.

A.2. Transaction Studies:

A.2.1. Farm inputs acquisition and financing.

A.2.2. Crop and livestock prices and marketing (sites and purchases) at village, regional and national levels.

A.2.3. Evaluation of off-farm income.

A.3. Agricultural Product - Transformation/Consumption Studies:

A.3.1. Basic ag. product transformation and consumption/transformation parameters.

A.3.2. Household budget allocation.

A.3.3. Energy consumption.

A.4. Special Surveys for Hypotheses and Models Confirmation:

The A1, A2, and A3 studies will result in formulation of a series of hypotheses regarding for instance:

- Farmers goals and decision making process.
- Constraints and their modes of operation (condition in which they occur at different levels and how they occur).
- Adjustment mechanisms or strategies used by farmers to alleviate constraints.
- Technology adoption conditions and evaluation criteria.

The studies results (parameters, hypotheses etc) will lead to dynamic models of typical farming systems and farming units representing different domains of recommendation.

Brief special studies will be carried out to confirm (or infirm) the model specification and parameters.

Specific expected output:

- . Dynamic models of the farming systems and farming units in the study region.
- . Specific constraints and their modes of operation.
- . Farmers solutions/strategies to deal with the constraints (adjustment mechanisms).
- . Technological needs, development and policy actions needed and their domains of recommendation.
- . Farming systems parameters, criteria for technology evaluation and for development project evaluation.
- . Methodology for farming systems socio-economic studies.

B. IMPROVEMENT OF FEED RESOURCE AVAILABILITY AND ANIMAL PRODUCTIVITY

The feed resources research in the first phase has clearly shown the possibility of alleviating the constraints of quantity and quality of nutrients for effective integration of animals and crops. In the second phase strong emphasis will be put on studying the performance of animals under different levels of nutritional management determine the nutrient requirements for various physiological states. This may ultimately lead to establishing a feeding system that may fit into the economic realities of the small scale farms and improve the productivity of animals in terms of meat, milk and draught power.

The following investigations will be conducted.

B.1. Study on the improvement of fallow with forage legume and brouse species:

- a) Continue assessing effect of oversowing fallow pasture with species such as S. hamata and M. atropurpurium on the quantity and quality forage produced.
- b) Assess the influence of annually sown forage legumes on the replacement of fallow by forage legume/cereal rotation.
- c) Determine the frequency of cutting of brouses, grown on fallow land, for use by animals.

B.2. Study on the production and conservation of forages for periods of inadequate feeding:

- a) Assess the performance of selected forage or dual purpose legumes under different levels of management to exploit their potential in biomass yield, nutritive quality and contribution to soil productivity.
- b) Continue assessing the techniques of conservation of forage legumes and natural pasture in the form of hay or silage at small scale farm levels.

B.3. Study on the nutrition of ruminant animals:

- a) Determine strategies for optimizing utilization of crop residues and other poor quality roughages by ruminants using forage legumes as supplements.
- b) Assess the influence of nutrition on the productivity of: (i) ewe lambs from weaning to end of first lactation, and (ii) adult ewes during the last stage of pregnancy and lactation.
- c) Assess the influence of nutrition on the milk yield of Zebu cows.
- d) Assess the influence of nutrition on the fattening of bréef cattle.
- e) Assess the influence of frequency of watering on the performance of beef cattle or sheep under a given level of feeding.
- f) Assess the influence of nutrition on the performance of cattle in draught power.

Specific expected output:

- Identification of a variety of sources of forage nitrogen, that are compatible with cropping systems, to optimize the utilization of crop residues and other locally available poor quality roughages by ruminants.
- Knowledge of methods of conservation of forages for periods of inadequate feeding.
- Knowledge of the nutrient requirements of animals that could lead to the establishment of a feeding system that will be sound biologically and will fit into the economic realities of the farms.
- A network of nationwide collaborative research to strengthen the national program in animal production research.

C. EFFECT OF MANAGEMENT PRACTICES ON DUAL PURPOSE LEGUMES FOR GRAIN AND FORAGE YIELD

The legume crops offer a means to integrate the crop production, animal production and soil fertility amelioration work through provision of forage and grain as well as N-fixation for subsequent crops.

The following investigations will be carried out:

- C.1. Effect of soil moisture storage (tied ridging, mulching) on legume performance with regards to production (grain and forage) and N-fixation.
- C.2. Effect of compost and rock phosphate, cured in compost on legumes.
- C.3. Performance of cereals following legumes under different management levels.

Sites: On fixed sites (fallow field) under researcher managed. On farmer managed (1988-1999) of results found promising above (1989-1999).

Specific expected output:

- Promoting dual purpose legume crops that fit into the farm resources base through better soil-water management and application of readily available phosphorus source.
- Increasing cereal grain yield through rotation with legumes and use of residual phosphorus from composted rock phosphate previously applied on legume crops.

D. TESTING OF CEREAL/LEGUME ASSOCIATION TECHNOLOGIES

In the Mossi Plateau cowpeas are rarely sole cropped. Crop association is expected to be the first step in intensifying production of dual purpose cowpea or other legumes. Some research results are available (IITA/SAFGRAD) indicating feasibility of such a practice.

- Testing cereal/legume association for optimum yield (grain and forage) in the two zones.

D.1. Varieties of crops and recommended arrangement in time and space will be tested.

D.2. Effect of management levels on productivity of cereal/legume association. Management levels include soil moisture storage and fertilization.

Researcher managed trials on research station and fixed sites. Farmer managed trials of technologies judged suitable (technical feasibility and fitting the farm resource base).

Specific expected output :

Cereal/legume association technologies that are suited to the different environments and farm resource base of the area.

E. TESTING OF IMPROVED CROPPING PRACTICES - VARIETY AND MANAGEMENT COMBINATIONS

Some promising varieties (introduced and local) for sorghum and cowpea have been identified. These will be tested in combination with management practices found promising. Where improved varieties are not available only local variety response to management will be tried.

- Crops to be tested:

. White sorghum, millet, red, sorghum, Maize, peanut, bambara nut, etc.

- Management:

. Tied ridging, mulching, tillage, weed control, etc.

Both research managed (on fixed sites) and farmer managed trials will be carried out.

Specific expected output:

Recommendation of crop x management technologies for given environmental complex to achieve food self sufficiency.

F. TESTING OF TECHNOLOGIES TO IMPROVE SOIL PRODUCTIVITY

Crop productivity potential cannot be expressed if the soil does not provide suitable medium for plant growth. There is serious problem of soil erosion and runoff water loss in parts of the Mossi Plateau. FSR has until recently neglected the area to the advantage of crop performance evaluation although farmers of the area show initiative in soil conservation work. Due to the instability of the first phase of the program such work was not undertaken by INERA/SAFGRAD FSR team. Work on the area is needed in the second phase.

The following activities will be undertaken:

- F.1. Study on the efficiency of traditional conservation practices in controlling soil erosion and effect on crop yields.
- F.2. Efficiency of mechanical barriers (with and without vegetative cover) on soil erosion and runoff control and effect on crop yield. The vegetative cover consist of legume forage and tree/shrub species alley or strip cropping.

Specific expected output:

- Indicative soil conservation recommendations for different levels of investment in two zones of the Mossi Plateau (Soudano-Sahel and Soudan).
- Promote intensified crop production so that cultivated area can be reduced in the long run. This will lead to increased fallow area for improved pasture and soil restoration.
- Lead to awareness that soil degradation can be arrested.
- Promote ability of farmers to accept other production technologies (fertilizer, crop selection, tillage, etc) which they cannot on degraded environment.

G. RESEARCH ON THE MODALITIES OF INTRODUCING TREE SPECIES IN THE VILLAGE SPACE

G.1. Use of tree/crop association to improve soil fertility and to meet fruit, forage, energy and construction material needs:

Activities are:

- a) Revegetation of diguettes.
- b) Strip planting of trees along contour lines in a crop field.
- c) Use of trees for alley cropping and cut mulch purpose.
- d) Crop intercropping with leguminous tree forages.
- e) Fruit tree establishment.
- f) Improvement of fallow field by establishing tree species.
- g) Tree planting along field borders and around dwellings.

G.2. Establishing live fences around fields, gardens and enclosures.

G.3. Study on composition, dynamics and density of agroforestry species in the village, and management recommendations.

G.4. Research on simplifying nursery operation and seedling transplanting to promote creation of nurseries and reforestation activities at the individual, family and village community level.

Specific expected output:

The specific output is to provide farmers with technologies that allow:

- to meet their needs in forage, fruit, service wood and energy needs;
- to protect their crops effectively with lower labor needs using live fences;

- to enable farmers to produce and manage seedlings themselves;
- to control soil erosion effectively with minimum labor requirement for maintenance of structures;
- to enable farmers maintain fertility of their land.

H. DESCRIPTION OF THE BIO-PHYSICAL ENVIRONMENT AND MICRO-VARIATIONS AT THE VILLAGE LEVEL

There is marked differences in soil moisture regime and soil fertility within farms at the village levels e.g. as a result of toposequence or differential management of fields. Rainfall is also highly variable within the season and between years.

The investigation will attempt to describe quantitatively the micro-variation at the village level using secondary long term data (soil and long term rainfall) with additional soil parameters to be collected.

Specific expected output:

Delineation of biophysical environments at the village level and implications on technology adoption.

I. SOCIO-ECONOMIC EVALUATION OF TECHNOLOGIES

Justification and objectives:

The test and the evaluation of proposed technologies on the farm enable agricultural research scientists to appraise the actual performances of the designed technologies. The results of the evaluation enable them to efficiently screen and improve such technologies. As such, technology evaluation is an indispensable tool which enable agricultural research to make substantial progress toward the desired goals.

The objective is to evaluate recommended or promising technologies and resource management systems for their socio-economic feasibility at the farm or village level, and in terms of their ability to enable farmers to meet their objectives with "acceptable" levels of risk and benefits.

The technology evaluation will be carried out primarily with the results of farmer managed trials. The thirty five farmers in each village will be involved in the evaluation of technologies.

The on farm technology evaluation will be focussed on technology which are capable of alleviating the major constraints which haven been identified.

- . Inadequate moisture (drought)
- . Low and degrading soil quality
- . Labour bottlenecks and low productivity of implements
- . Inadequate feed resource availability for ruminants species.

The types of technologies which will be evaluated are as follows:

I.1. Evaluation of labor saving mechanical/animal traction implements:

- Such as:
- . Seed bed preparation implement i.e. ridge tier and ditchers for soil-water conservation.
 - . Seed drillers
 - . Mechanical weeders, polyvalent implements.

I.2. Evaluation of agronomic and soil-water conservation techniques:

- . Test of improved traditional soil-water conservation techniques (stone bunds, grass-strips, zaī, mulching, etc).
- . Test of introduced soil-water conservation techniques (i.e. tied ridges, earth dykes ...).
- . Test of fertilizer recommendations.
- . Test of traditional and recommended intercropping practices.

I.3. Evaluation of elite crop varieties:

The tests will be focussed on cereal and legumes varieties from the International Agricultural Research Centers and from the National Agricultural Research Institute (INERA).

I.4. Evaluation of recommended or promising forage production and conservation techniques.

I.5. Evaluation of livestock feeding techniques.

I.6. Evaluation of manure production techniques.

I.7. Evaluation of agroforestry techniques.

I.8. Evaluation of promising integrated technological packages.

Specific expected output:

- Criteria for technology evaluation to determine acceptability, costs/benefits of promising technologies and their domains of recommendation.

- A set of adapted technologies for preextension and extension.

J. TRAINING

Three types of training are being considered: short term training, medium term training and long term training. Short term and medium term trainings were carried out during the first phase of the project. Long term training is envisaged during the second phase of the project.

J.1. Short term training:

It is an in country training, not exceeding one week. In the past it involved only technicians working within the program, it will be extended in the second phase to technicians working in other research programs of INERA and to technicians working in Recherche-Développement Units of the regional development agencies as well as to other agricultural research and development agents.

The training is usually designed to provide the technician with basic theoretical tools to carry out properly their duties and to generate discussion regarding practical problems encountered during the season's studies or experiments. It is usually carried out once every year at the end of the agricultural season (between January and April). The training is usually designed and executed by the scientists of the FSR program. However, scientists from other research programs are likely to be involved in the training in the future.

In the past, the number of trainees did not exceed 15, with the extension of the training to technicians of other research and development programs the number of trainees will be set to a maximum of thirty.

J.2. Medium term training:

It is a one to six month training designed to improve the basic training of technicians and national scientists working within the program. The candidates attend courses organised on specific topics by research centers such as IITA, ICRISAT, ICRAF or by specialised training institutions such as CENATRIN (computer science) or university departments.

Such training sessions take place either inside the country or outside the country and are organised through the SAFGRAD Coordination Office.

One technician and one national scientist by FSR component discipline are expected to attend such training every year. That is a maximum of eight persons per year. The SAFGRAD scientists will also attend one to six weeks special courses or conferences once or twice during the second phase of the project to update or improve their knowledge.

J.3. Long term training:

In order to enable national scientists who are working within the program to take over the lead for carrying out the FSR activities after the departure of the SAFGRAD scientists, complementary long term trainings to either the Msc or Ph.D level are planned for one national scientist by FSR component discipline during the second phase. That is a maximum of four national scientists, one in agronomy or soil science, one in animal science, one in agricultural economics and one in agroforestry. Such trainings are expected to take place in african or foreign universities and will be organised through the SAFGRAD Coordination Office.

K. SEMINARS AND WORKSHOPS

Seminars and workshops constitute a means of diffusion of research results and of exchange of scientific information. Two types of seminars and workshops may be envisaged: national seminars/workshop and regional seminars/workshops.

K.1. National seminars and workshops:

In the past the FSR program has organised seminars once a year in collaboration with the Rechercher-Developpement Units of the regional development agencies to discuss the research results of the past season and to discuss and adopt research proposals for the forthcoming season. Thematic researchers and developpers usually participate in such seminars where they receive the necessary information and express their needs to guide the on farm research activities. Prior to the seminar, a field visit day with farmers and collaborating research and development institutions is also organised once a year.

Such practices will continue during the second phase of the project with some improvement.

K.2. Regional workshop:

No regional workshop has yet been organised by the program. However, one is planned for early 1988 to end the first phase of the project. Another one is projected for the end of the second phase of the project. The regional workshop will be organised by the SAFGRAD Coordination Office.

2.2.2. Additional activities on the second Phase:

The following activities are additional assignments previewed for the program.

- A) Assistance to new NFSR teams in staff training, reconnaissance survey, baseline survey, field activity planning, technology evaluation and data synthesis.
- B) Writing proposals and consultancy services for INERA on development projects.

3. GLOBAL EXPECTED OUTPUT

Specific outputs listed previously will lead to the following global outputs in the second phase.

- a) Strengthening of NFSR through training. (This aspect of the Phase I program was not adequate. A stronger effort on training

for the second phase will be needed to enable the national staff to continue the program. Training on research, technician and extension level will be required including advanced degree studies).

- b) Basic equipment and infrastructure for continuation of FSR activities will be acquired.
- c) Methodologies for an integrated multidisciplinary research will be learnt.
- d) Sets of tested technologies with their recommendation will be available.
- e) Information that will assist agricultural research and development policy makers will be acquired.

4. RESOURCES AND BUDGET

The expansion to new zones implies need for additional resources. INERA has expressed a wish that some resources (technical and financial) for the new teams be made available.

The Kamboinse team needs funds for collaborative work on station with disciplinary researchers of INERA.

Funds are required to assist INERA to activate FSR at other sites.

The expanded activities of the Kamboinse team (e.g. agro-forestry) requires more funds since this component of the FSR is being launched. The total budget requested for 1988-1991 is 1,375,000 US \$.

The budget is preliminary estimate based on 1987 Research Proposal pre-viewed estimates. Additional funds required are:

- Agro-forestry : 30,000 US\$/for 1988-1989 with decline in the next two years.
- Animal production and agronomy : 22,000 US\$/for the first years.

- Economics : 12,000 US\$.

Fuel expenses is expected to increase. Similarly training fund should be increased. Additional funds are required for collaborative research with disciplinary departments, for consultancy to projects and assistance to regional teams.

Training and seminar budget (US Dollars)

Type	Number of participants	Estimated cost per person	Total cost per year	Total cost over 3 years
1. Short term training	30	100	3,000	9,000
2. Medium term training	8	1,000	8,000	24,000
3. Long term training	4	12,000	40,000	120,000
	2 Msc (2 yrs) 2 Ph.D (3 yrs)			
4. National seminars and field visits	50	30	1,500	4,500
Total			52,500	157,500

Schedule of Activities:

Activity	1988-89	1989-90	1990-91
<u>A. BASELINE STUDIES</u>			
- Production and resources management studies (A1)	***	**	*
- Transaction studies (A2)	***	**	*
- Agr product transform/Consump. studies (A3)	*	*	-
- Special surveys (A4)	*	**	**
<u>B. IMPROVEMENT OF SEED AVAILABILITY AND ANIMAL PRODUCTION</u>			
<u>B.1. Improvement of fallow pasture:</u>			
(a)	R***	R**	R**
	-	F*	F**
(b)	R***	R***	R***
	-	F*	F**
(c)	F***	R**	R*
	-	-	F*
<u>B.2. Production and conservation of forage:</u>			
(a)	R***	R**	R*
	F*	F**	F***
(b)	R*	R*	R*
	F***	F***	F***

Schedule of Activities (contd).

Activity	1988-1989	1989-1990	1990-1991
B.3. Nutrition of ruminant animals:			
(a)	R*** -	R*** -	R*** -
(b)	R*** F*	R*** F**	R** F**
(c)	R*** -	F*** F*	F*** F**
(d)	R*** F*	R*** F**	R*** F***
(e)	R*** -	R*** F*	R** F**
(f)	R*** F*	R** F**	R* F***
C. <u>MANAGEMENT PRACTICES ON DUAL PURPOSE</u>			
<u>LEGUMES</u>	F*	F**	F***
D. <u>CEREAL/LEGUME ASSOCIATION</u>			
	R*** F*	R** F**	R* F***

Schedule of Activities (contd).

Activity	1988-1989	1989-1990	1990-1991
E. <u>VARIETY x MANAGEMENT TRIALS</u>	R**	R**	-
	F**	F***	F***
F. <u>TECHNOLOGIES FOR IMPROVED SOIL</u>	R***	R**	R**
<u>PRODUCTIVITY</u>	F*	F**	F**
		P	P
G. <u>RESEARCH ON INTRODUCTION OF TREE SPECIES</u>			
G.1. Tree/crop association for multipurpose use:			
(a)	F*	F**	F***
(b)	F*	F**	F***
(c)	R***	R***	R***
(d), (e), (f), (g)	F*	F**	F***
G.2. Live fencing:	F*	F**	P**
G.3. Agro-forestry population dynamics:	R***	R**	R*
G.4. Bio-physical environment description:	***	***	***

Schedule of Activity (contd).

Activity	1988-1989	1989-1990	1990-1991
<u>I. SOCIO-ECONOMIC EVALUATION OF TECHNOLOGIES</u>			
I.1. Labor saving devices:	*	**	**
I.2. Agron. & soil-water management technologies:	*	***	**
I.3. Variety	*	**	*
I.4. Forage production and conservation)			
I.5. Livestock feeding systems)	*	***	**
I.6. Manure production)			
I.7. Integrated packages	-	*	**

Notes: Where appropriate R signifies Research Managed, F, Farmer Managed trials. In general R decreases with years, while F goes up. P signifies pre-extension trials.

* = Check ; ** = Medium activity ; *** = Heavy emphasis.

Research Investigators and Collaborators - INERA/FAFAGRAD FSR Program - Burkina Faso.

Activity	Principal Investigator	Participants	Collaborating Institutions
A. Baseline surveys	SAFGRAD FSR Economist	- National FSR Economist - Socio-economic assistant - Enumerators - University and technical school final year students	- Ministry of Agr. Developpt. - Social Sciences Dept. Univ. of Ouagadougou
B. Improvement of feed availability and animal productivity			
B.1. Fallow field pasture	SAFGRAD FSR Animal Scientist	SAFGRAD FSR Soil Scientist " " Agro-forester " " Economist	INERA Animal Production Unit
(a)	National Animal Scientist	Field technicians	CILSS
(b)	SAFGRAD FSR Animal Scientist - National Scientist	SAFGRAD FSR Soil Scientist " " " Agro-forester " " " Economist Field Technicians	INERA - Animal Production Unit IITA

Research investigators and Collaborators - INERA/SAFGRAD FSR Program - Burkina Faso (contd).

Activity	Principal Investigator	Participants	Collaborating Institutions
B.1. (c)	SAFGRAD FSR Animal Scientist National Animal Scientist	SAFGRAD FSR Agro-forester " " Soil Scientist " " Economist Field technicians	- INERA - Animal production Unit - IRBET
B.2. Production and conservation of Hay			
(a)	" "	SAFGRAD FSR Soil Scientist " " Economist Field technicians	- INERA - Animal Pro- duction Unit - IITA
(b)	" "	SAFGRAD FSR Economist " " Soil Scientist Field technicians	- INERA - Animal Pro- duction Unit
B.3. Nutrition of ruminant animals			
(a)	SAFGRAD FSR Animal Scientists National Animal Scientists	SAFGRAD FSR Economist Field technicians	- INERA - Animal Production Unit

Research Investigators and Collaborators - INERA/SAFGRAD FSR Program - Burkina Faso (contd).

Activity	Principal Investigator	Participants	Collaborating Institutions
B.3. (b)	SAFGRAD FSR Animal Scientists National Animal Scientists	SAFGRAD FSR Economist Field technicians	- INERA - Animal Production Unit
(c)	" "	SAFGRAD FSR Economist " " Agro-forester Field technicians	"
(d)	" "	SAFGRAD FSR Economist Field technicians	"
(e), §(f)	" "	SAFGRAD FSR Soil Scientist " " Economist Field technicians	"

Research Investigators and Collaborators - INERA/SAFGRAD FSR Program - Burkina Faso.

Activity	Principal Investigator	Participants	Collaborating Institutions
C. Dual purpose legume IMPROVEMENT	SAFGRAD FSR Soil Scientist SAFGRAD FSR Animal Scientist National Agronomist National Animal Scientist	SAFGRAD FSR Economist Field technicians	INERA - Agronomy Departments IITA
D. Cereal/legume association	SAFGRAD FSR Soil Scientist National Agronomist SAFGRAD FSR Animal Scientist National Animal Scientist	SAFGRAD FSR Economist Field technicians	INERA - Agronomy Departs IITA, ICRISAT
E. Variety x Management trials	SAFGRAD FSR Soil Scientist National Agronomist	SAFGRAD FSR Economist Field Technicians	INERA Depts IITA ICRISAT
F. Technologies for improved soil productivity (Soil Conservation Work)	SAFGRAD Soil Scientist " Agro-forester " Animal Scientist National Agronomist	SAFGRAD FSR Economist	INERA - Soil & Water Depts IITA/SAFGRAD CILSS

Research Investigators and Collaborators - INERA/SAFGRAD FSR - Burkina Faso (contd).

Activity	Principal Investigator	Participants	Collaborating Institutions
G. Research on tree species			
G.1. Tree/crop association	SAFGRAD FSR Agro-forester National Agro-forester	- FSR Soil Scientists - Animal Scientist - ESFIMA - INERA - Field Technicians - University Senior Students	- IRBET - Services Eaux et forets - University Ouaga - IITA - ONG - FEET - Sahel Research Institutes - Fruit Project
G.2. Live fence	SAFGRAD FSR Agro-forester National Agro-forester	- FSR Soil Scientist - " Animal Scientist - Field Technicians - Senior University Students	- Services Eaux et Forets - University Ouaga - Sahel Research Institutes

Research Investigators and Collaborators - INERA/SAFGRAD FSR - Burkina Faso (contd).

Activity	Principal Investigators	Participants	Collaborating Institutions
G.3. Agro-forestry Population dynamics	SAFGRAD FSR Agro-forester National Agro-forester	- FSR Animal Scientists - FSR Soil Scientists - FSR Economists - Technicians - Senior University Students	- Service des Eaux et Forets - IRBET - IGB - CRTO - Other national Institutes
G.4. Seedling establishment	SAFGRAD FSR Agro-forester National Agro-forester	- Technicians - Senior University Students	- IRBET - Services des Eaux et Forêts - Other National Institutes of Sahel
H. Bio-physical environ- ment description	SAFGRAD FSR Soil Scientist National Agronomist	- FSR Scientists (all) - Technicians - Senior University Students - INERA (Soil & Water)	- Agro-met. - INERA - Soil and Water Dept.
I. Socio-economic evaluation of technologies	SAFGRAD FSR Economist	- FSR Scientists (all) - Technicians - University and techni- cal School Senior Students	- INERA - Ministry of Agri- cultural Development

ANNEX - BUDGET

Additional Fund/Yr. for Existing 1988-89.

ADDITIONAL FUND/YEAR FOR EXISTING 1988-89

a) Expanded activities on present site:

	<u>Budget 1987 Estimated</u>	<u>Agro-forestry</u> + Agron.	<u>Animal Production</u>	<u>Economics</u>	<u>General</u>
1. Personnel	48,280	17,000	6,000	2,000	36,000(2coves)
2. Equipment	126,980	1,200	-	-	-
3. Supplies	14,550	3,000	-	-	
4. Operational fund	72,000	8,000	15,000	9,000	+15,000(Fuel)
5. Training seminars	21,000				+21,000
Total	282,910	29,200	21,000	11,000	82,000
6. Unforeseen (5%)	14,146	1,460	1,050	550	3,600
Total.....	297,056	30,660	22,050	11,550	85,600

ADDITION FUND - 1988 - 89

	b) Collaborative research with disciplinary depts.	c) Consultancy to INERA	d) Assistance to FSR Regional Teams	
1. Personnel				
2. Equipment				
3. Supplies				
4. Operational fund	40,000	16,000	30,000	
5. Training & Seminars			20,000	
Total.....	40,000	16,000	50,000	53
6. Unforeseen (5%)	2,000	800	2,000	
Total.....	42,000	16,800	52,500	111,300
<u>TOTAL</u>				548,216

BUDGET FOR 1988 - 1991

	1988-1989	1989-1890	1990-1991
1. Personnel	73,200	73,200	73,200
2. Equipment	160,000	-	-
3. Supplies	18,000	18,000	18,000
4. Operation	205,000	205,000	150,000
5. Training & Seminars	70,000	50,000	50,000
Total.....	526,200	346,200	291,200
6. + Unforeseen (+5%) (rounded)	553,000	365,000	310,000
+ 15% Inflation and staff benefit allowance	636,000	420,000	355,000
			1,411,000

BUDGET FOR 1988 - 1991

	1988-1989	1989-1890	1990-1991
1. Personnel	73,200	73,200	73,200
2. Equipment	160,000	-	-
3. Supplies	18,000	18,000	18,000
4. Operation	205,000	205,000	150,000
5. Training & Seminars	⁵ 60,000	⁵ 40,000	⁵ 40,000
Total.....	<u>516,200</u>	<u>336,200</u>	<u>281,200</u>
6. Unforeseen (15%) (rounded)	⁵ 540,000	⁶ 355,000	¹ 300,000
+ 15% Inflation and staff benefit allowance	³ 620,000	² 410,000	⁵ 345,000
			<u>1,375,000</u>

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Department of Rural Economy and Agriculture (DREA)

African Union Specialized Technical Office on Research and Development

1987-08

SAFGRAD SUPPORT TO NFSR PROGRAM OF BURKINA FASO

Kibreab, T.

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