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BAMAKO, MALI

MALI-SUD FARMING SYSTEMS RESEARCH PROJECT

-An Evaluation Report-

by

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for the

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MALI-SUD Farming System Research Project

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INTRODUCTION

This report summarizes observations made during a brief tour - December 2 to December 9, 1980 - through the villages affected by the Farming Systems Research project in southern Mali. The tour was a review mission organized by Dr. Tiécouradié Diarra, Director of the project, to advise on future research strategies. In addition to Dr. Diarra and the research staffs of the FSR and a related Dutch project, the mission included: Dr. Andrew Ker, IDRC Ottawa; Dr. David Norman, Kansas State University; Werner Kiene, Ford Foundation, Ibadan; and Peter Matlon, ICRISAT, ouagadougou. Two representatives from IER also accompanied the mission: Boubacar Traoré, agronomist from the Division de la Recherche Agronomique, and Jacques Brossier, economist. Views of all these persons have been liberally incorporated, without attribution, into this report. I also benefited from prolonged discussions on the subject with Roger Simmons. Any misjudgements, however, are only mine.

PROJECT BACKGROUND

The Farming Systems Research project is a multilateral effort by USAID, IDRC (Canada), the Ford Foundation, and the Government of Mali. The project covers the Mali-Sud region and is based in Sikasso. The Institute d'Economie Rurale (IER) is the umbrella organization within the Malian Government charged with the implementation of this project.

The project emerged out of a 1976 Colloquium on Farming Systems Research held in Bamako under the sponsorship of the Ford Foundation. Subsequently, in 1977, a group headed by Dr. Almouzar Maiga and including Dr. David Norman of Kansas State University, drafted a program of Farming Systems Research for Mali. This document, commonly referred to as the "Rapport Norman", remains the basic statement for the FSR project. Initially, the FSR program was to

concentrate in the Mali-Sud zone and, if successful, possibly be expanded to other regions.

Agreements between donors and the Government of Mali were signed in 1978. The project was to last 5 years, but AID's participation was scheduled for only the first two. USAID financial contribution to the Farming Systems Research project is relatively small. It amounts to \$175,000, most to pay for four vehicles, office and field equipment, and to build up basic infrastructure at the small Tierouala research station. USAID also pays for several enqueteurs and other lower-level personnel.

The Ford Foundation contributes \$100,000 for future training of Malian participants abroad. The largest financial burden is carried by the Canadian IDRC to cover operational expenses and the salaries of Malian research staff and two French-speaking expatriate advisors. IDRC's initial commitment was for \$418,000 over the first three years. IDRC has now extended its commitment up to 1983, and has included the building of project offices in Sikasso.

In accordance with the project agreements, a new division --DRSPR (Division de Recherches sur les Systemes de Production Rurale) -- was created within the Institute d'Economie Rurale in order to implement this project. Dr. Tiecouradié Diarra was detached from the Division de la Recherche Agronomique (DRA) and named Director of DRSPR. Moreover, the experiment station of Tierouala, near Sikasso, was transferred from DRA to DRSPR.

In addition to the Farming Systems Research project, DRSPR was given control over a small socio-economic research project which was financed by the Dutch government, and which was in operation at the time (1977) in villages around Fousebougou, northwest of Sikasso. Dr. Diarra is also Director of the Dutch financed project. The two projects share offices in Sikasso and interact closely in many ways, but they are financially independent of each other.

The Farming Systems Research project is now fully staffed. The Malian research staff includes two agronomists, Dr. Diarra, the Director, and Boubacar Coulibaly; one sociologist, Mahamadou Tongara; one animal scientist, Abou Berthé; and one economist, Ousman Sy. In addition there are 6 young Malian

enumerators in three villages. The two expatriate advisors provided by IDRC are Amal Chatterjee, Ph.D. in Agronomy, from India, with experience in rice production in Algeria, Vietnam and the Phillipines, and John Lichte, agricultural economist, U.S. citizen, Ph.D. candidate at Michigan State University, and former Peace Corps Volunteer in Upper Volta. Chatterjee has been with the project since February 1979, while Lichte arrived only a couple of months ago (October 1980). There are no Canadians in the team.

The Dutch project contingent is headed by Paul Kleene, a Dutch agro-socio-economist with long experience in West Africa. It also includes Gerben Vierstra, Dutch sociologist, and Will Händers, a Dutch economist on his second tour as a volunteer. In February 1981 the Dutch project expects the arrival of Robert Shulman, a U.S. agronomist with experience in animal traction. The Malian research staff are: Bakary Sanogo, animal scientist; Zana Sanogo, agronomist; and Djigué Diabaté, sociologist. There are also six enqueteurs in the three villages covered by the Dutch project. Several of the Malians now with the FSR project were formerly with the Dutch project.

THE FARMING SYSTEMS RESEARCH APPROACH

Norman defines "...the primary aim of the Farming Systems Research approach is to increase the overall efficiency of the farming system; this can be interpreted as developing technology that increases productivity in a way that is useful and acceptable to the farming family, given its goals, resources, and constraints" (Norman, 'MSU Rural Development Paper No. 5, 1980, p. 5, see documentation annex). "... FSR recognizes and focuses on the interdependencies and interrelationships between the technical and human elements in the farming system". (idem).

The essential elements of the Farming Systems Research approach over the traditional conduct of agricultural research can be summarized:

- (a) It places the farmer at the center of the process, as the ultimate judge of the relevancy of agronomic research;
- (b) It emphasizes the need to understand what farmers are doing currently, and the rationale for their practices;

- (c) It highlights the need to view technological innovations in agriculture from the perspective of the whole farm, rather than as partial solutions;
- (d) It takes into consideration the interaction between the technical and the human elements in determining a farming system, and adopts a multi-disciplinary approach to research;
- (e) It bridges the gap between researchers and farmers by stressing the need to conduct farm-level testing as part of the cycle for generating agricultural research.

No explicit statement of objectives appear in the IER paper, (see documentation annex), but the following can be readily inferred:

- (a) To gain a close understanding of the structure of farming in the Mali-Sud region, and the principal constraints faced by different types of farmers;
- (b) To identify potential interventions to raise farmer's production of food and cash crops;
- (c) To provide guidelines and priorities for agricultural research, so as to respond to the more critical needs of farmers;
- (d) To screen promising interventions by testing them at farm level, and identify those most apt for further extension among the region's farmers.

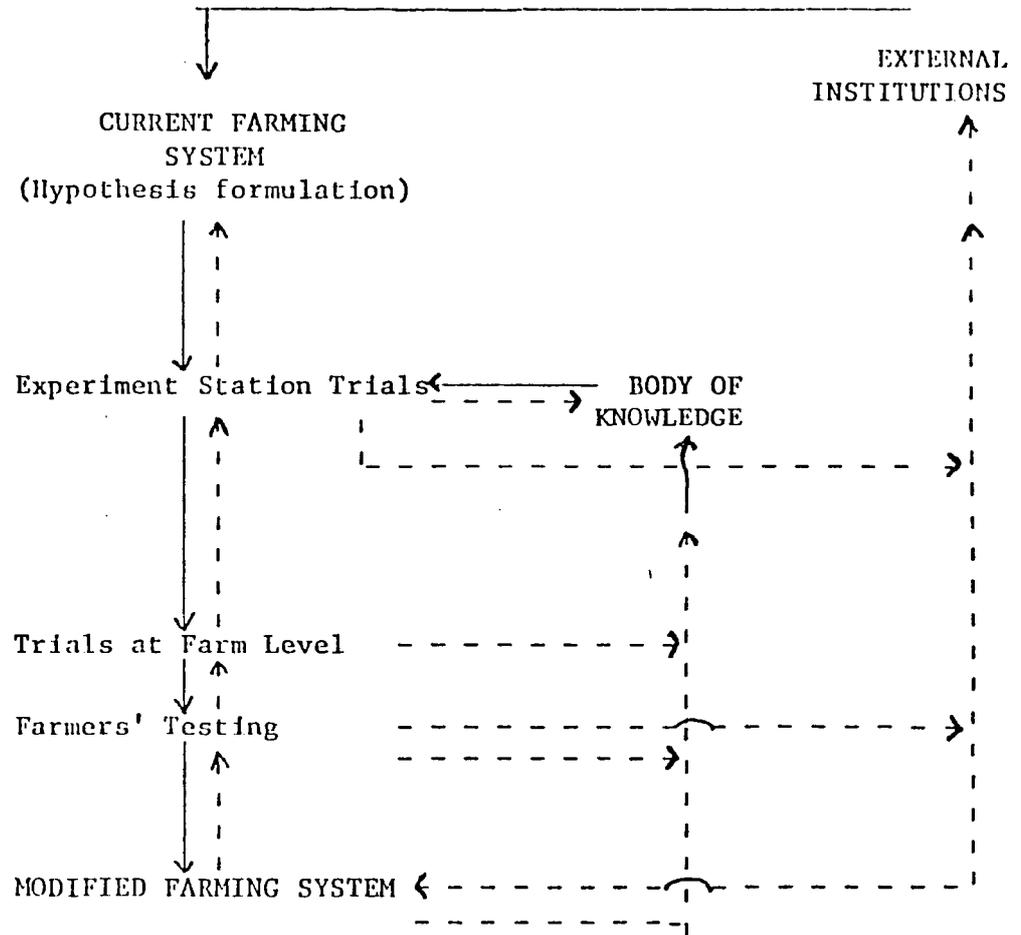
To accomplish these objectives a 4-stage methodology was proposed for the Farming Systems Research project (see accompanying diagram):

- (a) A descriptive phase to study the existing farming system and determine its constraints;
- (b) A design phase to conceive new technological solutions to remove those constraints, and test them in experimental stations;
- (c) A testing phase of those new techniques in farmer's fields; and
- (d) An extension phase to make those successful techniques available to large numbers of farmers.

This logical scheme of the Farming Systems Research approach for the generation of new agricultural technology is illustrated in the accompanying dia-

FARMING SYSTEM
RESEARCH STAGES

1. Description or diagnosis of present farming system
2. Design of improved systems
3. Testing of improved systems
4. Extension of improved farm system



SCHMATIC FRAMEWORK FOR FARMING SYSTEMS RESEARCH AT THE FARM LEVEL
(Downstream Farming Systems Research)

Source: Norman, D. The Farming Systems Approach Relevancy for the Small Farmer. MSU Rural Development Paper No. 5, 1980.

gram, found in several of the documents cited earlier.

Implementation

These four stages are not to be viewed as a linear sequence of steps, but rather as a recursive cycle of trials, errors, and modifications. It is not necessary to start at Stage I and continue down the line. Indeed, the authors of the IER Project Paper note that "there is a considerable body of knowledge which permits the farming systems research group to start some research directly at the experimental level on farmers' fields..." Nevertheless, in the implementation of the FSR project, the four-step sequence was adopted as an agenda for action, and the first two years of operation have been occupied in going through the first step. This leads to the concern that the project could end before it completes even one full cycle. A more activist approach is therefore required.

Descriptive Stage

It is deceptively simple to say "First, let us describe the current farming system, and identify its constraints". The methodology to accomplish this promptly and efficiently has not yet been developed. The established farm management technique of detailed data collection of input, output, and market relationships during at least one full crop cycle has proven effective, and requires only a graduate-level researcher to supervise the data collection and then analyse the results. Unfortunately, in the best of cases a minimum of three years is needed before the results are available and it is hard to institutionalize the follow-up of the results with practical recommendations for new solutions or interventions. That approach was therefore rejected in this project.

The authors of the IER Project Paper sought instead to gain time through the use of a case-study methodology. Rather than plodding through vast amounts of data on many randomly selected farmers, they suggested the careful selection of no more than a dozen farming units representing three or four "types" of farming in the region. Through formal and informal techniques to gather information on these case studies, it was hoped that the project researchers

would be able to define the principal constraints of prototype farming systems in the Mali-Sud region. As it will be seen, the difficulties of that methodology were greatly underestimated.

Selection of Villages

The original IER paper called for an initial reconnaissance survey of some 300 villages throughout the Mali-Sud region. Out of the estimated 9000 families, 200 were to be chosen randomly throughout 45 villages, in order to develop a typology of farmers according to their degree of technological advancement. Such an undertaking soon proved to be beyond the limited resources of the project. Instead, the project management wisely opted to focus their efforts in only three villages, chosen so as to reflect different levels of development. To do this it took advantage of data available at ^C ~~C~~MDT (Compagnie Malienne de Developpement Textile), obtained in the course of the latter's own surveys. Of course, the CMDT data is mostly concerned with aspects related to cotton production. Fortunately, cotton production coincides all too well with the level of development of villages in the Mali-Sud region. The most prosperous districts and villages are those where cotton is widespread and long established; conversely, the poorer villages are those not included in the zone of influence of CMDT.

The determinant role of cotton is evident in the three villages selected: In Sakoro, the poorest village, no cotton is produced; in Gladié, the most advanced village, 31 percent of the area is planted in cotton; in Monzondougou, the intermediate village, 17 percent of the cropland is in cotton (see accompanying Table 1).

The observed relationship between cotton and development fits well with the theories of export-induced growth in the economic development literature. According to such a school a region's development is tied to its ability to produce an item for export to the outside; the income thus generated, if properly distributed among the producers, slowly gets channeled into capital accumulation and a corresponding improvement in productivity ensues. One may postulate then a sequence of developments in the Mali-Sud villages, starting with the opening of cotton production possibilities through the intervention of CMDT. Slowly, as more farmers are able to enter cotton pro-

COMPARATIVE TABLE OF FSR VILLAGES

Criteria	Gladié	Monzondougou	Sakoro
Production Units (PU)	60	41	80
Total Population Present	1,715	674	926
Active Population	476	294	412
Total Population/PU	28.6	16.4	11.9
Active Population /PU	8.0	7.3	5.1
Total Population/Active Population	3.6	2.3	2.3
Cultivated Area (has)	366.5	225.7	152.4
Cultivated Area/PU	6.1	5.5	2.0
Cultivated Area/Total Population ¹	0.21	0.33	0.16
Cultivated Area/Active Population	0.75	0.76	0.38
Cotton Area (percent)	31.1	16.9	0.0
Cereal Area (percent)	65.1	65.7	61.0
Rice Area (percent)	9.1	10.9	28.0
Other Crops Area (percent)	-	6.5	11.0
Absentee Population/Total Population (percent)	32.0	10.5	5.0
Cattle Ownership (percent PU's)	75	71	69
Animal Units (UBI/PU)	6.1	4.5	3.8

Source: DRSPR Typology Report, 1980.

duction, their cash revenues allow the purchase of better agricultural implements and increased specialization in production. The introduction of oxen and animal traction equipment marks a major threshold in increasing the productive capacity of the farmer. Improved soil fertility from the use of manure and inorganic fertilizer in cotton, progressively allows the continued cultivation of land without fallow. (In Gladié, for example, there are fields in permanent cultivation for over 20 years.) The three year rotation recommended for cotton has maintained a balance between cotton and cereal crops, notably sorghum and millet. Indeed, the prosperous village not only produces more cotton, but also more cereal grains than Sakoro, the village without cotton.

Animal traction and increased wealth has induced farmers to acquire livestock, cattle in particular, and to incorporate them into their farming. While in Gladié cattle ownership is widespread, cattle are milked, fed, herded, and kept in paddocks; in Sakoro there are few cattle, they are not used in farming, and are not herded outside of the rainy season.

The observed differences among villages cannot be attributed to ecological factors. No major differences are observable in soils, although Gladié is near low-lying areas along a tributary of the Bagoé River, hence a slightly better soil might be present there.

In terms of location and access to road transport, the situation of the three villages is deceptive. Sakoro, the poor village, is both closer to Bamako and to the paved road; Gladié, the rich village, is farthest from Bamako and the paved road; Monzondougou is in an intermediate position on both counts. For cotton production, however, it is the proximity to the processing facilities that count, and these are located in Sikasso. Hence the relative development of these three villages is consistent with the locational theory of economic activity. Not until a couple of years ago did CMDT open a ginning plant in Bougouni. It is hoped that the presence of such a new "pole" of development will open the way for Sakoro to enter the transformation that the other two villages have already undergone in the past two decades.

To conclude, the Farming Systems Research project set out to stratify villages according to different levels of technology in agriculture. We ended up with

three villages with different levels of cotton production. The relationship between the level of technology and exposure to cotton production is evident. Development in Sakoro, it seems therefore, was not such much hampered by lack of agricultural technology suitable to its conditions, as by its lack of access to the cotton market.

Future improvements in the agricultural productivity of Sakoro farmers would be hard to attribute to the effects of the FSR project, since, with the opening of the Bougouni cotton ginnery, Sakoro stands to benefit substantially.

Typology of Farmers

Once villages were chosen, the project researchers proceeded to make a survey of all family units in order to develop a typology of farmers in each village. It had been envisaged that at most four "types" of farmers would be needed. To identify the two extreme types of farmers was relatively simple: small, poor farmers, with little equipment, no oxen, no livestock and no cotton fall into the lower group. Large farm units, well equipped, with oxen, with livestock, and a lot of cotton fall into the upper group. But farmers in-between defied categorization into neat homogeneous groups. If ranked according to one criteria, other categories would come out of alignment. Among the main variables considered were the number of active family members, dependency ratios, equipment present, livestock ownership and types, total crop area, cotton area, cereal area, techniques used, cotton yield, and gross revenue per adult head.

Project researchers then adopted an ad hoc strategy and grouped farmers in each village into subjectively satisfactory categories. Categories differ between one village and another. Six types were defined for Gladié, four in Monzondougou, and four in Sakoro. Within each type there may be several sub-types. For each type and major sub-type, one or two farmers were selected as case studies. A total of 29 case studies are being carefully monitored: 10 in Gladié, 9 in Monzondougou, and 10 in Sakoro. The net effect is a rather unstructured quilt of farmers, but there is sufficient variation among them to reflect the diversity of farming in the region.

Case Studies

Two enqueteurs in each village are charged with collecting data on the case studies. Everyday they visit the fields to find out who is working where; fortunately farmers' fields in the region are contiguous rather than dispersed around the village. Questionnaires cover family composition, time used in agricultural work, use of farm equipment, use of oxen, field measurements, yield measurements, agronomic practices, livestock activities, revenues and expenses. The enqueteurs seem contentious and well informed about the case studies under their responsibility. In each village the mission had opportunity to chat with two farmers, one poor and one prosperous, and to visit their fields.

It is worth noting the deliberate exclusion of champs-de-case from the survey; these are the small plots around the concession or in the immediate perimeter of the village. Although small, these plots have the highest fertility since they receive the villager's organic waste matters. They are usually tended by women, and are planted with corn and vegetables. The researchers felt these champs-de-case were too small and irregular in shape to merit the record keeping effort.

Another important omission concerns women's time use. Only their farming activities are recorded; no account is kept of time needed to procure water and firewood, grain pounding, food preparation and delivery, and child care. Given the traditional importance of women's labor in African farming and the trade-offs between farm and household activities. Such an omission seems unwarranted. All the more so since the research team benefited from the participation of several sociologists. There are no women in the project staff.

Rice production is the exclusive concern of women and it invariably takes place in small basé-fond plots. After some initial hesitation, rice fields were included in the survey of case studies. Rice is particularly important in Sakaro, the poorest village, where it accounts for over one-fourth of the cultivated area.

The ratio of 5 families per enqueteur seems excessively low compared to 15 to 20 families in similar surveys elsewhere in West Africa. The main reason for this is the high frequency of interviewing - daily - and the emphasis placed

on field visits everyday. The project researchers were urged to shift to intermittent interviewing every several days, relying more on memory recall by the farmers. Three to four day recall is normally reliable; beyond that accuracy diminishes unless the information is very specific. Reduced frequency of field inspections was also suggested.

Data was collected on the case studies during the 1980 crop season and will be continued during the 1981 season. Why it is necessary to collect a second year of data is not clear. On the other hand, farm-level trials are planned for the coming crop season using the case-study families, hence close monitoring will be required.

Data Analysis

Analysis of the case studies for the 1980 season has not yet begun. There is justifiable concern among the researchers that the preparations to carry out the data processing are not adequate. As often is the case, it is easier to collect data than to digest it. There are far more figures than were ever anticipated in the Project Paper. At most a dozen case studies had been envisioned, and the analysis was to be qualitative and monographical, rather than strictly qualitative. Now we are faced with ten special cases in each of three villages. These are far too many to be treated under the prescribed case-study methodology, and too few and heterogeneous to be amenable to standard statistical analysis.

There is no clear perception of what sort of analysis is to be done on the data. The case-study technique presupposes an intimate knowledge of the subject units by the researcher. This is hardly the situation in this project. The researchers lives in Sikasso, and given the distances and time involved, they can visit the villages only once every couple of weeks and for a brief period at that. Their time is naturally spent mostly with the enumerators themselves. The latter are personally well acquainted with the case-study families, but their knowledge is not easily transferrable to the researchers who rely mainly on the questionnaires for information. The researchers are therefore in a dilemma. Should they spend more time in the villages getting familiar with the case studies, or in Sikasso analysing the questionnaires?

Another objection voiced by others to the case-study methodology is the long experience and high level of training required of the researcher. It is hard enough for a veteran observer to know what is important in understanding a particular farming system and what is not relevant. It is overly ambitious to charge that responsibility on the shoulders of a young professional fresh out of college. The project research team is highly dedicated and well qualified, but relatively young and without experience in farming systems research surveys. The on-the-job-training of these young professionals should be considered a valuable output of this project.

The numerical manipulation of data flowing from the field already poses a challenge to the limited personnel available at the project bureau. IDRC agreed with some reservations to the purchase of an Apple micro-computer, which is already in Sikasso. The electric supply is not much of a concern despite the lack of reliability of the electricity in Sikasso, because the project bureau is in the same sector as other government agencies which receive special treatment from the company. The Apple and its accessories have not yet been unpacked or tested. Software would need to be developed to process the questionnaires; that might require hiring of specialized personnel, although John Lichte, the newly arrived agricultural economist, is said to be adept at operating the unit.

Initially, the Apple might create more problems than it solves, and take an inordinate amount of time from the researchers, but once the programs are developed it might pay off in prompt results. The long-term reliability of the system under local conditions remains worrisome. A manual back-up system should be kept as a precaution.

For the time being the project management has decided to postpone the introduction of the computer processing until after the researchers become experienced with the manual methods using calculators. Jonathan Gluckman, a Peace Corps Volunteer attached to IER as a data processing specialist, has already assisted the project with some programming. IER's experiences with their Radio Shack unit will be helpful in getting the project's Apple in operation.

Conception Stage

In the second stage of the Farming Systems Research scheme new technological solutions to alleviate the constraints found in stage one are conceived and tested at the experimental station level. Since no specific constraints have yet been singled out in the first stage, this conception exercise has not taken place so far. Precisely how the needed creativity will come into being is not specified. There are no modeling or simulation games contemplated as part of the process. Brain-storming sessions between the research staff and the review mission were very informative and mentally stimulating but very few new and practical ideas developed. More likely, techniques already existing elsewhere would be selected for trial under experimental conditions at the research station.

Conceptually, the second stage of the FSR methodology is the least satisfactorily understood by this reviewer, and its proposed implementation raises two serious issues: the links between the FSR project and the rest of the agronomic research network, and the role of the Tierouala experimental station with the project.

Project Links to Agricultural Research

A separate division was created within IER to carry out the Farming Systems Research project. That places the project on an equal status with the Division of Agronomic Research (DRA), the body charged with overseeing agricultural research in the whole of Mali. DRA has under its jurisdiction the national network of agricultural experiment stations, and the more local research units named PARs (Point d'appui à la Recherche).

There exists, therefore, a real danger that the Farming Systems Research division be perceived as a separate entity outside the rest of the national agricultural research community. There are no built-in linkages between the project and the DRA apart from the fact that both are under the umbrella of IER. Coordination between the two divisions is accomplished through the annual meeting of the Comité National de la Recherche Agronomique (CNRA), a four-day event that is not conducive to meaningful dialogue. The occurrence of separation and isolation has already been experienced in another

FSR unit elsewhere in West Africa, with the consequent defeat of the principal purpose of Farming Systems Research, namely bridging the gap between researchers and farmers.

It is therefore reassuring to observe a definite effort on the part of the project management to maintain close association with DRA and other research organizations. The project director, Dr. Diarra, is commended for these initiatives. The presence in the mission of Dr. Traoré, an agronomist from DRA, and of Dr. Matlon of ICRISAT, attest to his efforts in that regard. Moreover, DRA is carrying out agronomic experiments on cotton at the Tierouala experiment station. Such linkages in the field between DRA and DRSPR should be encouraged and strengthened.

In future prospective FSR undertakings, the alternative ~~of~~ option of creating a Farming Systems Research unit within the existing agricultural research organization, rather than as a parallel entity, should be given careful consideration. Farming Systems Research ought to be viewed as a process to promote interaction between agricultural researchers and farmers, rather than as a separate project standing on its own.

Tierouala

The small Tierouala research station was transferred to the Farming Systems Research project as a way to provide an in-house capability to conduct controlled experiments on new technologies before being tried in farmers' fields. So far, however, the Farming Systems Research project has not generated any program of research for the station. In the past two crop seasons since the station has been under DRSPR control it has continued research experiments planned under the previous administration and on which there is no longer much interest. For the 1980 crop season it was scheduled to perform comparative culture on several crops using motorized (tractor) techniques and animal traction methods. Unfortunately, the only tractor available broke down in the first week of operations and the experiments were aborted. The tractor remains disassembled for lack of spare parts. No plans for experiments in the 1981 season are likely as part of the FSR project, but the DRA

experiments on cotton might continue, and the Dutch project would like to try some animal traction using a single ox, rather than a pair.

Given the agreed priority of having the project conduct a few farm-level trials in the coming 1981 crops season, and the need to complete the analysis on data collected on the case studies in the last season and the next, it is unrealistic to stretch the agronomic talent in the project to undertake experiments at the station. The suggestion has been made to delegate responsibility for supervising the station, at least temporarily, to an agronomist provided from the outside, either by DRA or a donor-agency. The project management, however, remains hopeful that beginning in the fourth year the station could be brought into the activities of the project.

At the moment, the grounds of the station are properly kept, and despite the lack of a tractor, the yields from the experimental plot look favorable. There are five working oxen and two young steers. A brand new meteorological station was built by the Meteorology Service, but the improvement scheduled for the station under the FSR project, including the construction of a stable, an outside fence, a network of ditches, and storage and workshop buildings have not been made. They are waiting the approval of USAID, the funding agency for those items, of the plans drawn by Genie Rurale.

In summary, Tierouala has played and will likely continue to play a rather marginal role within the Farming Systems Research project. There is at the moment no clear plan of action to integrate the station into the rest of the project's activities. Alternatives for the future need to be explored.

Trial Stage

In the first two crop seasons it was thought prudent to refrain from intervention that, if not successful, could have diminished the credibility of the project in the eyes of the farmers. The project management and the review mission now agreed on the desirability of doing something concrete in the villages under observation, in addition to the data collection.

Many ideas for action were put forward but it is best to concentrate efforts on only one or two to assure proper monitoring. The main focus suggested for

the 1981 crop season concerns maize. Several organizations have already identified corn as a promising cereal crop for Mali-Sud, in view of its high yield potential, good response to soil fertility, short cycle and relatively easy agronomic practices. CMDT now has started a maize promotion program. There is increasing concern about the deteriorating profitability levels for cotton, hence the need to develop an alternative cash crop for the region.

Corn is not a new crop to the Sikasso area. Almost all families grow small patches of corn around the concession, in the champs-de-case. It is also grown in the field in association with millet, or sometimes with sorgho, but almost never as a sole crop. Although it is widespread, corn is really a minor crop. The main factors inhibiting the extension of corn are flavor and milling. Corn is consumed exclusively as sweet corn, grilled, rather than as grain. Its short cycle and availability early in the season makes it ideal as a soudure crop. Corn grain is often used to satisfy the cereal demands from OPAM. The local diet strongly prefers millet and sorghum over corn.

Grinding corn grain is not easily done with the traditional wooden mortar and pestel. To introduce corn meal in the diet would require the furnishing of manual or power mills. Although their use is widespread throughout households - such as in Latin America- they are not found in West Africa. Even in the most prosperous unit of the prosperous village (Gladié) grain is ground by women in the traditional manner. The experiences of introducing hammer mills in villages in the Sine-Saloum area of Senegal might provide some lessons on the feasibility and problems of introducing corn mills in the area.

There is a widespread belief in the field, by farmers and agricultural officers alike, that CMDT credit and fertilizer are available only to those farmers who grow cotton. In the CMDT Sikasso office, however, no such linkage was acknowledged in principle, but it was conceded that in practice farmers with long standing relations with CMDT in connection with cotton, would of course be the more likely to take advantage of the newly introduced corn program. Moreover, credit is extended by CMDT on a newly commercial basis for the season, and a reasonable prospect for payment is required. Farmers

without cotton are therefore not viewed as worthwhile risks because they have no alternative source of cash. Corn itself is not yet viewed as a cash crop in the area of Sikasso, although in Koutiala it is reported that many farmers already grow corn as sole crop rather than in association.

CONCLUSIONS

The first two years of operation of the Mali-Sud Farming Systems Research project provided valuable information on the promises and difficulties that arise in carrying out the FSR approach within a national context.

Progress in implementing the prescribed four-stage FSR methodology has been slower and harder to achieve than it was anticipated when the project was designed.

All efforts so far have been concentrated in gathering information for the first stage—description of current farming systems—but the constraints analysis remains to be done.

The efforts at reaching a farmer typology for the region has not produced a clear categorization of farmers according to their level of technological advancement.

The case study approach has developed several pitfalls in execution: too many case studies are being followed; researchers are not in sufficiently close contact with the case studies; over-emphasis has been given to data collection activities and not enough to the informal techniques demanded for successful case study analysis; there are serious reservations how applicable standard statistical procedures are to data aggregates collected for the case studies.

Data processing bottlenecks will surely arise in the coming months when analysis of the case studies starts, and preparations for the next season's research are in progress. Assistance with data processing will probably be necessary.

The project management is highly competent and dedicated. A good working atmosphere is sensed within the project, and interactions between the FSR and the Dutch-funded project are frequent and cordial. The Director is personally committed to maintain links with outside agricultural research units such as the Division de la Recherche Agronomique and ICRISAT.

Many of the difficulties encountered in the first two years of the project might be attributed to the relative youth and lack of experience on similar research on the part of the research staff. ~~The profession~~

The professional experience in Farming Systems Research gained by the research staff of the project is a valuable contribution made by the project

Cotton production and accessibility to the extension network provided by CMDT seems to play the determining influence in inducing the adoption of modern agricultural practices. The spread of animal traction in the region can be credited largely to the cotton production possibilities of the zone. The opening of the Bougouni cotton gin plant augurs well for the introduction of new techniques in Sakoro, the poorest of the three villages in the project, if cotton production becomes established.

There is reasonable concern about the potential for separation and isolation of the FSR unit from the rest of the national agricultural research community. So far the Director has maintained close associations between DRSPR and DRA and other international groups like ICRISAT and SAFGRAD.

The project management has exercised initiative in adjusting the methodology prescribed in the IER project paper to suit the conditions of the region. The revised strategy for selective villages was justified. The exclusion of livestock as a major concern for the FSR project appears warranted by the relatively secondary role of cattle in the area, outside animal traction, and the limited potential for livestock related research within the project.

The program of farm-testing of CMDT recommendation on maize will provide more concrete evidence of the value of FSR than the straight forward data collection activity done so far.

The Tierouala research station has played a negligible role in the project's activities, and it is likely to remain of marginal attention in the next couple of years.

RECOMMENDATIONS

The rather critical review of the Mali-Sud project should not be construed as an indictment of Farming Systems Research. Similar problems are common to other attempts at collecting farm-level data in an African rural milieu.

The basic aims of Farming Systems Research remain important to pursue as part of any program of agricultural research directed toward African agriculture. Two elements of FSR bear highlighting: its emphasis of understanding the rationale for the farming system currently practiced by farmers; and its focus on farm-level testing as a critical stage in the generation of new agricultural technologies.

The difficulties encountered in implementing the recommended FSR methodology should motivate a careful review of alternative procedures. In particular, the adequacy of the case-study and farm-typology approaches to capture the existing structure of agricultural technology should be reconsidered in the light of the problems in this project. The option of using traditional farm management survey techniques is worth studying.

Replications of the Farming Systems Research project in other regions of Mali should await further experience in the Mali-Sud area, and the opportunity to redesign those elements of the project that appear the weakest.

It would be preferable, whenever possible, to establish the FSR unit within the existing structure of agricultural research, instead of as a separate unit of equal status as it was done in this project.

The objectives of Farming Systems Research may be pursued without establishing FSR units. Activities such as the tests-de-pre vulgarisation already

in DRA, and the program of farm-level tests of sorghum and millet done by SAFGRAD in Mali, should be encouraged as much as possible.

The scope of work of Farming Systems Research units should be concentrated along the first and third stages (description of current system and constraints analysis, and farm-testing of new techniques). That would imply leaving the task of designing new solutions to the established agricultural research organization; moreover, the diffusion of successfully tested techniques should be entrusted to the network of extension services already in place.

Project Documentation

There are several documents that should be kept for future reference on the project.

(a) The fundamental paper for the Farming Systems Research project in Mali is the report prepared by Norman, Maiga, et.al., in 1977, entitled "Pour un Programme de Recherche sur les Systemes de Production Agricole", put out in mimeograph form by the Institute d'Economie Rurale. That report is more than a project paper; it discusses at some length the entire organization of agricultural research in Mali and introduces Farming Systems Research as a possible way to improve its results. The report identifies the Mali-Sud region as the area of principal interest to try the applicability of Farming Systems Research under Malian conditions. It also set the organization of a FSR unit to carry out the pilot scheme, and outlines in some detail the methodology and the program of activities for the first five years. An ambitious initial 5-year budget of close to three million dollars was put forward.

(b) Grant Agreement. This is a legal document setting the terms of the accord between the Government of Mali and the United States concerning the U.S. financial contribution toward the project. It contains little of substantive nature, except for a 4-page Annex giving a brief description of the project. An illustrative breakdown of the \$175,000 budget is also included there.

(c) Progress Reports. The only progress report available on the FSR project activities is the "Rapport Synthetique de la Campagne 1979-80, et Programme 1980-81" submitted by the Division de Recherches sur les Systemes de Production Rurale (DRSPR) at the annual meetings of the Comité National de la Recherche Agronomique (CNRA) in May 1980. The report includes three separate sections. One describes the three villages along the Bougouni-Sikasso road selected for observation as part of the FSR project. The second part gives an account of activities in the Dutch project around Fousebougu. A third section (2 pages) re-

lates the experiments at the Tierouala station. The report closes with a list of anticipated activities and topics of research under the three units for the 1980-81 crop season now underway.

USAID/Bamako can request copies of the DRSPR reports at the annual meetings of CNRA as a way to keep abreast of activities of the project. The next report is due around March 1981. The previous report, April 1979, is not of interest here; it only covers activities of the Dutch project in Fousebougou since DRSPR had not yet been created.

(d) FSR Research Project Papers. The first major report coming out of the FSR project just appeared in November 1980, namely the "Rapport sur la Typologie Préliminaire des Unités de Production dans les Villages de Gladié, Monzondougou, et Sakoro." The typology report condenses the work performed in the project during the first year of operations (June 1979 to June 1980) and it served as the basic working document for the tour made by the review mission. It details the process followed in selecting the three villages as representative of a prosperous, an intermediate, and a poor village, respectively. It then gives the criteria used in classifying farming units in each village into homogeneous and distinct categories. It finally explains how certain units (unités de production) were chosen within each category as case studies to be followed at great depth in the future. Of particular interest in the typology report are the sections on each village and the structure of farming units observed. The summary table for the villages is attached. The Annex section of the report includes sample forms to be used during the survey of case studies. Substantive discussion of this report will follow later.

(e) Other documents. There are at least four other pertinent items that merit reading in connection with the Farming Systems Research project: (i) the two annual reports of the SAFGRAD project in Mali (Semi-Arid Food Grain Research and Development), for the 1978 and 1979 crop seasons, submitted to the CNRA; (ii) the Report of the 1979 Season for the Cooperative Program ICRISAT-Mali, Prepared by J.P. Scheuring; (iii) the MSU Rural Development Paper No. 5 by David Norman, "The Farm-

ing System Approach: Relevancy for the Small Farmer", 1980; (iv) the MSU Rural Development Paper No. 6, by E.H. Gilbert, D.W. Norman, and F.E. Winch, "Farming Systems Research: A Critical Appraisal", 1980.

ANNEX II

Some SAFGRAD Results

The SAFGRAD program in Mali duplicates to some extent the goals of the Farming Systems Research project. Among the declared priorities of the SAFGRAD Mali program one finds:

- "Selection pour l'amélioration de la productivité et de la qualité nutritionnelle"
- "Recherche sur les systèmes culturaux: culture associées, rotations, etc."
- "Recherche agro-socio-economique permettant de connaître les contraintes des systèmes culturaux actuel..."
- "Recherches sur le petit équipement et l'utilisation de la traction animale: (Project SAFGRAD Au Mali, Rapport de la Campagne 1978)

These objectives coincide exactly with those prescribed for the Farming Systems Research project. In practice, however, SAFGRAD has not followed the "holistic" approach implied by the above objectives.

Neither have SAFGRAD activities taken place in the DRSPR zone, except for one trial in one of the villages around Fonsenbougou. In that sense there has been no duplication of effort in the area by both SAFGRAD and DRSPR.

The SAFGRAD program is not multidisciplinary. It is carried out by agronomists using standard agricultural research designs in a farm-level setting, using farmers themselves. Information collected is limited to agronomic items directly relevant to the experimental plots; no attempt is made to ascertain the structure of the farming unit, or the other crop production activities. Social factors regarding the farming unit are not considered. Even such things as labor inputs in the plots were not collected.

Reports of the SAFGRAD farm level experiments for the 1978 and 1979 seasons are already available. The most striking result of these tests concern sorghum. The local varieties without fertilizer outyielded the so-called "improved" varieties with fertilizer!! This is not a freak phenomena. Both 1978 and 1979 seasons produced these results. Equally striking are the results concerning response to fertilizer. While the local varieties exhibit a positive response, the "improved" varieties show a negative effect!! Again, the 1978 and 1979 seasons are consistent in this finding.

SAFGRAD results of farm testing for millet are somewhat similar to those for sorghum. Only in the case of corn, the improved variety Tiemanteé slightly outyielded the local varieties with and without fertilizer.

One concludes then that (a) there is very little that the agronomy profession can now offer to the Malian farmer to raise sorghum and millet production; (b) that local varieties do respond well to applications of fertilizer, although the economies of doing so are not certain; (c) that the Tiemantié corn variety offers a slightly promising avenue to increase grain production.

These results from SAFGRAD leave no doubt of the valuable contribution of farm-level testing in crop selection. Such tests should be strongly encouraged.

6250928-③
PD-AA6-028-E1

Cynthia 625-928

DEPUTY

ACTION MEMORANDUM FOR THE ADMINISTRATOR

THRU : ES

THRU : AA/PPC, Alexander Shakow *CP*

FROM : AA/AFR, Goler T. Butcher *BT*

SUBJECT: Proposed Project--CILSS--IPM RESEARCH (625-0928)

Problem: To approve life-of-project authorization for a technical assistance grant of \$25,280,000 and Code 935 procurement of technical services from the FAO and Code 941 procurement for goods and other services to be furnished under the project.

Discussion: The proposed project is designed to establish an integrated pest management (IPM) capability for the protection of food crops within the CILSS (Inter-State Permanent Committee for Drought Control in the Sahel) states. Integrated pest management which involves the maximization of non-chemical control methods through adjusted planting schedules, post harvest stalk destruction, crop rotation, animal traction for weeding, plant breeding and seed soaking, has been tested elsewhere in the world and proven effective. Under the proposed research activity, the integrated pest management methodology will be tested and validated for application within the Sahel.

Although this applied research into integrated pest management is a distinct, self-contained project, it fits into a \$68 million comprehensive CILSS program for protection of crops in the Sahel. Other elements of the program which are being financed primarily by other donors include strengthening national plant protection services, delivery systems, rodent control, research into and control of grain-eating birds and information/training capabilities related to plant protection program. See the attached chart which presents in visual form the overall context for this project.

The proposed project is responsive to AID's Congressional Mandate since it is aimed at development through research of technically and environmentally sound production practices which will enable the small farmers of the Sahel to reduce food crop losses caused by pests. The project is also sensitive to Congressional directives in that it strengthens coordination among donors who are active in pest control assistance and utilizes an international organization (FAO) as the technical agent for project implementation.

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AID
EXECUTIVE SECRET

The project consists of three main components: applied research, outreach and regional coordination. Research objectives are to develop and validate the most effective integrated pest control techniques for each of the major food crops of the Sahel. To achieve this it will be necessary to upgrade six laboratories, to establish 70 demonstration study areas (test plots), and to provide 17 expatriate researchers. The research activities will be carried out in conjunction with the national and regional agricultural research organizations in the various Sahelian countries.

The outreach component of this project will be focused on preparing the mechanism for the transfer of the results of the field tested laboratory research to the small farmer through the national plant protection delivery system. A total of 15 expatriate outreach/surveillance personnel (mostly trained entomologists) will be located in the various national plant protection agencies to assure adequate linkage between these agencies and research laboratories. These outreach personnel will also coordinate the collection of pest surveillance data (including base line data for environmental monitoring) and participate in crop forecasting exercises and crop loss assessments.

Under the regional coordination component of this project, specialized expertise will be provided to establish a central coordination office in Ouagadougou. The coordination component will assist CILSS in managing the entire project through negotiated relationships with the various member state governments and appropriate required entities.

Each of the three project components described above will require inputs of equipment (principally laboratory, field, and vehicles) construction, (small laboratories) and other costs (including operational costs and counterpart support). These inputs will be coordinated by CILSS and FAO to achieve an end-of-project status wherein effective pest management techniques are locally available in the Sahel to control crop losses. FAO has been selected by CILSS because of the experience that FAO will bring to the project as a result of its role in establishing the global FAO-UNEP Program on Integrated Pest Control which has been effective in coordinating research on several crops in various locations around the world.

The ultimate beneficiaries of this project are the small farmers in the Sahel who will be able to draw upon tested pest control techniques

to protect their food crops. The direct beneficiaries will be the national agricultural research and plant protection agencies which will receive expatriate assistance and logistical support coordinated through CILSS. Another direct beneficiary will be the CILSS which will gain operational experience in coordinating and managing this regional crop protection program.

The technical assistance grant input called for in this project totals \$25,280,000 for the five year life of the project. In support of this project, there will also be contributions from the United Kingdom and FAC--mainly in the form of advisory personnel--valued at \$1,400,000 over the life of the project. Counterpart contributions from the eight CILSS member states will be made but have not been detailed here since they will be defined in the context of country-operation plans which will be negotiated by CILSS during the early part of 1978. Since this project is funded under Section 121 of the Foreign Assistance Act, the Sahel Development Program, the Section 110(a) requirements of a 25 percent host country contribution to the project are not applicable.*

With respect to project implementation, CILSS has created a special Regional Management Unit (RMU--see Annex B (VILA) of the PP) to provide operational control of the project within the larger context of the CILSS Plant Protection Program. CILSS will rely upon the FAO to assure that technical implementation takes place. The RMU will undertake to assure that the equipment and construction elements are properly managed. AID will assign a Project Manager to Ouagadougou who will be responsible for project implementation and liaison with the RMU. For technical backstopping the project will draw upon the direct-hire entomologist resident in Dakar.

On October 19, 1977, the Africa Bureau Executive Committee for Project Review (ECPR) met and reviewed the subject project. The general finding was that the project was sound and should be authorized for funding in FY 1978. During the ECPR session several issues were reviewed and appropriate action to resolve them was recommended as indicated below:

*This project is described at page 404 of the FY 1978 Congressional Presentation for Africa. The requirement of Congressional notification, therefore, has been satisfied.

- A. Training Waiver: The PP requested a Code 935 waiver to permit training in Europe. The ECPR questioned the necessity of using U.S. funds for this purpose and concluded that if such training was required, European donors should be approached for funding.
- B. Construction and 611(a): Construction cost estimates for laboratory elements at the six sites referred to in the PP are based on calculations derived from costs projected for similar types of structures in the Sahel but not in planning for the actual structures to be financed by AID. Given the uncertainties related to construction costs in the Sahel which vary widely based on the actual location of construction, and the restrictions of Section 611(a), the ECPR indicated that the PP funds earmarked for construction should not be allotted until preliminary plans and cost estimates for each site are reviewed and approved by AID. In addition the ECPR indicated the total of \$1,271,000 should be viewed as the ceiling for AID contribution for construction under the proposed project. In the event cost estimates indicate that additional funding is required, AID will not commit its funds until such additional funding is available.

For effective project implementation it will be necessary to obtain the following waivers:

1. Technical Services: To obtain FAO services, a Code 935 waiver will be required for the FAO core staff as well as any experts who may be recruited from non-U.S. sources as justified on page 1 of the PP. Both CILSS and FAO will be informed that recruitment by FAO must commence in the United States and FAO must maximize and exhaust the qualified pool of U.S. candidates before recruiting from other countries. FAO is to be directed to work out an appropriate relationship with USDA to assist it in technical backstopping as well as in securing qualified U.S. candidates.
2. Procurement of Goods and Other Services: Program objectives require that a Code 941 waiver be granted to CILSS as justified on page 2 of the PP.
3. Vehicles: Although CILSS has indicated that it will attempt to utilize American vehicles, the ECPR suggested that flexibility be retained so that selective vehicle waivers could be requested when project implementation in a particular country requires and justifies it.

Recommendations: That by your execution of the attached Project Authorization you approve (1) the entire proposed grant at life-of-project total of \$25,280,000,

APPROVED A. S. [Signature]

DISAPPROVED _____

DATE 12/8/77

(2) a FY 1978 obligation of \$3,400,000 in two tranches of \$2,329,000 for immediate obligation and of \$1,071,000 for obligation for construction upon determination that 611(a) has been satisfied.

APPROVED A. S. [Signature]

DISAPPROVED _____

DATE 12/8/77

(3) a waiver to permit Code 935 procurement of technical advisory services from the FAO,

APPROVED A. S. [Signature]

DISAPPROVED _____

DATE 12/8/77

(4) a waiver to permit procurement of goods and other services from Code 941 countries plus member states of CILSS.

APPROVED A. S. [Signature]

DISAPPROVED _____

DATE 12/8/77

- Attachments: 1. PAF 1
 2. PAF 2
 3. Statutory Check List
 4. Chart

CLEARANCES

AFR/DR:JWithers [Signature]
 AFR/DR:JKelly [Signature]
 GC:MBall [Signature]
 GC/AFR:STisa [Signature]
 PPC/DPRE:EHogan [Signature]
 PPC/DPRE:PMatheson [Signature]

AFR/DR:DDibble [Signature]
 AFR/DR:NUlsaker [Signature]
 AFR/DR:CHusick [Signature]
 AFR/SFWA:DShear [Signature]
 AFR/SFWA:GMacArthur [Signature]
 AFR/DP:CWard [Signature]
 SER/ENGR:PStearns [Signature]
 SER/COM:PHagan [Signature]
 AFR/DP:FWTate [Signature]

AFR/DR/SFWAP:JGraham: 11/22/1977

AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS PART I	1. TRANSACTION CODE <input type="checkbox"/> A ADD <input type="checkbox"/> C CHANGE <input type="checkbox"/> D DELETE	PAF 2. DOCUMENT CODE 5
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3. COUNTRY ENTITY WEST AFRICA REGIONAL (SAHEL)	4. DOCUMENT REVISION NUMBER <input type="checkbox"/>
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5. PROJECT NUMBER (7 digits) <input type="text" value="625-0928"/>	6. BUREAU/OFFICE A. SYMBOL: <input type="text" value="AFR"/> B. CODE: <input type="text" value="06"/>	7. PROJECT TITLE (Maximum 40 characters) <input type="text" value="CILSS-IPM Research"/>
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8. PROJECT APPROVAL DECISION <input type="checkbox"/> A APPROVED <input type="checkbox"/> D DISAPPROVED <input type="checkbox"/> DE DEAUTHORIZED	9. EST. PERIOD OF IMPLEMENTATION YRS. <input type="text" value="5"/> QTRS <input type="text" value=""/>
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10. APPROVED BUDGET AID APPROPRIATED FUNDS (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY <u>78</u>		H. 2ND FY <u>79</u>		K. 3RD FY <u>80</u>	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) AD	171 S	977		3,400		4,450		5,070	
(2)									
(3)									
(4)									
TOTALS				3,400		4,450		5,070	

A. APPROPRIATION	N. 4TH FY <u>81</u>		Q. 5TH FY <u>82</u>		LIFE OF PROJECT		11. PROJECT FUNDING AUTHORIZED	
	O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	J. LOAN	ENTER APPROPRIATE CODE(S) 1 - LIFE OF PROJECT 2 - INCREMENTAL LIFE OF PROJECT	A. GRAN - B. LOAN
(1) AD	6,024		6,336		25,280			2
(2)								
(3)								
(4)								
TOTALS		6,024		6,336		25,280		PROJECT FUNDING AUTHORIZED THRU <input type="text" value="8"/> <input type="text" value="2"/>

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED (\$000)	13. FUNDS RESERVED FOR ALLOTMENT																				
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th rowspan="2">A. APPROPRIATION</th> <th colspan="2">B. ALLOTMENT REQUEST NO.</th> </tr> <tr> <th>C. GRANT</th> <th>D. LOAN</th> </tr> <tr> <td>(1) AD</td> <td>2,329</td> <td></td> </tr> <tr> <td>(2)</td> <td></td> <td></td> </tr> <tr> <td>(3)</td> <td></td> <td></td> </tr> <tr> <td>(4)</td> <td></td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;">TOTALS</td> <td>2,329</td> </tr> </table>	A. APPROPRIATION	B. ALLOTMENT REQUEST NO.		C. GRANT	D. LOAN	(1) AD	2,329		(2)			(3)			(4)			TOTALS		2,329	TYPED NAME (Chief, SER. EM. SEC FCD) Dannie Baker SIGNATURE: <i>Dannie Baker</i> DATE: <u>12-7-77</u>
A. APPROPRIATION		B. ALLOTMENT REQUEST NO.																			
	C. GRANT	D. LOAN																			
(1) AD	2,329																				
(2)																					
(3)																					
(4)																					
TOTALS		2,329																			

14. SOURCE/ORIGIN OF GOODS AND SERVICES	<input checked="" type="checkbox"/> 000 <input checked="" type="checkbox"/> 341 <input checked="" type="checkbox"/> LOCAL <input checked="" type="checkbox"/> OTHER <u>935</u>
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15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED

FOR PFC/PIAS USE ONLY	16. AUTHORIZING OFFICE SYMBOL	17. ACTION DATE MM DD YY	18. ACTION REFERENCE (Optional)	ACTION REFERENCE DATE MM DD YY
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Project Authorization and Request for Allotment of Funds

Part II

Country: West Africa Regional - Sahel

Project: CILSS Integrated Pest Management and Research

Project No: 625-0928

Pursuant to Part 1, Chapter 1, Section 121 of the Foreign Assistance Act of 1961, as amended, (the "Act"), I hereby authorize a Grant to the Permanent Interstate Committee for Drought Control in the Sahel ("CILSS"), an international organization consisting of the countries of Cape Verde, Chad, the Gambia, Mali, Mauritania, Niger, Senegal and Upper Volta (the "Member States") of not to exceed Three Million Four Hundred Thousand United States Dollars (\$3,400,000) to assist in financing the foreign exchange and local currency costs of goods and services required for the project as described in the following paragraph.

The project shall consist of providing, together with the Governments of England and France, technical assistance, training, operating expenses and other goods and services for the establishment within the CILSS and its Member States of the capability to develop integrated pest management techniques for the protection of food crops in the Sahel by constructing/improving, equipping and staffing six small research laboratories in various locations in the Sahel, by the establishment of demonstration study areas to field test the results of the research under various conditions, by the establishment of a capability for pest surveillance and crop loss assessment in the Sahel, and by the development of an outreach/information transfer mechanism through the assignment of project personnel to the national plant protection agencies of the Member States, and by training counterparts in integrated pest management techniques (hereinafter referred to as the "Project").

I approve the total level of A.I.D. appropriated funding planned for the Project of not to exceed Twenty-Five Million Two Hundred and Eighty Thousand United States Dollars (\$25,280,000), Grant, including, the amount authorized above, during the period FY 1978 through FY 1982, subject to the availability of funds and in accordance with A.I.D. allotment procedures. Not more

than \$1,271,000 of the Grant shall be used to finance the construction/improvement of research laboratories under the Project; such funds shall not be obligated until preliminary plans and cost estimates for such laboratories are reviewed and approved by A.I.D. and until A.I.D. is satisfied that CILSS has available sufficient funding to cover such cost estimates.

I hereby authorize the initiation of negotiations and execution of the Grant Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority, subject to the following terms, together with such other terms and conditions as A.I.D. may deem appropriate:

a. Source and Origin of Goods and Services

Except for ocean shipping, goods and services financed by A.I.D. shall have their source and origin in the United States and in the Member States of CILSS, except as A.I.D. may otherwise agree in writing. Ocean shipping financed under the Grant shall be procured in any eligible source country except the Member States of CILSS.

b. Conditions Precedent

1. Prior to the first disbursement of funds under the Grant, or to the issuance of commitment documents with respect thereto, CILSS shall furnish to A.I.D., in form and substance satisfactory to A.I.D., an executed agreement with the Food and Agriculture Organization of the United Nations (the "FAO") for technical services required for the Project.

2. Prior to disbursement under the Grant for any purpose in each Member State of the CILSS, other than to finance the services of the FAO referred to above and goods and services required by CILSS for the management of the Project, or to the issuance of commitment documents with respect thereto, the CILSS shall furnish the following to A.I.D., in form and substance satisfactory to A.I.D.:

(a) A copy of an executed agreement with such Member State setting forth the rights and obligations of the CILSS and such Member State required for the effective implementation of the Project and the terms of the Grant Agreement, including, but not limited to, the contribution to be made by such Member State to the Project;

(b) Documentary evidence of the development of a procurement system adequate to ensure that goods and services will be procured in a timely manner to achieve the objectives of the Project;

(c) A copy of the Project operations plan, including, but not limited to, the manner in which the training required for effective implementation of the Project will be provided, the manner in which baseline information regarding the effect of pests on crop production in the area will be obtained, and the manner in which the activities conducted under this Project will be coordinated with the Sahel Water Data Project and the Regional Remote Sensing Project.

3. Prior to disbursement under the Grant for equipment procurement, or to the issuance by A.I.D. of commitment documents with respect thereto, CILSS shall furnish the following to A.I.D., in form and substance satisfactory to A.I.D.:

(a) Detailed specifications for such equipment;
and

(b) An executed contract for such equipment.

4. Prior to the first disbursement under the Grant for each construction activity, or to the issuance by A.I.D. of commitment documents with respect thereto, CILSS shall furnish the following to A.I.D., in form and substance satisfactory to A.I.D.:

(a) An executed contract for construction supervision of such activity, or a description of the arrangements made for public agencies of the Member State in which the construction is undertaken to perform such service;

(b) Plans, specifications, bid documents and time schedules for such construction; and

(c) An executed contract for construction services for such activity with a firm acceptable to A.I.D. or a description of arrangements satisfactory to A.I.D. for providing the construction services by force account.

c. Covenants

The Grant Agreement shall contain a covenant providing in substance that procurement and use of pesticides in the Project shall be in accordance with A.I.D. regulations.

d. Waivers

Notwithstanding paragraph a. above and based on the justification set forth in Part 1A of the Project Paper, I hereby

1. Approve a procurement source waiver for goods and services procured under the Grant from Code 000 (U.S. only) and the Member States of CILSS to Code 941 of the A.I.D. Geographic Code Book and the Member States of CILSS and certify that such procurement from the sources mentioned above will best serve the interests of the U.S. and is necessary to the attainment of U.S. foreign policy objectives and the objectives of the foreign assistance program; and

2. Approve a procurement source waiver to Code 935 (Selected Free World) for technical advisory services required for the Project and the procurement of such services from the FAO, without competition, and hereby determine that such procurement will best serve the interests of the United States.

A. Shaban
Deputy Administrator, Acting

12/2/77
Date

Clearances: As shown on Action Memorandum

Drafted by: SM Stephen Tisa, GC/AFR

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE

A
 C - CHANGE
 D - DELETE

PP

2. DOCUMENT CODE
3

3. COUNTRY/ENTITY

West Africa - Regional (Sahel)

4. DOCUMENT REVISION NUMBER

5. PROJECT NUMBER (7 DIGIT)

625-0928

6. BUREAU/OFFICE

A. SYMBOL
AFR

7. PROJECT TITLE (Maximum 40 characters)
 CISSS - IPM Research

8. ESTIMATED FY OF PROJECT COMPLETION

FY 8 2

9. ESTIMATED DATE OF OBLIGATION

A. INITIAL FY 78
B. QUARTER 1
C. FINAL FY 82
(Enter 1, 2, 3, or 4)

10. ESTIMATED COSTS (5000 OR EQUIVALENT \$) -

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FY	C. U/C	D. TOTAL	E. FY	F. U/C	G. TOTAL
AID APPROPRIATED TOTAL	1,335	2,065	3,400	15,361	9,919	25,280
(GRANT)	1,335	2,065	3,400	15,361	9,919	25,280
(LOAN)						
OTHER (1)						
U.S. (2)						
HOST COUNTRY (3)						
OTHER (4)						
TOTALS	1,615	2,065	3,680	16,761	9,919	26,680

11. PROPOSED BUDGET APPROPRIATED FUNDS (5000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN	K. 2ND FY 79	
										N. 1ST FY 78	O. 2ND FY 78
(1) AD	1715	977	3400	4450						5070	
(2)											
(3)											
(4)											
TOTALS		3400	4450	5070							

A. APPROPRIATION

C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	LIFE OF PROJECT	
						M. 4TH FY 81	O. 5TH FY 82
(1) AD	6024	6336		25280			
(2)							
(3)							
(4)							
TOTALS	6024	6336	25280				

MM YY
 11 78

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PIO FACESHEET DATA. BLOCKS 12, 13, 14, OR 15 OR IN PIP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PIO FACESHEET.

YES
 NO

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE Director, AFR/SEWA

DATE SIGNED

MM YY

MM YY

15. DATE DOCUMENT RECEIVED IN AID/4 OR FOR AID/4 OCCURMENTS, DATE OF DISTRIBUTION

AID 1330-4 (3-78) * To be determined during CISSS/FAO/host country negotiations of individual country operations plans.

CILSS - INTEGRATED PEST MANAGEMENT

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I. SUMMARY AND RECOMMENDATIONS

A. RECOMMENDATIONS

This PP is adapted from the CILSS Plant Protection Program document which requests AID participation in Annex B of that document for integrated pest management research. This PP presents and analyzes the CILSS - IPM Research Project and recommends AID participation in that undertaking.

The Grantee is the Inter-State Permanent Committee for Drought Control in the Sahel (CILSS).

<u>Amount of Grant Assistance</u> (\$000s)		25,280
<u>Life of Project</u>	FY 1978-82	
<u>AID Grant</u>	FY 1978 (\$000s)	3,400
Foreign exchange		1,335
Local currency		2,065
<u>Other Donor Contributions</u>		
	FY 1978	280
<u>Grantee Contributions</u>		To be determined
		<hr/>
TOTAL FY 1978		3,680

This PP is developed with the following requirements for waivers:

1. Technical Services: FAO has been selected by CILSS and AID to provide technical expertise in pest management for this project for the following reasons: (a) FAO has a global pest management program that has been operating in other countries and the experience gained in that program will be useful in the AID financed Integrated Pest Management Project, (it will also facilitate the coordination of this project and that program and the exchange of results from each); (b) FAO has an existing level of in-house technically qualified staff to contribute to this effort; (c) FAO has well established recruitment patterns which draw upon non-U.S. sources of expertise

when qualified French-speaking Americans cannot be made available (FAO has already contacted USDA to assist it in locating qualified French-speaking Americans who can serve on this project and will first turn to USDA for assistance, before recruiting from other sources, when it is necessary to find personnel to add to its in-house capability); (d) this project is a component of a multi-donor program for pest management developed under the auspices of the Club du Sahel/CILSS requiring careful coordination among donors and components, and an established international organization such as the FAO is well suited to assist the CILSS in its role of coordinator of donor inputs to the various components of the overall program; (e) this is the first substantial project under section 121 of the FAA, the Sahel Development Program, which is anticipated to involve very substantial increments of assistance from the U.S. and other donors over the long-term for which AID is not expected to have adequate manpower to devote to the Sahel Development Program in the same manner as other AID programs and it has been considered important in AID's participation in this program to develop techniques for drawing upon international organizations such as the FAO to assist in the design and implementation of SDP projects to avoid substantial increases in AID's staff. (Congress has been advised of these concerns, and this project tests these techniques). For these reasons, it is believed that a waiver to Code 935 for the procurement of technical services from the FAO will best serve the interests of the U.S. and important foreign policy considerations.

2. Code 941 Procurement: Agency policy concerning the source and origin of grant-financed procurement was modified on July 14, 1977 to permit procurement from Code 941 countries for bilateral grant-financed projects in relatively least developed countries (RLDCs). Of the eight members of CILSS, five (Chad, Gambia, Mali, Niger and Upper Volta) are on the UNCTAD list of RLDCs. (In addition, it is likely that Cape Verde will qualify for inclusion on the UNCTAD list, thus placing six of the eight CILSS members on the list). Although the CILSS serves a coordinating function on behalf of its member states, project activities, together with necessary procurement, will occur within individual member states which are on the list.

It seems inappropriate to impose more restrictive procurement requirements in AID financed activities in these countries merely because the AID grant is made to a regional organization, rather than individually to each country, that will ensure effective coordination of project activities in each of these countries, an important objective that is often lacking in regular bilateral programs. Thus we believe Code 941 procurement should be approved with respect to those CILSS member states which are RLDCs. Moreover, we believe that the effort made by CILSS to coordinate project activities within its eight member states is difficult enough without having two different sets of procurement rules for the project, one for the six RLDCs and the other for Mauritania and Senegal (which, although not technically RLDCs, are just recovering from the Sahel draught and are among the poorer countries in the world).

There is another important reason to permit Code 941 procurement in this project. Although the Sahel Development Program is focused on the CILSS and its Sahelian States, it is very important for the development of this region to promote and encourage close trade ties between the CILSS states and the coastal states, which are not direct beneficiaries of assistance under the Sahel Development Program. We believe that such economic integration is an important foreign policy consideration and an objective of the assistance program. It will provide a form of assistance to those neighboring African countries at no additional cost to the AID program. Thus, it is submitted in view of the predominate RLDC nature of CILSS membership and the positive integrational effects that Code 941 procurement would have on the CILSS community and its relationships to the surrounding West African states that a waiver to Code 941 procurement of goods and services (other than those procured from the FAC mentioned above) is in the best interest of the U.S. and is necessary to the attainment of U.S. foreign policy objectives and the objectives of the foreign assistance program.

B. PRIORITY AND RELEVANCE

In recent years, pest¹/damage to basic food²/crops in the Sahel has accentuated production losses by pests resulting from the recent droughts.

In response to this situation a resolution was adopted at a meeting of CILSS Member Countries held in Banjul in December 1974, which recommended the strengthening of national and regional plant protection services and organizations as well as research and training efforts.

A multidisciplinary study team which visited Africa in 1972 under the University of California/AID contract (No. AID/CSD-3296-USAID, University of California) stated that practical programs of total pest management on crop protection integrated completely with improved production systems should be the ultimate goal. Research programs dedicated to development of pest management strategies should be initiated immediately but should stress initially the solution of pest problems. An efficient approach to problem solution and development of research information leading eventually to pest management would be the formation of regional research facilities.

These problems have been examined in depth by a number of other technical meetings.

-
- 1/ The term "pest" used without further description denotes arthropod pests, weeds and diseases.
 - 2/ The term basic food crop as used in this manuscript refers to millet, sorghum, maize, cowpea, ground-nuts and rice.

The very low sorghum and millet yields on the traditionally operated small farm (less than 500 kg/ha) will not, in most cases, economically support a sustained chemical control program. However, since it makes maximum use of natural mortality factors, integrated pest control is ideal for such a situation. This method is based on a careful choice of control measures. This choice will be made on the basis of detailed biological knowledge of both the plant and pests attacking it. In this approach, various measures are relied upon, such as: the introduction of new cultural practices, use of varieties resistant to pests, maximizing the action of natural enemies, introduction of parasites and predators of the pest in question, and application of pesticides at the period when the pest is most vulnerable, thus reducing considerably the quantity of pesticide required. Such an approach avoids many secondary problems normally

encountered in wide-scale pesticide applications: development of strains resistant to pesticides, appearance of new and often more dangerous pests, environmental contamination and disturbance of ecological balances. One of the first steps in this method is quantifying the economic damage to the crop by each pest attacking it, so that the application of pest control measures can be made on the basis of economic injury levels.

Cultivation of sorghum, millet and cowpeas has been going on for many centuries in Africa and it is certain that a biological and ecological balance has been established between pests of these crops and their natural enemies over the course of time. It is critical to discern the relationships in this balance so that the knowledge can be used to develop pest control strategies. Experience shows that unfortunately these balances can be easily destroyed through use of broad-spectrum pesticides. Moreover, the general spread of these pesticides inevitably leads to environmental pollution, making the practice a threat to the general public.

The development and application of a program of integrated control in basic food crops in the Sahel would enable these countries to avoid some of the unfortunate experiences of other countries, where widespread and indiscriminate pesticide use prevented the application of integrated pest control programs.

This project was designed on the pre-supposition that the implementation of integrated pest management (IPM) was in the long run the best solution for effective crop protection, for the following reasons:

- IPM is based, as much as possible, on methods adapted to local conditions (resistant varieties, cultural methods, natural enemies), and thus will be the least costly solution;
- it has been sufficiently demonstrated that integrated pest control avoids the necessity of ever more frequent pesticide applications, a problem which often arises when chemical control alone is used;
- widespread use of pesticides on areas as vast as those under food crops in the Sahel would lead to considerable environmental disturbance (upset of biological and ecological balances, appearances of new pests or strains resistant to pesticides, etc.), making it essential to have access to the larger choice of control alternatives offered by the integrated control method.

This inter/country program for research and development of integrated pest management in food crops in the Sahel countries

would be established within the framework of the "FAO/UNEP Cooperative Global Program for the Development and Application of Integrated Pest Control in Agriculture". The FAO Panel of Experts on Integrated Pest Control would serve as an advisory body. The proposed program will have close ties with the world-wide FAO program on the development of crop loss assessment methods. (See Annex B II for additional information on FAO/UNEP program).

For the sake of practicality and efficiency this project will focus, principally on sedentary pests attacking basic food crops in the field, especially the sorghum/millet ecosystem, including cowpea. It will study arthropod pests, weeds and diseases. The outreach activities will also cover rice as needed. This will be done in close collaboration with WARDA. For the control of other major pests of importance to agricultural production in the Sahel, proposals are put forward in the CILSS/ Club des Amies du Sahel crop protection program.

C. Description of the Project

1. Project Objectives

Crop protection measures presently being used are oriented essentially towards a short-term solution with particular emphasis on the supply of pesticides and equipment for their application. Most present training programs aim to improve the structure and operations of national plant protection services. Research efforts have been and are being undertaken to achieve a better knowledge of the biological and physical factors regulating the development of pest populations. Before the recent drought period, chemical control was rarely considered as the major means of protecting food crops. Research is currently conducted by several national agricultural research organizations with French bilateral assistance. But generally, large scale basic studies have not been undertaken due to lack of funds, competent personnel, equipment, or well-coordinated programs at either national or regional levels. The result is that pesticides are being used without proper regard for the environment and related ecological factors.

The proposed project will improve this situation by providing a structure that will increase knowledge of the economic importance of the major pests in food crops. It will also include an effective system for surveillance and, at a later stage, forecasting of pest development. The necessary applied research will be conducted to develop a comprehensive integrated pest control program.

Project objectives will be to:

- a) establish a surveillance system on the occurrence of major pests;

- b) evaluate the relative economic importance of these pests through the organization of crop loss assessment experiments;
- c) establish demonstration study areas to study and demonstrate the benefits to be drawn from integrated pest control;
- d) develop, in close collaboration with national plant protection services, a mechanism to implement results at the farmer level;
- e) to establish a research team to study the bionomics of the major pests and develop the best integrated control techniques as a support to national activities.

2. Plans for Achieving Objectives

In order to achieve the above objectives and to reduce substantially pest inflicted losses to basic food crops, the following activities will be carried out:

- a) To collect, classify and disseminate as soon as possible all documentation pertaining to the subject. At the beginning emphasis will be on the application of existing information to improve pest control activities, which will be further strengthened as knowledge is gained through project activities;
- b) To survey continuously and accurately identify the various food crop pests in the Sahel countries;
- c) To determine the relative economic importance of each species and damage caused;
- d) To study the biology and ecology for the major pests and develop a surveillance and reporting system; to identify natural mortality factors and the relative importance of parasites and predators;
- e) To determine the economic damage threshold for each species in order to guide optimum application of control measures;
- f) To determine which control methods are most effective under the prevailing ecological and economic conditions, i.e., use of resistant varieties, cultural, biological or chemical control;
- g) To assist in the development of methods for implementation at the farmer level based on a monitoring and forecasting system;

- h) To train personnel at academic and intermediate levels to create the research and application capability required to continue activities initiated by the project;
- i) To collaborate with current and planned bilateral and multi-national assistance programs of a similar nature.

In brief, the program aims to strengthen national research capability toward developing appropriate technical packages to be provided to extension structures so that the farmer may gain maximum profit from his farming activities.

D. Beneficiaries

The ultimate benefits of this program will go to the small farmer.

In a study on prospects for agricultural development in the Sahelian zone 1975-1990 (FAO, Rome, PS/SAH/76/ESP/1) it is stated that:

"According to studies and observations to date, cereals form the basis of the food supply. They furnish an average of 60-70% of the energy supply.... This group of foodstuffs is the primary source of energy and proteins and in some countries the first or second source of carbohydrates."

Sorghum and millet still will be the principal food crops for most of these countries in 1990 and beyond. They are mostly grown in association with cowpeas.

A recent development due to the drought has been a shifting of emphasis from cash crop production to food crop production. The yield from the new land brought into cultivation has not produced anticipated amounts of additional output due to the lower fertility on the one hand, and the presence of pest and disease on the other, among other factors. This project will not attempt to redirect this trend, but will support this effort by assisting in on-farm reduction of losses caused by pest and disease. The problem of social disruption is not at issue here, as no fundamental changes in socio-economic structures are intended.

The project's objectives in its latter phases will be applied through demonstration and practical training at the farm, village and arrondissement level; and by academic and applied training for selected regional and national government officials. Farm plots to be used for demonstration purposes will be selected by the farmers, or their chosen representatives.

Since field demonstrations will be conducted by field agents who are members of the local village and tribal groups, farmer resistance is not considered to be a strong factor. Commercial farmers are accustomed to pest management programs.

Ultimately, through demonstrations and training in methods and techniques, farmers and individuals selected by village and tribal leaders will become the conduit for conveying information and practices designed to assist in the protection from pest and disease damage. The highlight of this process occurs when comparisons are made of yields from stands employing protection measures.

The initial beneficiaries of this project will be the governments whose research capabilities in integrated pest management will be developed in their respective countries. Such research capabilities will also allow the development of better crop protection methods for other crops. Improved protection of basic food crops will result in an improved food situation and increased income to the small farmer and minimal environmental disturbance.

Role of Women

In some of the Sahel countries (e.g., Gambia), women have the responsibility for food crop production which includes protecting these crops from pests. If there is a surplus of food produced (in excess of family and/or tribal requirements) they are sometimes considered to be the property of women. They may trade or sell the surplus. This creates a motivation factor for trying better methods of pest control to increase production. Wherever possible, depending on a country's policy for hiring women to work in plant protection services and research teams, an effort will be made to encourage and assist in employing women in project activities.

E. Summary Findings

The PP design team, with the advice and assistance of various technical experts, has determined that this project is technically, socially, and financially sound. Official and technical consultants from the donor countries, from the selected technical implementation agency as well as from the grantee and its member states have participated fully in the collaborative development and design of this project and all participating parties are prepared to move ahead immediately with its implementation.

F. PROJECT PAPER ISSUES

At the ECPR held in May a list of issues which were to be addressed prior to project authorization was drawn up (See Annex B III). Some of these issues were resolved in the June-August period and recommended courses of action have been included in other sections of this paper. The remaining issues are commented on below:

1. Program Issues

- a) CILSS priority for pest protection:- A letter from the CILSS Secretariat dated 9 August 1977 underscores CILSS member country interest in the program and reconfirms the high priority CILSS places on this program.
- b) Post harvest crop protection efforts:- The above cited CILSS letter also reviews efforts to secure other donor contributions needed to address this requirement.
- c) Availability of African personnel:- The full dimensions of the training requirement will only be appreciated when the country operations plans are negotiated between CILSS/FAO/National Government. CILSS has agreed to respond to a condition precedent in the draft grant agreement calling for an overall training plan (See Section III.A.3.f., page 47 for a further discussion).
- d) Recurrent cost implications:- As indicated in CILSS' August letter there is deep concern over recurrent cost implications of all SDP programs. CILSS has commissioned a study to help it come-to-grips with this problem.

2. Project Issues

- a) Early inclusion of socio-economist:- The present PP projects the arrival of the socio-economist in the first year of the project.
- b) Relation of project activities to existing pest protection efforts:- These relationships cannot be definitively defined prior to the CILSS/FAO/National Government negotiations of the country operations plan. This PP presents an illustrative description of these relationships in two representative member countries (Senegal and Upper Volta) on pages 24-30.
- c) Relation of Annex G (Training/Information) with Annex B:- CILSS has indicated its strong intention to pursue the design of Annex G immediately to assure that it will be implemented at the same time as Annex B. The CILSS letter of 9 August 1977 indicates this intention.

- d) Relation of Annex B to AGRHYMET and LANDSAT programs:- Technical review of the PRP indicated the need for an interrelationship between AGRHYMET and Annex B Programs. (The LANDSAT link appeared less critical over the short run.) A condition precedent has been included in the draft project agreement to insure the required relationship is established.
- e) Implementation plan:- As noted elsewhere, detailed country implementation plans will only be developed during the CILSS/FAO/National Government negotiations. Section IV B and Annex E present an initial implementation plan.
- f) Application of 611(a), audit, and source/origin problems:- Since Section 611(a), regarding preliminary plans and cost estimates, has not yet been satisfied with respect to construction elements of this project, A.I.D. will not obligate funds for that purpose until A.I.D. reviews and approves such plans and cost estimates. Funds will only be made available for those general project activities for which adequate planning is now in existence. Regarding audit rights, CILSS is agreeable to having an international auditing firm audit this program and FAO as the principal technical implementation agency has agreed to an AID/FAO negotiating Session to develop an acceptable formula. The source/origin waivers question is not a significant one as foreseen. Since FAO cannot accept tied procurement, CILSS will procure on its own behalf from Code 000 and member states.

3. ECPR Issues

Relationship between Annex B and Annex A:- A substantial amount of information regarding these relationships on a country level will be developed during the CILSS/FAO/National Government negotiations of the country operation plan. AID has gone on international public record (Washington conference, September 27-28, 1977) proposing the merger of the Sahel Crop Protection Project (625-0916) with the appropriate elements of CILSS Annex A and Annex G when these projects become operational.

II. PROJECT BACKGROUND AND DETAILED DESCRIPTION

A. BACKGROUND

The economies of the Sahelian states are primarily agriculturally based with some 85% of their combined population of approximately 26 million engaged in agriculture -- mainly small subsistence farmers producing sorghum and millet. Historically, little attention has been paid by governmental authorities to production and protection of food crops. Agricultural development efforts have tended to concentrate on production schemes for export crops, notably peanuts and cotton. As a consequence, in the face of rising populations, the Sahel has become chronically dependent in recent years on imported food supplies to fully meet the consumption requirements of its urban populations while its rural populations have become increasingly vulnerable to climatic vagaries or other natural afflictions in their struggle for survival.

In the 1960s, the newly independent African nations, aided by various donors, began to address the problem of increased food production. Organizations such as the Institute for Agricultural Research (IAR) at Ahmadu Bello University, Northern Nigeria, the International Institute for Tropical Agriculture (IITA) at Ibadan, Nigeria, the French based "Institut de Recherches Agronomiques Tropicales (IRAT), and the West African Rice Development Association (WARDA) at Monrovia, drawing upon the work of other international research institutions, have begun to build a body of usable research results. This research has primarily concentrated on maize, sorghum, and millet. Research and limited field trials have been conducted to determine local adaptability of existing varieties, to develop new varieties and agronomic practices to best utilize the genetic capabilities of the adopted or developed varieties, and to realize the potentials offered by current scientific progress in breeding techniques for insect and disease resistance, higher yields and higher protein content. The extension link between this research and the farmer, however, has still to be further developed before it can find a widespread reflection in agricultural production.

Comparable progress has not been made in the area of plant protection. The two regional organizations, OCLALAV and OICMA, established in the 1960s, have been successful in controlling locust outbreaks and recent research efforts have enabled them to greatly increase the effectiveness of their aerial and ground spraying activities. The Center for Overseas Pest Research (COPR) sponsored by the British Overseas Development Ministry and the French sponsored "Groupement d'Etudes et de Recherches pour le Developpement de l'Agriculture Tropicale" (GERDAT) have done valuable research on grasshoppers. Beyond this, only limited

entomological and phytopathological research has been undertaken at the various research stations in the Sahel. There is no comprehensive and reliable information in these countries on the character and extent of crop losses sustained as a result of pests -- although informed estimates would place total losses in the range of 25% to 40% of production. In most Sahelian countries, plant protection services have only been created in the last few years. They are all still inadequately staffed and their action is limited mainly to the delivery of chemical control materials in the event of massive insect outbreaks.

During these years, in the agriculturally advanced countries, there was a growing awareness that the heavy reliance on chemical controls for protection of plants against pests carried with it serious environmental and ecological consequences. In response, the FAO/UNEP Cooperative Global Programme for the Development and Application of Integrated Pest Control in Agriculture was mounted in 1974. Integrated pest management makes maximum use of natural mortality factors and is based on a careful choice of control measures. This choice is made on the basis of detailed biological knowledge of both the plant and pests attacking it. In this approach, various measures are relied upon, such as: the introduction of new cultural practices, use of varieties resistant to pests, maximizing the action of natural enemies, introduction of parasites and predators of the pest in question, and application of pesticides at the period when the pest is most vulnerable, thus reducing considerably the quantity of pesticide required. Such an approach avoids many secondary problems normally encountered in wide-scale pesticide applications: development of strains resistant to pesticides, appearance of new and often more dangerous pests, environmental contamination and disturbance of ecological balances. One of the first steps in this method is quantifying the economic damage to the crop by each pest attacking it, so that the application of pest control measures can be made on the basis of economic injury levels. The basic information for the current proposal was collected within the framework of the FAO/UNEP Cooperative Global Programme.

A multidisciplinary study team which visited Africa in 1972 under the University of California/AID contract (No. AID/CSID-3296-USAID, University of California) stated that practical programs of total pest management on crop protection integrated completely with improved production systems should be the ultimate goal. Research programs dedicated to development of pest management strategies should be initiated immediately but should stress initially the solution of pest problems. An efficient approach to problem solution and development of research information leading eventually to pest management would be the formation of regional research facilities.

The human suffering and deprivation of the protracted drought of 1968-1973 in the Sahel brought into sharp focus, both to the countries directly concerned and to the world donor community, the fragility of the ecosystem of the area, its basic and unresolved development problems and its total inability, in the face of such situations, to deal with the food needs of its populations. In order to better cope with these problems, Chad, Mali, Mauritania, Niger, Senegal and Upper Volta joined in March 1973 to form the Permanent Interstate Committee for Drought Control in the Sahel (CILSS). Cape Verde became a member following its independence and the Gambia also joined. The CILSS has fixed as its objectives to:

- reduce the consequences of emergency situations in the future;
- insure self-sufficiency in staple foods; and
- accelerate economic and social development, particularly in the least developed countries of the region.

The CILSS attempted from the beginning to represent needs of the member states for donor financing of specific project proposals and, with the international donor community, to search out additional ways to bring about a basic transformation of the region. These efforts to secure donor support led to the creation of the Club du Sahel which held its inaugural meeting in March, 1976 at Dakar. The Club provides a forum for the CILSS members and interested donor and funding organizations to discuss the goals of Sahelian development and the strategy for achieving them. It reflects the growing awareness in the donor community of the need for a concerted effort in the Sahel and offers an instrumentality through which substantially increased resource flows into the area can be generated.

The easing of the drought in 1974 brought with it massive outbreaks of pests which highlighted both the inadequacy of the existing capability to deal with pest problems and the magnitude of the threat which pest attacks posed to food production and availability. There was realization also that planned agricultural development efforts (e.g., expansion of acreage under irrigation, expansion of recession agriculture, introduction of mixed or inter cropping, etc.) would favor the growth of pest populations and greatly increase the risk of crop losses. Recognizing that the benefits of investment in agricultural production schemes could be largely negated without a parallel development of plant and crop protection capabilities, the CILSS, at its meeting in Banjul, the Gambia, in December, 1974, adopted a resolution which recommended the reinforcement of national plant protection services and regional plant protection organizations, as well as related research and training.

Sahelian plant protection problems were examined in depth at three technical meetings:

- a meeting on integrated pest management in the Sahel, held at the initiative of AID in Washington on 11 and 12 December 1974. This meeting recommended that a special coordinating committee be established, which would review progress and maintain coordination of the program. It was agreed that FAO be invited to accept responsibility for arranging annual meetings of this Committee and keeping its records.
- a CILSS-OCLALAV (Joint Organization for Locust and Bird Pest Control) meeting on the problems in food crop protection was held in Ouagadougou 18-22 September 1975. CILSS and OCLALAV were requested to coordinate the efforts of member and donor countries to ensure adequate funding for the strengthening of national plant protection services and regional migratory pest control organizations in order to improve the protection of traditional field foodcrops and of irrigated agricultural schemes.

Donor countries, agencies of the United Nations system and regional West African organizations were also requested to coordinate their efforts for the financing of foodcrop protection in the medium term. CILSS was asked to take the initiative in this coordination.

- In May 1976 officials responsible for national plant protection services from Member Countries of the Economic Community of West Africa (ECWA) and OCLALAV convened at Ouagadougou. ECWA and CILSS were requested to take every possible action to establish a coordinating unit for research, training, reporting and control in the field of crop protection.

As a follow-up to these meetings, the FAO convened in Rome from December 13 to 17, 1976 a Government Consultation on Crop and Post-Harvest Protection Needs in the Sahel. The consultation, in addition to reviewing the status of needs and existing, planned and proposed assistance, devised a common strategy outline for strengthening plant protection in the region. This strategy reflected recognition of the need to:

- strengthen national plant protection services;
- strengthen regional coordination of research; surveillance, training and information within the framework of CILSS;
- maintain the capability of regional migratory pest control organizations to respond to outbreaks of locusts and grain-eating birds;
- coordinate planning and implementation on both a national and regional basis.

Also in December, 1976, at the N'Djamena meeting of the Council of Ministers of CILSS, the Sahel Institute was formally established and it was specifically charged with the coordination of CILSS member state activities in the field of plant and crop protection.

Pursuant to a proposal made at the Rome Consultations, a design team was assembled in Dakar in February, 1977 to complete the formulation of a comprehensive program embodying the strategy decisions reached at Rome. Under the leadership of the FAO and with the active participation of AID, this team developed a series of action proposals for plant protection in CILSS member countries during the period February 14 to March 16. This program was adopted by the CILSS at its meeting in May, 1977 and forwarded to the Club du Sahel for consideration by the donor community.

The document entitled "Plant Protection in the CILSS Member Countries" described a program which is planned over a 15-year period with funding proposals covering the medium term first five year phase. In accordance with the goal of the CILSS to insure self sufficiency of the Sahelian countries in staple foods, and recognizing that crop protection should be considered as a vital element in agricultural production equal in importance to plant improvement and soil fertilization, this medium and long-term program has the following objectives:

- to establish in the countries concerned a national capability to develop and implement effective pest management programs for the protection of food crops in field and in storage;
- to promote the expansion of extension activities at the required scale for effective pest control at the small farmer level, and
- to promote regional collaboration in plant protection, particularly through research, information exchange and contacts, and support effective regional organization.

The comprehensive program, costed at approximately \$70 million for its first five year phase, is composed of six principal thrusts:

- Strengthening of National Plant Protection Services
- Research on and Development of Integrated Pest Management for Basic Food Crops in the Sahel
- Migratory Pest Control
- Regional Locust Control

- Grain Eating Bird Control
- Improved Post Harvest Crop Protection
- Improved Rodent Control
- Plant Protection Information/Documentation/Training Center

It attacks what are currently seen as the major constraints to crop production in the Sahel and at the same time, addresses the regional and national institutional structures through which crop protection efforts will be carried out. Each of the components is somewhat distinctive in character, calling for its own approach to the problems under consideration. However, the major emphasis will be on the Integrated Pest Management project for which AID financing is proposed in this paper. In dealing with practical research into sedentary pests, pathogens and weeds in food crops, it seeks to develop protection programs incorporating the use of natural mortality factors with other control methods. To the extent applicable, the principles of integrated pest management are embodied in each of the program components. The knowledge and technology developed within the Integrated Pest Management project will be of direct benefit to the other programs proposed - for example, it plans to develop an effective pest surveillance and forecasting system for the whole of the Sahelian zone.

This program is to be operational at three levels - national; sub-regional and regional. The establishment of plant protection policies, programs, and priorities in each country is the responsibility of the national authorities. The implementation of these policies and programs is also primarily a national responsibility. Strong national plant protection services are considered to be the fundamental basis of any sustained progress in the reduction of crop losses from predators and disease. At the same time, it is recognized that pests and diseases are not respectors of national boundaries, that many aspects of research can best be dealt with at broader ecological levels, and that the most economic use of scarce manpower and financial resources requires the avoidance of duplicative national efforts. These considerations dictate a sub-regional or regional approach to many of the problems of crop protection. It is not suggested, however, that functions be tightly compartmentalized within these levels and some functions can find an appropriate expression at all levels. Strengthening of plant protection services per se concerns primarily the national level. The other four thrusts have regional, sub-regional and national implications as is outlined in the following:

1. Migratory Pest Control. These pests can range over wide areas within the Sahel region and even beyond. Moreover, the breeding areas where controls can be most effectively applied are not necessarily coincident with the areas (or states) which are potentially subject to attack. A regional approach to research, surveillance, forecasting and control of these pests is, therefore, necessary. The program envisages that these activities will be continued within the structure of the existing regional organizations, OICMA (Inter-state Organization for the African Migratory Locust) and OCLALAV (Joint Organization for Locust and Bird Pest Control), both of which include member states outside of the geographic confines of the Sahel, and/or such other arrangements as the participating groups of states may agree upon. Parts of this undertaking will involve research at the sub-regional or ecological zone level. In accordance with established practice, national services will be involved in activities within their countries.

2. Rodent Control. This project will be implemented through the national services in Senegal and Niger where rodent problems have been most serious and where there is immediate interest on the part of the governments to launch an effort in this field. The studies and research will have regional implications, however, and they should lead to better techniques for evaluating the real extent of rodent damage in other countries as well as providing a sound research base for control programs which could be replicated elsewhere as required.

3. Post Harvest Crop Protection. This is an inter-country project involving the establishment of an adequate infrastructure for effective control operations, the development of a forecasting system through bio-ecological research, as well as applied research to adapt known technology to the conditions of the countries concerned. Specific elements of the study and survey program will be conducted in each of the participating countries with the information gathered in each country providing a basis for improvements in grain storage in all.

4. Integrated Pest Management. The research aspects of this project will be implemented through the national institutions in Senegal, Mali, Upper Volta, Niger and Chad, each of which will undertake certain elements of the regional research program. Although this research will be conducted at the national level, it will address the problems in the context of an ecological zone. Similarly, a concentrated approach on pest surveillance and forecasting and the development of crop loss profiles will be undertaken through the national services in the CILSS Member Countries. Assistance in development of a base for the introduction of integrated pest management into country programs will also be provided to national services in all the Sahelian countries. This

approach is consistent with the overall program aim of strengthening national services, but it is expected that the research results and outreach activities will have sub-regional and regional applicability. CILSS will facilitate regional coordination with the assistance of FAO as the executing agency. This coordination will serve to assure that efforts at individual national levels are introduced as widely as possible.

5. Plant Protection Training/Information Unit. This coordinating unit will function at the regional level in close cooperation with the Sahel Institute, which will ultimately subsume its functions. The unit will serve as a data collection center, a documentation center, a coordinating body to facilitate continual flow of knowledge and technology into outreach programs, and an evaluation mechanism to assess the effectiveness of training or information communication techniques at the farmer level.

The CILSS considers the program "Plant Protection in the CILSS Member Countries" to represent a cohesive whole, all elements of which should proceed within a compatible time frame. If the program has been presented as a series of discrete components, this is more to accommodate expressions of donor interest than to emphasize the distinction between the activities to be carried out. The CILSS Council of Ministers has consistently expressed the importance it attaches to the crop protection program. The CILSS member nations see crop protection not only as a priority but as an absolute necessity. In their view, protection of crops is difficult under normal ecological and meteorological conditions but within the Sahel context, with its unpredictable rainfall and biological conditions, the question of crop protection can mean the difference between satisfaction of bare minimum food requirements and starvation. The series of meetings which the CILSS has convened since 1974 to consider plant protection problems give witness to the urgency and importance with which it regards the matter. In elaborating the role of the Sahel Institute, the CILSS Council of Ministers once again underscored the special attention needed in the field of crop protection. The CILSS has twice examined this program in the context of the investments foreseen in the multi-sectoral effort making up the Sahel Development Program and on both occasions has decided to support the level of investment proposed for "Plant Protection in the CILSS Member Countries". Firm indications of donor interest have already been received for a substantial portion of the program and the CILSS is actively seeking financial sources for the remainder.

B. DETAILED DESCRIPTION

1. Duration and Scope

This project is planned for a fifteen year duration divided into three phases. This paper describes in detail the medium term first-phase five year activity.

For the sake of efficiency and practicality this project will focus principally on sedentary pests attacking basic food crops in the field, especially the sorghum/millet ecosystem including cowpea. It will study arthropod pests, weeds and diseases. In close collaboration with WARDA, testing and demonstrations related to rice will also be undertaken. For the control of other major pests of importance to agricultural production in the Sahel, proposals are put forward in other elements of the program for "Crop Protection in CILSS Member Countries".

The project consists of three major inter-related components:

- Research
- Demonstration and feedback
- Pest surveillance, economic loss assessments and economic threshold determination

It also includes a Coordination Unit to ensure effective support and harmonization of the activities to be undertaken.

The project is Sahel wide in its reach but will work mainly through national institutions in each of the countries in such a way as to provide a cohesive whole.

2. Project Objectives

Crop protection measures presently being used, except for the AID Sahel Crop Protection Project, are oriented essentially toward short term solutions. Particular emphasis is placed on the supply of pesticides and equipment for their application, although before the recent drought period chemical control was rarely considered as a major means of protecting food crops. Some research efforts have been and are being undertaken to achieve a better knowledge of the biological and physical factors regulating the development of pest populations. This research is currently conducted by the national agricultural research organizations, mainly with French bilateral assistance. But generally, large scale basic studies have not been undertaken due to lack of funds, competent personnel, equipment or well coordinated programs at either the national or regional level. Broadly stated, this project proposes to improve this situation by providing a structure that will increase knowledge of the major pests in food crops and their economic importance

and improve methods of putting this knowledge in the hands of the farmer.

Toward this end, the project has as its objectives to:

- a. Establish a research capability in the Sahel for the study of the biology and ecology of the major pests, natural mortality factors which affect them and the relative importance of parasites and predators in order to develop integrated pest control techniques in support of national plant protection activities which represent the most effective control methods under prevailing ecological and economic conditions.
- b. Establish a network of demonstration study areas in each of the Sahelian countries to study and demonstrate the benefits to be drawn from integrated pest control and assist in the introduction of these techniques at the farmer level.
- c. Develop, within the national plant protection services, a mechanism to support the implementation of integrated pest management programs.
- d. Develop a methodology for and initiate in each of the countries the establishment of a surveillance and reporting system providing current information on the occurrence of major pests.
- e. Organize in each country the capability to evaluate the relative economic importance of these pests through crop loss assessment experiments and to determine the economic damage thresholds for each species in order to guide the optimum application of control measures.

For the attainment of these objectives, certain practical criteria have guided the development of the implementation plan.

- The program is an inter-country effort in which the basic principle is the strengthening of national institutions and capabilities within a well coordinated effort. Consistent with the existing national situations and the integrity of the total project effort, each country should participate in reaching the overall objective.
- Activities to be undertaken should as much as possible fit in with existing national crop protection programs and research and extension facilities.
- The pest management program should have close links with other crop improvement projects. Facilities and manpower should thus be located in proximity to these other activities to the extent that this does not interfere with the effective carrying out of the work.

3. Research

The project proposed to provide an integrated pest management research basis in the Sahel through the establishment within existing national agricultural research structures of six entomological/phytopathological laboratories in five Sahelian countries Senegal, Mali, Upper Volta, Niger and Chad. These laboratories will be located in areas representative of differing ecological zones. Complementary research programs will be put into operation at each of the stations which, taken in the whole, will address the full range of pest problems which the project seeks to encompass as they appear in varying ecological circumstances. Expatriate research teams are proposed for each of these laboratories in function of the current or planned presence of other research workers in the participating countries.

In addition to the strengthening of national research programs along sectoral lines as described above, this first phase project proposed to set up a multidisciplinary pilot project concerned with an ecological unit of great economic importance as represented by a hydro-agricultural development scheme. The Senegal River Valley within a sub-regional framework of interest to Senegal, Mauritania and Mali is an ecological unity well suited to the execution of this type of research on integrated pest control. To carry out this activity, a network of observation stations covering the entire Senegal River Basin will be established, supported by a well-equipped laboratory at Saint Louis, Senegal. This activity, which is both analytic and synthetic, will approach the problem of crop protection not only in its specific context but also in the more general context comprising the whole of the ecosystem and of the agro-ecosystem of the area, including the changes introduced by agricultural development. The impact of hydro-agricultural schemes on all matters concerning pests, diseases and weeds will be studied permitting, for example, a better understanding of the phenomena of infestation or reinfestation following the introduction of new crops or changed agricultural practices, or recolonization of protected crops from surrounding uncultivated areas. This activity would be based on research methods such as the concept of ecological optimum, ecological modelling and operational simulation. These methods have already provided excellent results in grasshopper research and are certainly valid for other situations. A structure will be developed for research, pest monitoring and integrated pest control that will allow for an effective protection of the irrigated areas and ensure that the benefits to be derived from other investments are not lost. Recognizing that the results of this activity will have relevance for other similar agricultural development, close collaboration is planned with hydro-agricultural schemes in the Lake Chad Basin and Niger River Valley.

Accomplishment of project objectives requires the training of an adequate number of local research personnel. At the counterpart level this training should be seen as taking place in three stages. Beginning in the first year, candidates will be selected and tested on their ability to participate in applied biological research. Beginning in the second year, grants will be accorded for academic study with the aim of forming high-level researchers. This training, probably of about two years duration and preferably to the M.Sc. level, will take place at African or third country universities or equivalent institutions. After this, the trainees will be associated again with the project experts for a period of approximately one year to complete the practical aspects of their scientific preparation. For the first five-year phase, fifteen such study programs are planned. In addition, in order to permit the efficient implementation of the planned research effort, a cadre of well trained medium-level technicians is necessary. During this first-phase project, a total of approximately thirty such technicians will be formed through study in African institutions or through on-the-job training. Also, to man the observation stations under the multi-disciplinary activity, a cadre of approximately twelve technicians will be trained.

Thus, by the end of phase one, the project will have mounted the basis of a comprehensive integrated pest management research capability in the Sahel which will be beginning to develop a body of locally relevant research results in support of plant protection programs. It is likely however, that this research will only have significant impact in the second phase.

4. Demonstration and Feedback

While research is an essential element of an effective integrated pest management program, it is considered equally important that from the outset it be intimately associated with outreach efforts to strengthen the linkages between research, plant protection services, extension and the farmer. The project proposed to achieve this purpose through the establishment of Demonstration Study Areas (DSA) in each of the participating countries. These DSAs will serve to:

- establish a dialogue with farmers for the correct assessment of his growing practices, including pest control, and draw upon his knowledge;
- provide the research effort with the inputs and contacts needed for its effective adaptation to practical requirements;
- assess economic and social constraints to the adoption of proposed practices;

- to evaluate the effectiveness of the flow of information from research to extension and back;
- assess the needs for plant protection training of extension staffs;
- conduct field trials for various ecological zones;
- serve as information collection stations for the research centers.

At an early stage in project implementation, a plant protection expert will be stationed in each of the CILSS countries, working within the national plant protection service. He will guide the establishment of the DSA network and otherwise assist in coordinating national research and extension activities and assuring a practical orientation of research programs.

A total of 65 DSAs will be established in the eight Sahelian countries, where possible in proximity to field posts of the national plant protection services. Some 130 field extension agents will receive specialized training in plant protection concepts and methods, through specialized courses and/or on the job experience, to support the DSA activity. The first-phase project will thereby establish a mechanism for carrying out farm level field trials, guiding the adaptation of research information to outreach needs and assuring a continuing feedback from the farmer/extension level. It will also test, or provide a model for, organizational and operational links between research, extension and plant protection services which can be more generally applied in the second phase.

5. Pest Surveillance/Crop Loss Assessments/Economic Thresholds

The question of crop loss assessments is an integral part of a pest/disease surveillance system. To improve and develop methods, an intensified effort will be undertaken in two countries: Senegal and Upper Volta. The team in Senegal will also have additional responsibilities for the Gambia. Location of the teams in Senegal and Upper Volta will allow two distinct ecosystems to be studied; the former representing a more intensive production system in the river basin areas and the latter representing arid dry land farming.

Coordination and training are critical elements that must receive careful attention and a series of workshops involving staff from within and outside the project will achieve these objectives. A two man expatriate team in both Senegal and Upper Volta is considered to be the minimal critical mass for the operation of the experimental and survey phases of a viable program

on crop losses. The methodology that will be developed in these two countries during roughly the first two years of the project will be employed with any necessary modifications in other Sahelian countries. This will be facilitated by the placement of an integrated pest management officer in each of the other countries who will be responsible for implementing surveillance systems and crop loss experiments. Initially, a minimum of twenty pest surveillance/loss assessment stations will be established in Senegal and Upper Volta and staffed with forty technicians who will be trained to carry out surveillance and/or assessment activities. Two counterpart level professionals will be given university training to qualify them in this type of work. Beginning in the third year, up to 45 pest surveillance/crop loss assessment stations will be set up in the six other countries and some 90 technicians trained to man them. This will allow a pest/disease data base to be developed during the first phase for the whole of the Sahel utilizing standardized assessment methods.

There will also be a requirement for a central data processing center to analyze and interpret the information generated within the national networks and to collate information on a regional basis. The AGRYMET laboratory at Niamey has adequate data processing facilities and could be used as a coordinating center for data analyses and interpretation. This facility would probably not be required until the second year of operation when the first data would be generated.

6. Country Activities

With the realization that the CILSS/FAO/National Government negotiations will be the final arbiter in determining host country relationships in the country operations plan, this PP has selected to analyze only two of the member states. These two states, Senegal and Upper Volta, are considered representative of the type of relationship problems which one can find in the Sahel. It should, however, be kept in mind that these two country analyses are necessarily illustrative until their country operations plans are determined, but no great changes are expected.

a. Senegal

Research - All research in Senegal is organized under the "Delegation General a la Recherche Scientifique et Technique" which is attached to the Prime Minister's office. Consultative Commissions, representing ministries and institutes concerned with the research programs, including the Ministry of Rural Development, meet annually with the Delegation General to review and orient research activities in line with development programs

and priorities. Independent of these Commissions, an annual meeting on plant protection matters is held between the Plant Protection Service of the "Direction of Agricultural Production" Ministry of Rural Development and interested institutes to examine research results and their application and to identify research programs for the coming year in the light of problems encountered in the field. Terms of reference of these research activities are reviewed and approved by the Plant Protection Service.

Most agricultural research in Senegal is carried out at the "Centre National de Recherches Agronomiques" (CNRA) at Bambey, which is part of the "Institut Senegalais de Recherches Agronomiques" (ISRA). Under its Senegalese Director, the Bambey station groups 35 research scientists of whom one-fifth are Senegalese. The crop protection department is composed of a Senegalese entomologist mainly working on millet, an entomologist (ICRISAT) concentrating on sorghum, two cereal phytopathologists, a weed control specialist, and a stored products pest specialist. The entomologists in particular approach their work on the basis of the integrated pest management concept. Particular attention is paid to biological control of earworms and stemborers, as well as host plant resistance and crop management control tactics. The pathologists look in particular into the epidemiology of major diseases. The weed control section studies combinations of mechanical and chemical weed control. Promising research results at the Bambey station undergo field tests at widely dispersed points under the direction of the CNRA. Those results subsequently found appropriate for general dissemination are turned over to the "Direction of Agricultural Production" for field trials and/or demonstrations.

The crop protection research team at Bambey provides a strong nucleus, within the framework of the multidisciplinary agricultural research of the ISRA, which it is proposed to complement under the project with one entomologist and one phytopathologist. They would work in particular on various ecological and control aspects of the pest species complex of cowpea. They will evaluate the biocontrol complex, host plant resistance and alternative methods of control.

A counterpart is to be assigned to each of the two experts, probably drawn from among the seven Senegalese currently studying in universities abroad who are scheduled for assignment to the Bambey station upon completion of their courses in the next year or two. The project will fund both the planned practical experience at the station and any needed additional academic training in the U.S. or third countries to fully qualify them for their research responsibilities. Each expert will also be assisted by two technicians and two skilled laborers financed under the project.

In order to furnish the crop protection department with adequate facilities, the project will provide a well equipped laboratory and an insectarium as well as housing for the two experts. One all purpose vehicle and one light van will also be provided.

Field Trials and Demonstrations - The responsibility for outreach to the farmer level in Senegal lies primarily with the semi-autonomous "Societes d'Intervention" such as SODEVA, SAED, SOMIVAC, STN, SODESP, and SODEFITEX each of which operates in a fairly well defined geographical area. In all, they represent a network of over 300 extension type agents. While enjoying a substantial autonomy in their operations, these organizations fall under the general direction of the Direction of Agricultural Production, Ministry of Rural Economy. In addition, however, there is a somewhat parallel system of "Centres d'Expansion Rural" (CER), directly responsible to the Direction of Agricultural Production, which has a field staff of 150-200 agents.

In order to better understand present farmer practices, to build a two-way channel of information flow between the researcher and the farmer, and to begin the development of structures through which existing technology in the field of plant protection or future research results can be effectively applied at the farm level, the project proposes to establish 10 Demonstration Study Areas (DSA) in Senegal. These DSAs will be organized within either the Societes d'Intervention or the CERs, whichever organization best lends itself locally to the project's requirements. When possible, however, they will be located in proximity to the secondary bases of the Plant Protection Service described below. The DSAs will consist of experimental plots at which the effectiveness of integrated pest management methods will be compared with traditional methods. They will enable the testing of new methods to prove their validity and identify shortcomings and will provide the nucleus from which further activities can be organized and supervised. The project will provide for specialized training in plant protection matters of 20 agents of either the Societes d'Intervention or the CERs to staff the DSAs as well as the training of other agents to enable them to provide more effective farm level guidance in the field of plant protection. An expert will be assigned under the project to the GOS Plant Protection Service to assist in the establishment and operation of this network of DSAs, the back-stopping by the PPS of this demonstration activity, and the initiation of a process of information exchange between demonstration and research. Funding is also intended to cover the assignment of a counterpart to this expert and the cost of any local or third country training which he may require. An all purpose vehicle and needed field equipment for the DSAs will be furnished.

Pest Surveillance/Crop Loss Assessments - The GOS intends to place the responsibility for pest surveillance and crop loss assessments with the Plant Protection Service. With the exception of phytosanitary inspection stations at the port and airport of Dakar, the Plant Protection Service exists at present only at the headquarters level. The GOS, however, plans to establish a secondary (regional) plant protection base in each of the country's seven administrative districts. Eventually, the 10 surveillance/assessment stations proposed for the first five year phase of the project will be sited at or in proximity to these secondary bases. At the outset of project activity, it will be necessary to rely upon staff and facilities of either the research services, the Societe's d'Intervention or the CERs. Two experts will be assigned to the Plant Protection Service to direct the work of these stations and develop the methodology for data collection, loss assessment quantification, and economic threshold determination. One will be located at Bambey and the other at Ziguinchor where he will also carry out activities in the Gambia. The project will provide for the assignment of a Senegalese counterpart to each of these experts and for any necessary local or third country training. The project will also fund two technicians for each of the stations and their training locally at the school being established under the Sahel Crop Protection project. Provision is also made for two laborers at each of the stations. An all purpose vehicle for each of the experts, Mobylettes for the surveillance technicians and equipment for the stations will be funded by the project.

b. Upper Volta

Research - Coordination of agricultural research is the responsibility of the Direction of Agricultural Services in the Ministry of Rural Development. A coordination office was recently established within the Direction but it has not yet been fully staffed. The principal mechanism for effecting coordination of research activities has been an annual meeting of interested agencies, including offices of the Ministry of Rural Development, the research institutes and the ORDs (Regional Development Organizations). These meetings review the research activities of the previous year, determine those results which are ready for extension to the farm level, and establish the research program for the coming year.

Food crop research in Upper Volta is, for the most part, carried out by the French "Institut de Recherches Agronomiques Tropicales" (IRAT) under agreement with the GOUV. IRAT operates two stations - one at Saria near Ouagadougou in the Sahelian zone and one at Farakoba near Bobo Dioulasso in the higher rainfall Sudanic zone. At the latter station, there are adjoining facilities of the "Centre d'Experimentation pour le Riz et les Cultures Vivrieres" (CERCI). Recently, a government research station at Kamboinse has been expanded and will provide the locale for the ICRISAT and SAFGRAD research teams. The teams will include a phytopathologist and an entomologist to deal mainly with studies of disease and insect resistance of newly

introduced varieties. Under informal arrangements with IRAT, Kamboinse will concentrate on sorghum, millet and corn research in the area of Ouagadougou and the north while the Farakoba station will deal with these crops in the more humid southern area. There is also a government station in Bobo Dioulasso which was established with UNDP assistance for study of cotton diseases. It will now receive Canadian support and its role will be altered to cover investigations of food crops. By 1980, this station is to be staffed by a director, an entomologist, a phytopathologist, a phytopharmacologist and a nematologist. Field testing of research by IRAT is carried out mainly through a network of "Points d'Appuis Permanents" which are directly responsible to the research stations. In some cases, however, facilities of CERIC or other research groups may be used. The government station at Kamboinse, to date, uses ad hoc arrangements for field testing, such as through rural schools.

The Farakoba station, including all the research activities located there (IRAT, CERIC, etc.), is staffed with 17 researchers of which about one-third are Voltaic. The plant protection section consists of one Voltaic entomologist, who must deal with a wide range of insect problems, and a newly assigned Voltaic pathologist. Under the project, it is proposed that two experts be assigned to Farakoba - one entomologist and one weed scientist - to supplement the existing staff. The entomologist will concentrate on the integrated control of sorghum pests, in particular shootfly and midge problems. The weed scientist will be responsible for early season weed problems in particular. Facilities at Farakoba will be expanded by project funded construction of an entomological/pathological laboratory with a small supporting water purification plant.

The Saria staff will be strengthened by the assignment of an entomologist to study the pest complex of millet, in particular stemborers. Provision is also made in the project for refurbishing the entomological laboratory facilities at Saria.

At both Farakoba and Saria, a Voltaic counterpart will be assigned to each of the expatriate researchers. These counterparts would be drawn either from the 6 Voltaics currently studying plant protection in universities abroad or graduates of the "Institut Superior Polytechnique" in Ouagadougou. The project will provide for one year of practical training at the stations for each, followed by any needed additional academic study abroad, and a second year of in-country research experience with the expatriate researcher.

Each expert will be assigned two technicians and two skilled laborers from project funding. The project will also provide a vehicle for each expert.

Field Trials and Demonstrations - The agency in Upper Volta responsible for rural development at the field level is the ORD - of which there are 11, each covering a geographically distinct area of the country. The ORDs are financially autonomous public corporations. They are, in all, staffed with approximately 600 extension type agents through whom farmer contacts for field trials and demonstrations would be effected.

In order to develop a bridge between plant protection research and the farmer, the project proposes to establish at least 10 Demonstration Study Areas (DSAs) within the existing organizational structures of the ORDs. The DSAs should be located in proximity to the secondary bases of the Plant Protection Service in order to facilitate the necessary contacts between the two organizations. Twenty agents, drawn from the ORDs staffs in the locality of the DSAs, will be given special training under the project in plant protection matters with particular attention to integrated pest management concepts to man the DSAs with the backstopping of plant protection personnel. The project would also provide ad hoc plant protection training to these or other extension agents in connection with the introduction of specific interventions or the organization of particular campaigns.

The project will assign a Demonstration/Liaison Officer to the GOUV Plant Protection Service to work with the interested agencies in the establishment of the DSAs and to assist in the development of a two-way information flow between demonstration and research. The project will fund the assignment of a counterpart to this expert during the first 5 years and the cost of necessary local or third country training.

An all purpose vehicle and necessary field equipment for the DSAs will also be provided by the project.

Pest Surveillance/Crop Loss Assessments - The GOUV intends that the responsibility for the pest surveillance system and crop loss assessments should be placed with the Plant Protection Service of the Director of Agricultural Services. This Service currently has a headquarters staff at Ouagadougou and four regional (secondary) phytosanitary bases for Ouagadougou, Fada N'Gourma, Bobo Dioulasso and Ouahigouya. Under the Canadian assistance program, the GOUV is establishing seven additional regional bases to provide one in each of the ORD regions.

This project will provide for the establishment of at least 10 pest surveillance/crop loss assessment stations, where possible located on the secondary bases of the Plant Protection Service. These stations will be directed by two experts linked to the

Plant Protection Service - one located at Farakoba and the other at Saria. A Voltaic counterpart will be assigned to each of the experts and given necessary training under the project. The project will also provide for two technicians at each of the stations and for their training locally and/or at the schools established in Dakar and Yaounde under the Sahel Crop Protection Project. Project financing will cover the employment of two laborers at each station.

An all purpose vehicle for each expert, Mobylettes for the surveillance technicians and field equipment for the stations will be funded under the project.

7. Regional Multidisciplinary Activity for Hydro-Agricultural Development Schemes

This element was included on the premise that grasshoppers must be included in the integrated pest management project. It was, however, proposed that the activities be carried out based on the following two criteria:

- continuation of intensive research (example activities currently undertaken by GERDAT) and extensive research (example activities currently undertaken by COPR/OCLALAV);
- applications of surveillance and forecasting methods developed for grasshoppers so far to the total complex of pest species.

Thus, parallel to the strengthening of national research teams in the area of integrated pest management of pests of basic food crops in the Sahel, it is useful to set up in the present project a multidisciplinary pilot activity concerned with an ecological unit of great economic importance. Such a unit will also be representative for the future agricultural development of the area.

The goal of this activity should be to undertake an overall approach of problems concerning pests in addition to the sectoral approaches described above. Such an overall approach would be based on research methods such as concept of ecological optimum; ecological modelling and operational simulation. These methods have already provided excellent results in grasshoppers research and are certainly valid for other situations.

The initial research locus is the Senegal river valley which is a sub-regional framework of direct interest to Senegal, Mauritania and Mali and is an ecological unity well suited for the execution of this type of collaborative research on integrated pest control. Close collaboration is planned with other hydro-agricultural development schemes such as the Lake Chad Basin and the Niger River Valley. Liaison will be established with other projects planned in this overall program.

The impact of hydro-agricultural schemes on all matters concerning pests, diseases and weeds will be studied. A structure will be developed for research, pest monitoring and integrated pest control that will allow for an effective protection of the irrigated areas and will ensure the benefits to be drawn of other investments.

The 5-year activity will be carried out by a multidisciplinary team. GERDAT having already considerable experience in this type of multidisciplinary synthetic research will participate in the execution of part of the activities.

The team will work in close collaboration with all other national and international specialists working in the Sahel in the projects already mentioned.

This activity, which is both analytic and synthetic, will approach the problem of crop protection not only in its specific context but also in the more general context comprising the whole of the ecosystem and of the agro-ecosystem of the area, including the changes introduced by agricultural development. As such one will for example better understand the phenomenon of infestation or reinfestation in the case of introduction of new crops, changed agricultural practices, or the recolonization of protected crops from the surrounding uncultivated area.

The basic principle is to establish a network of observation stations covering the entire Senegal River Basin supported by a well-equipped laboratory at Saint Louis. This network will later be completed by similar stations in the Lake Chad Basin and the Niger River Valley.

The personnel of this regional activity will comprise a biologist specialized in operational ecology, an expert responsible for studies on the environment (eco-botanist) and an expert responsible for studies on pests (eco-entomologist). Three other entomologists will work on major pest problems: grasshoppers, lepidoptera, coleoptera and diptera. There will also be a phytopathologist, a weed scientist and an expert on application techniques of chemical, biological and ecological methods of control.

It is proposed that the integrated pest management project provide four experts (two entomologists, one phytopathologist and a weed scientist) for the research team, as well as an entomologist for the network in the Niger Valley and an entomologist for Lake Chad Basin. This would complete the existing team of COPR/OCLALAV in Niger that could also coordinate activities in the Chad Basin. This team will be completed by the French bilateral assistance (GERDAT). The ecological problems concerning rodents and birds will be studied in close collaboration with the projects concerned.

The activity will constitute an experimental set-up well suited to produce analytic elements of use for other projects. It will also undertake large scale syntheses of the results achieved in each of the other projects.

The team will need some equipment including a laboratory, all purpose vehicles, light vans, field equipment. Each expert should have two assistants and two laboratory aids. For each observation post two technicians are planned.

8. Logical Framework Narrative

The Integrated Pest Management project has as its ultimate goal the increase of the per hectare yield of food crops in Sahel. Toward this goal, this project will achieve an end-of-project status which will be the existence of designed integrated pest management activities for each of the Sahelian countries which will be ready for further financing by the host countries as assisted by interested international donors.

In order to reasonably state that an integrated pest management activity is ready to go in each country it will be necessary to have the following outputs in place at the end of the project:

- Seven research laboratories for plant protection will have been built and/or equipped in Senegal, Mali, Upper Volta, Niger and Chad, and an operating research program will be generating and testing, on a continuing basis, improved and adapted crop protection practices for the principal food crops.
- Forty African professionals will have been trained to at least the M.S. level in various disciplines.
- One hundred thirty local assistants or technicians will have been trained and assigned to the research programs.
- A methodology will have been developed for operating a surveillance system, quantifying production constraints, assessment of crop losses, and determination of economic thresholds to guide the implementation of plant protection programs in the Sahel.
- Seventy pest surveillance/loss assessment stations will have been installed in the Sahelian countries.
- Seventy Demonstration Study Areas will have been established and will be carrying out a continuous program of outreach to the farmer level.
- One hundred thirty field agents, appropriately qualified in plant protection, will have been trained to conduct the work in the stations and demonstration areas.
- A system of information flow on major diseases and pests will have been set up to guide research and enable a forecasting system to become operational.

By way of achieving the above note end-of-project outputs it is projected that the following intermediate outputs will be achieved at the end of the first and the second project years. Definition of third and fourth year intermediate output targets are not considered feasible at present but would be defined as part of annual evaluations.

Outputs

- Year I - Initiation of counterpart training of 10 scientist and 20 technicians.
- Establishment of coordination activities in close collaboration with Sahel Institute.
 - Collection of documentation research results and classification.
 - Initiation of surveillance and monitoring methods in Senegal, Upper Volta, Chad, Niger and Mali.
 - Collection of information on traditional crop protection practices.
 - Initiation of methodology for crop loss assessment.
 - Strengthening of ongoing research in Senegal, Upper Volta, Mali and Chad.
 - Set up a minimum of 10 demonstration study areas.
 - Preparation of construction plans for laboratories in Senegal, Upper Volta, Mali and for the coordination center.
 - Construction commences in Senegal of laboratory and coordinating center.
 - Procurement of 15 vehicles, entomological supplies, reference materials, field and office supplies.
- Year II- Continuance of training to include 20 scientist and 80 technicians.
- Finalize implementation of Coordinating Unit.
 - Continue documentation activity and preparation of extension aids.
 - Extend surveillance and monitoring system to all countries.

- Expand in collection of information on traditional crop protection practices.
- Further develop methodology for crop loss assessments.
- Establish 40 demonstration study areas.
- Initiate research programs in Senegal, Upper Volta, Mali and Coordinating Unit.
- Continue construction to completion of laboratories and the Coordination Center.
- Complete procurement of initial supply of commodities.
- Review progress of results of first year.

In order to achieve the end of project outputs, those inputs in terms of technical assistance, commodities, training, construction and other elements as defined in the financial plan (See III.B) will be required to be provided on a timely basis from AID, the other donors and the host governments involved.

III. PROJECT ANALYSES

A. TECHNICAL ANALYSIS

1. Feasibility

This project is based on the premise that integrated pest management is, in the long run, the best solution for effective crop protection in the Sahel for the following reasons:

- the very low yields (less than 500 kg/ha) of the major food crops, sorghum and millet, on the traditionally operated small farm will not, in most cases, support sustained chemical control programs.
- IPM is based, as much as possible, on methods adapted to local conditions (resistant varieties, cultural methods, natural enemies) and thus will be the least costly solution.
- the relatively minor use of chemical controls in the Sahel to date has not so upset natural ecological balances as to adversely effect the introduction of IPM principles.
- it has been sufficiently demonstrated that integrated pest control avoids the necessity of ever more frequent pesticide applications, a problem which often arises when chemical control alone is used.
- widespread use of pesticides on areas as vast as those under food crops in the Sahel would lead to considerable environmental disturbance (upset of biological and ecological balances, appearances of new pests or strains resistant to pesticides, etc.), making it essential to have access to the larger choice of control alternatives offered by the integrated control method.

2. Defining the Problem

The lack of biological and ecological information on various pests of basic food crops, and reliable statistics on losses incurred from them in the Sahelian countries is a major hindrance to the proper evaluation of their economic importance. However, on the basis of a number of reports and discussions with responsible people in the area, it is possible to identify the major constraints associated with plant protection problems. It is recognized that the foundation of integrated pest management is a working knowledge of the ecological relationship existing

within and without the crop system. It is therefore of paramount importance that the multidisciplinary studies interrelate all aspects.

a. Insect Problems

The stemborers of sorghum and millet in the Sahelian zone belong to at least three species of Lepidoptera. They feed on the interior of the stem and mechanically weaken it. Some authors also consider them to be one of the indirect causes for flower sterility. Borers are considered to be important sorghum and millet pests, because there are currently no effective chemical means for their control. It is not believed that any detailed research is currently underway on these insects in the Sahelian zone.

Earworms belong to a number of unidentified Lepidoptera species, the larvae of which feed on flowers and grains, mainly of millet and sorghum. *Masalia* species are the most important and seem to be specific to millet. They seem to be a problem unique to the Sahelian countries, as they are not known anywhere else as being important pests. Three to five different species have been mentioned in some conversations, but a detailed inventory still needs to be carried out. The caterpillars of these pests destroy flowers and feed on the grain when it is in the milk-ripe stage. Losses up to 80 percent of potential harvest have been observed. Knowledge on the biology and ecology of the earworm is extremely limited and the correct scientific names have not yet been determined.

There is some information on the types of pesticides that will control them. Studies are currently being undertaken at Tarna (Niger) by two Canadian entomologists who are studying the distribution of outbreaks and possible control means. Observations on some of the mortality factors are also being carried out at the IRAT Station at Farakoba in Upper Volta and the general biology and epidemiology of these pests are being studied at the Bambey Research Station in Senegal by entomologists working within the framework of ISRA.

Many species of grasshoppers attack sorghum and millet. About ten species are able to develop large populations and cause considerable damage to crops. Losses are caused mainly at the beginning of the rainy season on milk-ripe grains. Contrary to former ideas, some species of grasshoppers may migrate over long distances. These migrations are directly dependent on the dynamics of the intertropical front and concern the whole Sudano-Sahelian zone. Losses caused can be considerable, but it is not possible under the current conditions to exactly estimate the significance of these losses on a national or regional scale.

During certain years, however, grasshoppers have been considered to be the most important pests of sorghum and millet. A team of four research workers from the Groupement d'Etudes et de Recherches pour le Developpement de l'Agriculture Tropicale (CERDAT) is currently undertaking detailed studies on this problem. They are doing an inventory of major and minor species, completed by research on the biology and ecology of economically important species, as related to seasonal movements of these insects. Two researchers are stationed at Maradi in Niger (Sahelian zone), and two others are working at the Agronomic Research Station at Saria in Upper Volta (Soudano-Sahelian zone). One other program is being carried out in the Niger River valley under the direction of COPR and OSRO. It is essentially aimed at the monitoring of grasshoppers in the Niger valley and the training of personnel.

Midges occur regularly in sorghum in the tropical zone and cause sterility of the flower. Because it is so small, the insect is observed only by those trained to find it. This is the reason it is rarely noted in general estimates of crop losses in sorghum and millet. However, recent reports cite midge, along with stemborers, as a major pest species. Earlier studies in Senegal indicate that parasites play an important role in the regulation of midge populations. Detailed estimates of damage are however lacking. There is a good deal of literature on gallmidge in other areas, which should serve as a basis for the work to be undertaken in this program. Work is currently carried out by ISRA and IRAT, mainly concerned with observing population fluctuations and the impact of natural enemies.

The larvae of shootflies feed on young shoots of sorghum causing them to die. This insect attacks sorghum and millet extensively, but at this time it is impossible to give an objective damage estimate. IRAT trials in Upper Volta in 1974 indicate losses of about 20%. The shootfly causes the most severe damage to late sowings. Abundant literature from other tropical regions is available. Selection for resistant varieties is currently being undertaken, mainly by ICRISAT.

Many so-called minor pests should also be studied in detail. This was clearly demonstrated in 1975 and 1976, when blister beetles and meloidae suddenly began to cause major problems. Up to 80% damage was noted locally. Similar outbreaks are not uncommon in other situations and can be attributed mostly to the disturbance of existing balances. Only careful study of the total pest - natural enemies complex and detailed knowledge of their inter-relationships, will permit an understanding of how such events might be avoided.

An inventory of insect pests of cowpea published in 1976 by Mr. B. Diouye, Bambe, Senegal, shows that at least 35 species of phytophagous insects are regularly encountered on cowpea. Sixteen of these are said to be of sufficient economic importance to justify control measures. The most important are the species which are constantly present at relatively high population densities. This is the case for Amsacta moloneyi, a leaf-feeder which is considered to be the major pest of cowpeas in Senegal. Other important pests are the weevil, Piezotrachelus varium Wag, which feeds on the pods; Spodoptera littoralis, a leaf-feeder, Maruca testularis, a leaf and pod-feeder, thrips and different bruchid species which infest the seeds in the field and continue their feeding and development in storage. They are by far the most important storage pests of cowpea. Research has been limited mainly (at Bambe and Maradi) to pest inventory and surveillance, but very little is known so far on non-chemical control possibilities.

b. Pathogens and nematodes

This group of pest problems is rarely mentioned in discussions on crop losses in basic food crops in the Sahelian zone. However, there are many reasons to believe that their impact on crop performance is considerable and will become even more so when the overall production pattern is improved. The integrated pest management approach can be successfully undertaken only when pests other than arthropods are also given due consideration. Study of these pests will allow their relative importance to be evaluated, so that they can be fitted into a comprehensive crop protection program. The major pathogens recognized in sorghum and millet are smuts. At least five different species are recognized to be of importance. Downy mildew is also a serious problem on millet. A program of breeding for resistance to these diseases is underway at the Bambe station.

Investigations concerning plant pathogenic nematodes are being carried out mostly in the more humid regions of West and Central Africa. Rootknot nematodes seem to be widely distributed. Information is lacking on nematodes in sorghum and millet.

c. Weeds

Striga is the major weed problem in the CILSS countries, especially the Sahelian zone. It is widely distributed in sorghum, millet and cowpea fields. It is particularly damaging on poorer soils and yield reduction of up to 50% has been noted. Average losses in Nigeria are estimated to be at least 10%. The integrated control of Striga is currently entering a phase which justifies intensive applied experimentation and additional research.

Control strategies to be evaluated are impact of fertilizers, varietal resistance and especially interruption of seed dormancy. Studies on the possible use of herbicides combined with cultural methods are carried out in Senegal by ISRA.

Weeds generally constitute a problem at the beginning of the growing season. The manpower needed for weeding at that period interferes with a great deal of other agricultural activity. This results in a delay of weed control and a consequent impact on the crop's production capacity. Any improvement of this situation through well-adapted and simple methods of weed management will have a considerable impact on the improvement of agricultural production at the small farmer level.

3. Problem Solving Approaches

a. Insect Problems

Most major crop pests have been identified in the Sahel countries, but in many food crop areas, beneficial as well as harmful insects and their interrelationships are not understood. As new crops are introduced and large areas are brought into cultivation, careful studies to determine the damage potential of pests are essential. Virtually all agricultural crops are faced with a complex of serious pest problems and losses on crops are generally high, and usually beyond tolerable levels. A major problem in formulating a plant protection policy for the food crops in the Sahel, is the lack of information regarding the distribution of pests and the corresponding economic losses they inflict. The development of pest/disease surveillance systems, including estimation of losses, is a basic pre-requisite to the development of any plant protection program. During the course of such a program, economic thresholds can be determined and a data base accumulated to identify and quantify pest and disease development patterns in the area.

There are several factors which favor development of food crop pest management in the Sahel. With the possible exceptions of cash crops such as cocoa, peanuts, cotton and coffee, the relatively small amounts of insecticide used have not resulted in massive upsets of beneficial fauna as in the case of many areas of the world. Also, in most areas the farms are small, diversified and somewhat isolated; factors which favor ecosystem stability. To date, consumers are not so sophisticated as to demand produce free of insect damage or presence. An adequate food supply at low cost is more important than appearance. This places a premium upon non-chemical methods of pest management -- e.g. crop rotation, host-free periods, host plant resistance, crop residue destruction, biological controls, and the planting of late or early maturing varieties.

There is therefore a great need for research on non-chemical methods of pest/disease and weed control. Modifying time of planting, for example, is promising for control of sorghum midge and several other pests; control of smut by soaking the seed in water; stalk destruction to reduce carry-over of the stem borer species so damaging and common to millet, sorghum, maize and other crops is important. Crop rotation may determine to a large extent composition of weed populations.

The first and most important basic element in integrated pest management is the development of economic thresholds. An economic threshold, in this context is the level at which crop damage may no longer be tolerated; and hence, the level of pest infestation at which it is desirable to apply deliberate protection measures. The determination of these thresholds is prerequisite to the development of any system of pest management for two main reasons. First, one must know the level of pest populations below which damage may be tolerable. This defines the ultimate objective of the control system. Second, one must know the level above which treatment must be applied to avert significant injury or an outbreak of the pest organism.

To obtain this information, a clear understanding of the complex economics associated with the production of the crop of interest is vital. First, one must know the general economic situation and then determine what might be called the economic degrees of freedom. In other words, the margin of profit on which the farmer is operating must be determined so that the amount of yield he can afford to lose to the depredations of pests can be assessed. Second, against this background one must determine how much he can afford to pay for protection compared with this level of loss. For example, if a grower can afford to lose X hundreds of dollars per acre to pests and still turn a reasonable profit, he can afford to pay up to but not exceeding X hundreds of dollars for protection of his crop. If the crop can be protected for less than this amount, the difference will be added to his profit. This knowledge defines the problems for the scientist and sets the limits on the cost and value of the management systems that may be profitably implemented.

It is difficult to determine these economic thresholds and levels of tolerance because of the great number of factors involved, the inter-relationship with other production factors, and because many of the factors are economic and not readily available to, or assessable by, plant protection scientists. And, it is certain that the threshold levels will change constantly with changing economic and environmental conditions. They are dynamic. This favors the multifaceted approach to flexible pest management systems.

There generally have been few analyses of the economics of crop production relative to pest problems for any region, and none in the Sahel countries. Principles have rarely been developed or limits clearly defined. Consequently, it is not unusual for more to be spent to control a pest than the value of increased yield produced by the treatment. Even worse, as mentioned earlier, the application of a pesticide to destroy a major pest may well upset balances to such an extent that new, original, minor pests are created, which in turn require still more money to control. This sort of effect strains the boundaries of even the most liberal margin of profit. These type of interactions can only be clearly exposed by a detailed analysis of the economics of crop production in relation to pest control.

On the basis of the available fragmentary evidence, it may be concluded that economic-threshold levels are almost invariably higher than one would expect. Too frequently, the visual threshold the population level at which individuals of the pest species are obvious, is taken to be synonymous with the action threshold, and both may be equated with the economic threshold. However, the assumption that if a pest feeds on a plant it is causing economic injury, is not always true. The action threshold is the level of a pest population at which action must be taken to prevent the population from rising to the economic threshold where significant damage occurs. Ideally, it would be desirable to have biological control systems that are so effective and self-perpetuating that the necessity for action is avoided. Most systems, however, will probably require periodic action. Hence the determination of the action and economic threshold are of supreme importance.

Studies of the economics of crop production in relation to pest control lead to determining against a known economic background the damage levels that can be tolerated with each crop of interest. The total loss is assignable to the entire complex of pests attacking the crop, but one must take another step to determine the real and potential damage limits assignable to each major pest within the entire complex. These assignments depend not only on the economic framework of production, but also on certain biological attributes of the pests themselves. These are the attributes that determine whether the pest is a direct or indirect one, and whether it has the ability to increase rapidly.

The assignment of individual damage levels and potentials to each pest attacking a given crop leads to the final step in considering the array of pests that confront the farmer. This is to rank the common species in their order of importance. This may be only to single out the most important for intensive research, especially if all we can hope for is the development of an integrated control system in its most narrow sense - that

pertaining to a single species. If one intends, however, to attempt to design a system against all major pests in an ecosystem, ranking pests is even more important, this establishes the priorities for research. Also it is by this means that the interrelationship of the status of one pest with that of others can be determined.

Once the economic status of the pests of an ecosystem has been determined, studies on their ecology must be developed. These have two purposes: Prediction and manipulation. The main value of being able to predict the future trends in the population levels of pests is that it enables one to apply control measures to prevent increases above the economic injury level. Most pest management programs will be interwoven systems having a number of major components. Pest populations will certainly not be eliminated in these programs, but should be kept at low levels so that none produce unacceptable losses in yield. From time to time, these fluctuations will approach the economic injury level. If excessively vigorous measures are then applied, the system may be permanently disrupted. Therefore, it is necessary to be able to predict with confidence the future population trends so that new control measures will be used only when required to dampen potential outbreaks. Pest control tactics must be selected that have a minimal disruptive influence on the system as a whole. When danger is past, these tactics should be dropped from the system until again required. Prediction of past outbreaks is particularly important after a satisfactory control system has been developed.

Environmental manipulation is also basic to the establishment of integrated systems. One must be able to determine the factors in a crop ecosystem that affect pest numbers, or that have the potential to do so. Those with the greatest utility should be selected to manipulate the ecosystem as a whole and so that their regulative effect will be maximized. When this has been done (when the most value is being obtained from natural factors of the ecosystem) one may find that the pest populations involved are reduced to tolerable levels without further action on the part of the farmer. If not, one may add new components to the ecosystem that will complement those already present to suppress the levels of pest abundance to acceptable levels. In the rational and organized development of integrated control programs, this step-wise progression in research to determine how important environmental factors may be manipulated to maximize their effectiveness in suppressing pest populations is essential.

b. Management of Weeds

Striga, the major weed problem particularly in countries like Niger and Chad, should offer a good target for the successful implementation of a pest management system. This is especially

needed as chemical control is not a realistic approach because of the present economical condition of the small farmer. The approach to be followed should be based on a combination of measures of which varietal resistance and breaking of seed dormancy seem the most promising. Possibilities of biological control should also be looked into. If successful, this will undoubtedly be the method best adapted to the Sahelian conditions. It might be achieved at relative low cost.

For Striga as well as for early season weeds, considerable attention should be given to the impact of certain crop rotations. However, it should be realized that implementation of these measures can only be achieved if they do not break too far from traditional practices. The increase of animal power also allows for the study of equipment for mechanical weeding. If this could be provided at low cost, then it should certainly fit in with current practices.

c. Plant Pathology and Potential for Pest Management

The basic concepts of pest management for plant pathology are the same as those for entomology. Major diseases and most minor diseases of the basic food crops in the Sahel have been identified. A list of plant diseases in Senegal has been published. The plant protection officer in Chad has a report of an extensive survey of plant diseases in that country. About 30 diseases were described on sorghum and millet. On millet, downy mildew is the disease of prime importance. The most important on sorghum appears to be smuts, and to a lesser extent on millet. Other diseases have caused important damage in localized areas or on certain varieties. On cowpea, virus diseases and leaf spots can result in substantial economic losses. There seems to be a rather delicate balance between the ability of the pathogens to cause damage. Changes in varieties or cultural practices are likely to upset the balance for some of the minor diseases so that they will become important. For example, grain molds and head molds are of major importance on early maturing varieties being introduced by breeders; but these diseases are of little importance on traditional varieties. The addition of nitrogen fertilizer greatly increases the level of susceptibility of certain diseases, e.g. rusts on millet. The rusts will become important if farmers begin fertilizing their fields. Assessment of losses caused by diseases is needed as a basis for deciding how much effort to place in controlling various diseases and in evaluating benefits from disease control. There seems to be little doubt, however, that smuts are causing important losses. The most rapid results in reducing disease losses could be obtained by a concentrated program to control smuts. Chemical seed treatments are available, but a non-chemical method

should also be tried. Before fungicides were used for this purpose, cereal smuts were generally controlled by soaking the seed in water. In areas of the Sahel where mean temperatures are 25 degrees C or above, smut and many other seed-borne fungi could be controlled by soaking the seed in water for about 24 hours. At lower mean temperatures longer soaking periods may be required. This is an excellent example of the application of a small "pest management" measure. Since some smuts may be soil-borne as well as seed-borne, seed treatments may need to be integrated with other control measures such as crop rotation and the use of more resistant varieties.

Breeding programs have been under way for some years to develop sorghum and millet varieties that are resistant to downy mildew. Indications are that pathogenic races of the downy mildew fungus exist and that the varieties with a high degree of resistance probably have vertical or specific genes for resistance. This type of resistance is usually not very stable. Therefore, an effort should be made to maintain as high a degree of horizontal or non-specific resistance as possible in the new varieties; this is the primary aim of the ICRISAT and Texas/AID breeding program. Basic studies on the epidemiology of the disease and the biology of the casual organism are needed to see if other control measures might be employed to help reduce losses from this disease.

For the other diseases of food crops in the Sahel, the main objective should be to keep them from becoming important when changes are made in varieties or cultural practices. Thus plant pathologists should work in close cooperation with plant breeders and agronomists to evaluate the changes resulting from the introduction of new varieties or cultural practices.

Very little is known about the damage caused by diseases of cowpea or "niebe" in the Sahel. Work in northern Nigeria indicated that two virus diseases may be of sufficient importance to warrant control measures. If so, consideration should be given to obtaining the services of a plant pathologist with sufficient background in plant virology to do practical work with virus diseases of plants. This might be coordinated with the research done along these lines at IITA.

d. The Development of Pest/Disease Surveillance Systems;
Determination of Economic Thresholds and Economic Losses

One of the major difficulties in formulating plant protection policy for the Sahel is the lack of adequate information regarding the distribution of pests and diseases and their relative economic importance. Whereas problem solving approaches must be given high priority there is also a need to develop at the same time methodology for operating pest/disease surveillance systems,

determining economic thresholds and for quantifying the production constraints associated with pests, weeds and diseases. This is considered to be a basic prerequisite to the development of any plant protection program.

The basic methodology need not be studied in each country of the Sahel. On the contrary, two small teams located in two countries which are representative of different ecological zones is adequate. A two thrust program will be developed consisting of an experimental and a survey phase. In the experimental phase a network of field experiments in farmers fields will be conducted to estimate the current constraints to production associated with pests, weeds and diseases of the major food crops. Typical experiments will include untreated plots and treatments with insecticides, herbicides and fungicides applied separately and together. Pesticides will only be used as tools to establish the potential yield of the healthy crop. The network can also be used to establish the potential constraints of new varieties - e.g. pre release varieties of sorghum and millet from ICRISAT and Texas A&M/AID Sorghum Project will be planted alongside traditional varieties to assess the current and potential production constraints. A comprehensive set of data will be generated for each experiment to characterize the pest, weed and disease status throughout the growth of the crop. This will allow methodology for disease and pest surveillance to be developed which can then be utilized in the survey phase. After two to three years there should be sufficient experimental data accumulated to allow the relationships between different pests/pathogen levels and production to be characterized and economic threshold established.

The limited number of experiments in the network will not allow valid conclusions to be drawn regarding the importance of pests, weeds and diseases on a national or regional basis. Therefore the experimental data will be supplemented by a survey of representative fields where the incidence or severity of pests, weeds and diseases will be assessed at appropriate times throughout the season, utilizing the same assessment methods used in the experiments, so that the data are compatible. With the aid of yield determinations from the network of experiments the survey data can then be interpreted to assess the importance of crop losses occurring in the farmers' fields. Survey data can also be extremely useful to identify variations in pest populations from year to year, between regions, or differences due to variety, cultural practices, etc.

In the survey phase, acceptable sampling and pest/disease assessment methods will be tested and developed for use in surveillance systems which can then be implemented in other countries.

The practical application of knowledge developed in research and development work in agriculture is probably a more difficult task than in most industries. Farming consists of a great variety of production methods and objectives, and it is therefore important that there should be available reliable information about current practices and trends. The crop loss profile as determined in the survey will, to some extent, reflect the usage of control practices used by farmers to prevent pre-harvest losses. The usage of preventive practices for pre-harvest losses can best be characterized by conducting a survey of representative farms, to monitor the use of different control measures, including cultural practices, resistant varieties, pesticides, and any other factor leading to control. Such surveys will lead to a further understanding of how far, and in what way, have farmers accepted control practices. It also may indicate what key factors motivate farmers to introduce plant protection programs. In order to increase efficiency and consolidate operations, the same farms could be used in all surveys designed to assess pre-harvest losses and the use of corresponding control practices.

e. Composition of the Project Team

The CILSS Plant Protection document, Annex B, proposed an expatriate team for AID funding consisting of 17 research scientists (plant pathologists, entomologists, weed scientists, integrated pest management experts); 15 experts in crop surveillance, demonstration and liaison, and seven coordinating staff; a total of 39. These estimated needs were based on expert technical judgment. This PP submits a funding request to finance 35 expatriates since four experts will be financed by other donors (British and French).

f. Training

CILSS intends to recruit and train as many Africans as possible to replace the expatriate technical assistance team at the end of five years. Each FAO expatriate will have a qualified counterpart with whom he will work and train on an on-the-job basis. Selected counterparts will be sent to the U.S. or Europe to supplement their on-the-job training. In addition a substantial number of assistants will be trained to support experts' research activities. The proposed level of training effort is shown in Annex B, VI. It should be noted that the achievement of these training goals depends on successful negotiation of the country operations plans. In addition CILSS will be drawing up a comprehensive training plan which will relate the training efforts under the existing Sahel Food Crops Protection Project (625-0916) to those of the Sahel Institute as projected on Annex G. Such an overall training plan is called for as a second-level condition precedent in the draft project agreement (Annex G).

g. Environment

New concepts of pest management include the integrated approach to pest control to which this proposed program addresses itself. Normally without interference from man, crops and pests survive in a natural balance due to ecological factors in the environment. However, with man's propensity to disturb this balance for his material needs and the establishment of new varieties, monoculture cropping, careless introduction of new pests, etc., the balance becomes upset. Pests under these conditions without controls, result in disastrous, intolerable losses.

It has been learned, through the introduction of integrated pest-control programs in a number of crop situations, that even in modern agriculture we can rely to a large extent on the factors governing these natural balances. The so-called natural enemies play a far larger role than we even expected. The judicious choice of control measures which will allow these regulatory mechanisms to exercise fully their action will consequently enable man to achieve optimal agricultural production with a minimum of environmentally disruptive chemicals.

The use of varieties having maximum tolerance, resistance, or capability to recover from attacks is essential. Even the best germ-plasm may be inadequate to meet all pest situations, but some measure of resistance provides greater latitude for other strategies in the integrated pest management framework and gives some measure of relief for a few years until new biotypes develop.

Cultural measures are an important factor of integrated pest management and suppression of pests can be obtained by rotation of crops, sanitation, choice of sites, sterilization, etc. These measures can be useful under certain ecological conditions, but can become inoperative when conditions deviate excessively.

There are certain direct actions to suppress population increases of pests including the genetic control technique, sex attractants, hormones and biological control. Any one of these or a combination thereof may be effective in an integrated pest control program.

Even with the foregoing practices adopted, conditions still develop whereby pests multiply explosively because of inevitable shifts in the environmental conditions regulating pest development, changes in physiological resistance, etc. All the evidence suggests that pesticides will need to be utilized in the future. They provide the crop insurance that permits the farmer to invest in other inputs, i.e., irrigation, fertilizers, new varieties and mechanization. Chemicals are part of the

production inputs that must be further perfected to meet the growing demands for food and fiber.

Usage of pesticides in the countries concerned in this program has been minimal so far which is reflected directly in considerable crop losses, especially in the food crops such as millet, sorghum, and cowpea. Likewise, environmental side effects have also been minimal as a result of under-utilization of pesticides. For the control of migratory pests optimal use is made of knowledge concerning breeding habits thereby providing a means to limit pest control to well defined areas.

The decisions on pesticide use are to be based on assessments of the need for use. This assessment based on surveys will evaluate the degree of economic damage by a given pest or types of pests tolerable to a specific area of agriculture, and determine the need for one or more pesticides to control pests based upon a cost benefit analysis.

Under tropical conditions, it is not possible to effectively protect farm workers from the effects of the more hazardous organo-phosphate pesticides, therefore wherever possible recommendations and training of personnel will bear this in mind to avoid unnecessary poisoning of humans, livestock and wildlife.

It is generally agreed by research workers and practitioners in the field of crop protection and pest control that non-chemical methods of pest control are not likely to be effective substitutes for chemical pesticides by themselves, but will work best in conjunction with one or more other (chemical or non-chemical) pest control tools in an integrated pest management system. In this approach, the best of all available control techniques are brought to bear against pest problems, instead of sole reliance on chemical pesticides, or on any other single technique above. Thus, the use of pesticides will be reduced considerably and adverse effects on the environment will be minimized.

Integrated pest management programs, historically and of necessity have been developed only following widespread and extensive use of the broad spectrum persistent pesticides. Since the use of such compounds in the Sahelian Zone up to the present time has been of limited extent and intensity, the establishment of a complementary activity is strongly recommended to monitor the environmental impact of the use of agricultural pesticides, within the Integrated Pest Management Project for Basic Food Crops. Institution of such an activity is essential to the rational development of an integrated pest management program, it will contribute to the enhancement of environmental quality and will ameliorate the environmental impacts of agricultural pesticide use. The impact monitoring activity will be linked

with the Integrated Pest Management Project, but could eventually be extended to cover other aspects of pesticide use in the Sahel.

To accomplish this impact monitoring activity it will be necessary to compile relevant information necessary for specific definition of potential problem areas and devise appropriate monitoring procedures which will enable CILSS over the short run:

- (i) To describe the nature and extent of previous pesticide usage, in relation to present and projected patterns of land use and recommend, if appropriate, a sampling program to determine residue levels in different environmental components;
- (ii) To attempt, insofar as is possible, an assessment of the likely environmental impact of the above mentioned usages;
- (iii) To assess regional capabilities in pesticide residue extraction and analysis and recommend appropriate steps to ensure their adequacy for projected chemical monitoring requirements;
- (iv) To comment on the appropriateness of environmental safeguards incorporated in criteria for selecting pesticides to be used in recommended control programs under development;
- (v) To draw up action proposals with approximate time scales and levels of financial, technical and staffing input required in order to achieve long-term objectives.

Such long-term objectives for CILSS should include projections of research and monitoring needs in relation to areas of suspected vulnerability to pesticide contamination with a clear indication of priorities. Additional long-term objectives should include:

- (i) Ensuring that adequate and continuous consideration is given to the early detection and minimization or avoidance of adverse environmental effects of chemically based elements of pest and vector control programs;
- (ii) Monitoring the distribution and fate of pesticides in different environmental compounds with particular reference to the provision of advance warning of levels with potential toxicological significance;

- (iii) Conducting associated biological monitoring of selected elements of the biota recognized to play an important role in maintaining ecological stability and productivity.

B. FINANCIAL PLAN

The financial plan has been adapted from the CILSS plant protection document developed in February-March 1977. The table incorporated into this text includes all modifications to the original submission which was made during the Washington Conference September 27-28, 1977. Principal changes were that CILSS would arrange for equipment procurement and construction and as a result FAO's overhead on these items has been excluded. Secondly, the total number of expatriates to be funded by AID has been reduced by 4 (3 British experts in pest surveillance, 1 French bio-climatologist) based on pledges made at the September meeting (See following section). Finally, in view of the emerging role of the Sahel Institute, training funding has been reduced and the proposed training center and coordination cell building has been eliminated.

These modifications result in a decrease of \$4,522,000 from the CILSS document figure of \$29,802,000 to the total figure proposed in this PP of \$25,280,00 (See Table I). This represents a 15% reduction while at the same time enhances the capability of the various Sahelian institutions to perform tasks for which they will be responsible.

1. Other Donor Participation

Substantial other donor interest has been elicited by CILSS for various portions of its overall Plant Protection Program.

With respect to donor support for the Annex B Program there are two principal sources of funding other than U.S. - Great Britain and France. Great Britain through its Overseas Development Ministry has indicated it is prepared to provide three or four experts in pest monitoring and surveillance on the understanding that support costs for these experts are funded elsewhere.

FAC had indicated that it will supply several (probably 4) experts to the multi-disciplinary hydro-agricultural research activity, again on the understanding that logistical support be funded elsewhere. In addition, FAC is willing to provide the bioclimatologist who will work in the coordination unit.

Although several other donors have expressed interest in Annex B specifically, none has itemized any potential contributions. Consequently, the budget representing AID funding for Annex B shown in the financial plan takes only the British and French inputs into consideration.

TABLE I

(\$'000)

	PM	PY1	PY2	PY3	PY4	PY5	Total	
I	FAO Personnel		<u>597</u>	<u>1,677</u>	<u>2,604</u>	<u>3,055</u>	<u>3,290</u>	<u>11,223</u>
	Personnel (long-term)	108	447	1,452	2,304	2,730	2,940	9,873
	Consultants	24	150	225	300	325	350	1,350
II	Other Consultants	12	<u>85</u>	<u>100</u>	<u>115</u>	<u>130</u>	<u>150</u>	<u>580</u>
III	Training	(44)	<u>164</u>	<u>180</u>	<u>185</u>	<u>120</u>	<u>100</u>	<u>749</u>
IV	Commodities	Units	<u>680</u>	<u>975</u>	<u>410</u>	<u>545</u>	<u>430</u>	<u>3,040</u>
	Vehicles	(15)	<u>150</u>	(12) <u>120</u>	(12) <u>120</u>	(19) <u>190</u>	(12) <u>120</u>	<u>700</u>
	Lab Equipment		200	400				600
	Field equipment		175	250	50	100	50	625
	Expendable Supplies		60	65	70	75	80	350
	Maintenance, POL		95	140	170	180	180	765
V	Other Costs		<u>462</u>	<u>978</u>	<u>1,331</u>	<u>1,681</u>	<u>1,835</u>	<u>6,294</u>
	Local personnel		294	748	1,056	1,371	1,495	4,964
	Operating Costs		175	230	275	310	340	1,330
VI	Construction		<u>1,271</u>	<u>250</u>				<u>1,521</u>
	Buildings		<u>1,071</u>	<u>250</u>				<u>1,321</u>
	A and E, Supplies		200					200
VII	Administrative Costs		<u>134</u>	<u>290</u>	<u>425</u>	<u>493</u>	<u>531</u>	<u>1,873</u>
	FAO (14% of I)		84	235	365	428	461	1,573
	CILSS		50	55	60	65	70	300
			<u>3,400</u>	<u>4,450</u>	<u>15,070</u>	<u>6,024</u>	<u>6,336</u>	<u>25,280</u>

TABLE II

(\$'000)

ALLOCATION OF INPUTS BY FOREIGN EXCHANGE OR LOCAL CURRENCY

	PY 1		PY 2		PY 3		PY 4		PY 5		TOTAL	
	FX	LC	FX	LC								
I Personnel	682		1777		2719		3185		3440		11803	
II Training	44	120	64	116	88	97	40	80	24	76	260	489
III Commodities	525	155	770	205	120	290	190	355	120	310	1725	1315
IV Construction		1271		250								1521
V Other Costs		469		978		1331		1681		1835		6924
VI Administrative Costs	84	50	235	55	365	60	428	65	461	70	1573	300
	<u>1335</u>	<u>2065</u>	<u>2846</u>	<u>1604</u>	<u>3292</u>	<u>1778</u>	<u>3843</u>	<u>2181</u>	<u>4045</u>	<u>2291</u>	<u>15361</u>	<u>9919</u>

C. SOCIAL ANALYSIS

In this project, the target group is the large number of small farmers who produce primarily for on-farm consumption. These farmers may also engage in cash crop and livestock production as well as other economic activities as the opportunities arise. Given his economic standing, this type of subsistence-level farmer in the Sahel tends to be motivated by two main considerations. First, he wishes to produce adequate food for himself and for his dependents; second, he wishes, as far as possible, to avoid any risk that his food production will fall below the required amount, or that he will be committed to expenditures for crop inputs which he will be unable to meet.

Since the specific intention of this project is to raise the living standards of the mass of farmers at the subsistence level, the project is compatible with both of these motivations. On the one hand, its aim is to increase crop production by introducing a more widespread control of crop pests. On the other hand, the availability of techniques and materials envisaged by the project for combatting upsurges of pests will mean that the risk of decreases in production resulting from unexpected depredation will be reduced. To summarize, the crop protection measures to be developed in this project can address both concerns by assisting the farmer to ensure that his expenditures for production inputs will not be negated by uncontrollable disease and pest infestation.

In order to realize the project objectives, no fundamental changes in village-level socio-economic structures will be required. Since the project concentrates on food crops there should be no relative improvement or worsening of social or economic positions within the group of subsistence level farmers. Similarly, the impetus given by the project to subsistence farming is unlikely to be so great as to eclipse the status of cash cropping. Thus, the project should lead to an overall improvement in the long-run in the position of arable farming in the Sahel without evoking a negative response from cash cropping farmers. Such a change does not appear to conflict with the objectives of any of the national governments concerned and is fully consistent with the regional objectives of the CILSS/Club du Sahel.

At the farmer level, the suggested pest control measures which will be identified in this project must represent an acceptable combination of profitability and risk reduction to the small farmer. The precise microeconomic benefits to the farmer of control will vary according to individual local circumstances and will be monitored at regular intervals over the life of the project as part of the outreach program. In certain circumstances, a change in cultural practices at little cost to the farmer may assist in controlling a pest;

in others he may have to purchase pesticides and equipment. In some instances a subsidy on one or both of these purchased items may be necessary if they are to be used to the optimum technical degree. In many circumstances crop protection will represent an intensification measure which will forestall or replace the current tendency towards extensive practice. It may, too, permit marginal land to be "rested" or turned over to grazing.

Moreover, the application of the crop protection measures to be developed in this project should spread labor requirements for men and women more evenly throughout the growing season. While the labor and time of both men and women may be saved, it appears unlikely that the introduction of new varieties and cultural practices or pesticides will cause hardship through unemployment. In the case of insect vertebrate pest and disease control, for example, it seems likely that some of the labor saved by avoiding "extensive" agricultural practices will be required to deal with additional harvesting, processing and transport. In weed control, it is possible that the introduction of improved control methods could displace considerable quantities of labor currently used for hand-weeding. On the one hand, this may represent the removal of a labor peak in the agricultural cycle which has been preventing expansion of farmer activities. On the other hand, it may involve the displacement of casual labor with consequent hardship. Thus, the use and effects of pest control measures will be the subject of close economic and sociological monitoring throughout the life of the project.

Land tenure patterns are not an issue in this project. Since the project involves cultural controls it will work within the existing village land tenure systems in which the nuclear and/or extended family is the basic production and land tenure unit. Over the long-run, there may be an indirect benefit in terms of land tenure which might be attributable to the project. For example, the commercialization of a few crops in agriculture which has occurred in the recent past may have given considerable economic strength to the cultivators of these crops, with the result that they are able to expand their holdings and displace cultivators of subsistence crops. Any potential concentration of land in the hands of cash-crop producers is therefore likely to be forestalled by the increase in economic power to subsistence farmers envisaged by the project.

Active farmer participation is required at all stages of project implementation in order to accumulate accurate data on food crop losses, evaluate the contribution of crop protection measures and identify the microeconomic benefit of pest control to the farmer. In order to establish the appropriate organizational framework to achieve the required level and type of

farmer participation, the consultant attached to the National Plant Protection Services for outreach activities will undertake an analysis of the farmers' relationships to past and ongoing government agricultural and cooperative programs, and especially the relationships between farmers and extension/cooperative agents. The consultant will also be responsible for organizing the economic and sociological monitoring described above. This analysis of farmer-extension relationships will be done before the Demonstration Study Areas are identified so that the project activities can be integrated into the most appropriate ongoing agricultural production organizations as well as help define what kind of training will be required for farmers and agricultural staff. This analysis should also indicate the most appropriate means for coordinating the outreach activities with the village-level authorities in the demonstration study areas. In this way the project objectives can be achieved through demonstration and practical training at the farm-level which is directly and positively linked to the subsistence-level farmer's overall agricultural activities.

D. ECONOMIC ANALYSIS

In an economic analysis of research on development of integrated pest management, the key word is research. The output of this project will be a certain amount of knowledge, some trained manpower and a special institutional capacity. The program is designed to produce an intermediate output which will be a critical input into a second process, the widespread application of pest control measures. In this economic evaluation it is essential to recognize that the output of the project will not directly reduce food grain losses; the project will increase the capacity and the efficiency of ensuing efforts to reduce food grain losses.

It is not feasible to conduct a quantitative evaluation of this project because the requisite data do not exist, although quantitative analysis is possible in a purely technical sense. The core of the analytic methodology, financial and economic, involves determination of all project outputs, calculation of the net present value of the stream of savings caused by the outputs and comparison of the discounted benefit stream to the discounted cost stream. The technical procedures for this type of analysis are well known and routinely incorporated in project evaluations when the data are available. Thus, a quantitative evaluation such as the calculation of an internal rate of return is not provided. To acquire the necessary data would require initiation of a relatively large scale program of experimentation. Indeed, generation of economic data on

integrated pest management techniques is one of the major objectives of the project. Information and data will be generated and collected in a systematic manner so there can be methodical evaluation of plant protection measures in the Sahel.

Whereas the absence of data does not allow a quantitative analysis, it is possible to consider some of the qualitative aspects of plant protection. Some of the more general economic aspects are discussed in Annex B I.

The fundamental point to be made is that food grain production is a major and a vital economic activity in the Sahel. Thus even small relative changes in the rate of output will exert a significant overall impact. Two examples serve to illustrate this fact. First, in terms of the research project itself, the annual cost of the project is equal to slightly more than two percent of the total value of Sahelian food grain production in 1975. Experimental results have shown that the technology already exists to increase yields by at least 10 percent through pest control--and frequently by much more than this. It would appear that an increase of approximately two percent is quite plausible given adequate implementation efforts. To illustrate the degree of importance of crop protection in a Sahel-wide sense, it is noted that an increase in food grain savings equal to a 10 percent increase in the projected 1990 output level is worth \$184 million or 2.4 times the value of United States food grain assistance to the Sahel in the major drought year of 1974 and 1.4 times the total value of United States food assistance in 1973, 1974 and 1975.

It is also necessary to view plant protection vis-a-vis plans for the overall development of agricultural production in the Sahel. Parallel efforts are now in progress to increase agricultural productivity by introducing greater use of fertilizer, more specialized, productive plants and improved cultivation techniques. But as more modern techniques replace traditional methods there is a proportionate increase in the susceptibility of plants to diseases and pests. Thus plant protection is critical if gains produced by other efforts are to be realized. It is also noted that the historical record clearly demonstrates the economic efficacy of pest control programs in more developed economies where protection is a fundamental element in high-productivity agriculture.

The particular design of the research project has its own economically significant elements. The first element concerns the development of economic threshold criteria to be used in directing pest control operations. The second element is the use of an integrated approach to plant protection. The development and application of an economic threshold system

has appreciable significance for the economic efficiency of a plant protection program. Very briefly stated, use of an economic threshold criterion involves comparison of the cost of a specific protection operation to the expected value of savings. Thus, for example, in some areas where yields or prices are low, protection may not be warranted. Application of such a system, however, requires the development of data on pests, losses, natural conditions and other information necessary to make well-informed decisions. Without such a guidance system, it would be necessary to apply plant protection measures without specific knowledge of their cost effectiveness. The significance of this method is that the allocation of plant protection measures will be constantly directed by economic-technical criteria, giving the program an internal economic rationality and allowing it to reflect the diverse conditions which exist across the Sahel.

The second element is that an integrated approach to plant protection will be used. This fact has economic implications which have long-term significance for the Sahelian economies. Integrated plant protection minimizes the use of pesticides and maximizes the use of indigenous resources, particularly labor. Thus, the research project will establish a system which will maximize economic linkages. Minimization of the use of pesticides also minimizes the expenditure of foreign exchange or the use of foreign assistance funds which can be allocated to other, more critical purposes.

As a final point, it is noted that the economic cost of a protection measure may be near zero if it utilizes labor at a time when farmers would otherwise be idle or engaged in very marginal activity. Whereas a quantitative analysis of the project is desirable it is not feasible, nevertheless, the basic scheme of an integrated program, guided by an economic threshold system, constitutes a sound approach to achieving the primary goal in a manner which makes efficient and maximum use of Sahelian economic resources.

IV. IMPLEMENTATION PLANNING

A. ADMINISTRATION ARRANGEMENTS

CILSS has established a management structure for the overall management of the CILSS Plant Protection Program. Included in this is the management structure for administration of Annex B (See this PP, Annex B, VII A). All donor inputs to Annex B will be coordinated through this management structure.

Briefly, CILSS has established an Executive Committee with representation of all member states and all donors to Annex B. This committee meets annually to review progress and set policy but leaves daily operational control to the Regional Management Unit (RMU). The Regional Management Unit carries out the Executive Committee's decisions and serves as the principal operational supervisor to the technical implementation agency (FAO). To assure adequate technical review, CILSS has created the Consultative Committee, consisting of 6 members each from the African and international scientific communities. This committee, meeting annually, serves as the technical advisory body to the Executive Committee. Below the Consultative Committee is the Regional Technical Coordination Unit (RTCUC) which supervises the technical and scientific aspects of the project. Initially the RTCUC, for all intents and purposes, will be the FAO technical advisory team, but it is intended that as the Sahel Institute becomes operational this role of technical and scientific supervision will be shifted to it.

Regional administrative requirements will be handled on a regional basis by the RMU. These include: (a) the relationship of CILSS to the principal technical implementation agent (FAO); (b) procurement of equipment; (c) Construction supervision; (d) financial management. Administrative relationships on a country basis will necessarily be shaped by the negotiations to take place between CILSS, FAO, and the National government.

1. Technical Assistance

CILSS has selected FAO to be the principal technical implementation agent for this project. Upon negotiations of an agreement with FAO, the latter will provide expatriate research and outreach personnel to assist in implementing the project. FAO will serve as the primary technical advisor in each of the member states and may be called upon (depending on country negotiations) to perform certain operational tasks on behalf of CILSS or the member state. Exact relationships and duties remain to be worked out during country negotiations.

2. Procurement

Equipment will be procured from authorized sources, i.e., U.S. and West Africa (Code 941 modified) using recognized AID procurement procedures. FAO will assist in reviewing all proposed equipment purchases from the technical point of view to assure that appropriate equipment is procured. Once equipment lists are established, CILSS will contract with a recognized procurement agency to insure prompt shipment of goods. CILSS will utilize standard AID documentation such as PIO/C's, L/COMM's, and DRA's as appropriate. CILSS will work with REDSO's logistic supply and equipment specialists to comply with AID receiving report regulations. Procurement of locally available (West Africa) items will follow AID "off the shelf" rules with which CILSS is already familiar.

3. Construction

CILSS will contract for the necessary A and E services after satisfying initial conditions precedent. FAO will assist the selected A and E firm from a technical standpoint to assure that the buildings constructed will serve their desired functions. Construction is to take place at six different sites in three countries and is valued at a total of \$1.3 million. After review and approval of the A and E plans by REDSO, CILSS will transmit the plans to the appropriate Ministry of Public Works* who will be responsible for issuing a call for bids** and continue on as supervisory engineer on actual construction. REDSO engineers would be available for inspection visits on an ad hoc basis, but responsibility must reside on the national Ministry of Public Works to assure that the construction is properly executed.

Footnotes:

- * The services of the Ministry of Public Works of other such agency, as appropriate, will be negotiated for during the CILSS/FAO/National government development of the country operations plan.
- ** The call for bids will be restricted to the member states because of the wide dispersion of construction sites and the low level of cost per site.

4. Financial

Upon signature of the Grant Agreement and satisfaction of necessary conditions precedent, the CILSS Secretariat will prepare standard documentation to request an advance of three months operating costs be placed in the chosen local bank, the Volta International Bank (BIV). Two accounts will be established, one for dollar expenses and one for CFA expenses. The dollar account will be used principally as a conduit through which to fund FAO activities with the money being sent to Rome to be disbursed through FAO channels to pay salaries and support costs of FAO provided experts. The CFA account will be used as the conduit to cover all local costs (i.e. occurring in West Africa and denominated in the various currencies used in West Africa) including operations, counterpart salaries, local training and construction. Those local costs, occurring for example in Mauritania which uses ouagiyas, will be transferred from the BIV to its correspondent bank in Mauritania according to an approved national project budget and will be released by the Mauritanian Bank upon authorized signature of the designated CILSS representative there.

Regarding financial reporting, CILSS will have a full time controller in the Regional Management unit who will work closely with the AID controller being posted in Ouagadougou. Required AID financial reports will be produced by CILSS which will rely heavily upon the BIV for accounting and for reconciling advances made through BIV to their correspondent banks. FAO will also provide standard FAO type financial reports to CILSS which will in turn be transmitted to AID.

The BIV is considered to have the banking capability to perform these tasks as a result of experience gained on the AID R&R program. The BIV has negotiated a service relationship with CILSS and is expanding its staff and acquiring a computer in order to service CILSS program requirements in the most effective manner.

5. AID Administrative Arrangements

Direct project supervision will be vested in a project officer resident in Ouagadougou. (Technical supervision of the project will be assured by the present project manager for the Sahel Crop Protection (625-0916) resident in Dakar, who is a qualified entomologist). Both officers can avail themselves of any necessary backstopping through REDSO, AID/W and USDA.

AID country officers (RDO/CDO) will be expected to be aware of the nature of the country operations plan as negotiated by CILSS/FAO/National government in their country. Given the embryonic nature of CILSS' operational capabilities with regard to such activities as procurement, construction, etc., it may be necessary for AID country offices to assist the local CILSS representatives in implementing their country activities. AID/W management will rely upon AID country offices to provide ongoing monitoring of CILSS sponsored pest protection activities which are being financed under this project.

B. IMPLEMENTATION PLAN

Project implementation in this project must take into consideration the nature of the relationships between the CILSS, the FAO and the various national governments. Those entities will negotiate country operations plans for each country which will lay out in detail the responsibilities of each of the parties. Relationships within each country's agricultural service will vary but will necessarily involve the national agronomic research unit, the national plant protection unit and the national extension service. Interrelationships between these units will depend on the quality as well as the number of personnel available to work on this project. Exact numbers of expatriate personnel to be furnished will be determined during negotiations and for this reason the country budgets shown in Annex B. IV and the research manpower distribution in Annex B. V represent present best estimates.

Prior to the negotiation of the country operation plans, a few implementation steps can be taken and those are detailed in Annex E. The CILSS/FAO agreement for the provision of technical advisory personnel will be signed, A and E studies on the construction portion of the project will commence. Equipment lists and a procurement agent will be arranged. An evaluation baseline study will be undertaken and an overall training plan will be developed.

FAO has also submitted a tentative deployment schedule for its expatriate personnel, as follows:

Year I

Coordination unit	- 3 (Project Leader, Administrative Officer, Socio-Economist)
Outreach	- 5 (half-year) to be assigned in Senegal, Upper Volta, Chad, Niger, Mali
Research	- 4 (half year) Senegal, Upper Volta, Mali, Chad

Year II

Coordination unit - 6 (full strength)
 Outreach -10
 Research - 6

Year III

Coordination unit - 6
 Outreach - 15 (full strength)
 Research - 11

Year IV & V

Coordination unit - 6
 Outreach - 15
 Research - 14 (full strength)

Detailed project implementation beyond six months will result from a cumulation of all country operations programs with the addition of necessary coordination activities undertaken by the FAO on behalf of the technical administration and the RMU as the operational arm of CILSS.

C. EVALUATION PLAN

The project calls for the establishment of baseline data for purposes of research. Preview on a periodic basis will take place as is customary in scientific experimentation. At any given time it will be possible to determine the extent of progress in scientific research simply by comparing the current research activity to the established baseline. Special attention will also be paid to monitoring the environment (See Part III, A. pages 48-51). This activity will assure that the limited pesticide usage projected for the proposed research is carefully monitored to indicate the potential nature of environmental impact such pesticides would have if used on a widespread basis.

CILSS has proposed establishing sociological baseline data in selected areas using a contractor other than FAO. This would permit CILSS, in later stages of this project to monitor the small farmer understanding and acceptance of the techniques of integrated pest management as these techniques are researched, verified and ultimately made available to the farmers. Such an evaluation technique could prove invaluable in an overall project evaluation.

Finally, CILSS and AID will carry out annual project evaluations, as indicated in the project agreement (Annex G), which will involve use of AID evaluation techniques such as the PAR, or whatever other techniques which may be appropriate. The AID project manager in Ouagadougou will assure that these annual evaluations take place.

D. CONDITIONS, COVENANTS AND NEGOTIATING STATUS

Substantial negotiation has taken place during various international exchanges, especially at the Ottawa conference May 30-31, 1977, the Paris conference July 18-19, and the Washington conference September 27-28. Conditions precedent to disbursement have been detailed in the draft project agreement attached as Annex G. In addition to a series of standard conditions for review and approval pertaining to the country operations plans, as well as detailed plans for procurement, training, construction, and evaluation. Little additional negotiation is required for the Grantee, CILSS, and AID to be prepared to sign a final project agreement. Negotiations by CILSS with the principal technical implementation agency, FAO, are proceeding and will be completed prior to any disbursement by AID in this project.

CILSS + IPM RESEARCH

625-0928

Volume II - Annexes

ACTION MEMORANDUM FOR THE ACTING ASSISTANT ADMINISTRATOR FOR AFRICA

FROM : AFR/DR, John L. Withers *JWL*

SUBJECT : AID Participation in the CILSS-sponsored Plant Protection Program

Problem: AA/AFR approval of AID participation in the CILSS Plant Protection Program.

Discussion: In April 1977 AID received a copy of the CILSS document "Plant Protection in CILSS Member Countries". This document consists of nine sections: the first section is a program analysis of the Sahel Plant Protection "sector", and the remaining eight sections consist of individual project strategies to address constraints found in the Sahel Plant Protection sector. Financing by AID is being sought by CILSS for one of these project efforts, i.e. Annex 3 - "Research and Development of Integrated Pest Management for Basic Food Crops in the Sahel".

On April 25, 1977 and May 2, 1977, AFR/DR coordinated review sessions on the CILSS Plant Protection document. These lengthy sessions, attended by representatives of FAO, AID and USDA resulted in an "Issues Paper" (Attachment 1) which will be of interest to CILSS and donors as they move into the next phase of design in the Plant Protection area.

On May 18, 1977 the ECPR reviewed the Attachment 1 Issues Paper and indicated that it should serve as the basic guidance document for AID project designers who will be responsible for drafting a PP for AID financing of a segment of the CILSS program. The ECPR raised several additional issues which have been listed as Attachment 2 to this memorandum. Finally, for purposes of the upcoming Ottawa meeting, the ECPR summarized AID's position vis-a-vis the CILSS Plant Protection Program as follows:

"The U.S. Delegation to the Ottawa/CILSS meeting should undertake the following:

a. Endorse the CILSS initiative in the Plant Protection area.

b. Indicate AID's interest in financing a project in the Integrated Pest Management area - using "Annex 3" as a resource document. (AID also endorses those elements of Annex A which are incorporated in the ongoing

Sabal Crop Protection Project (625-0915) or will be included in the final draft of Annex 3).

c. Indicate AID's concern that multi-donor financing be obtained for "Annex G" given the crucial importance of this project element to any Plant Protection program.

d. Indicate that AID intends to work closely with CILSS, FAO, and other donors so that the project design of the AID-financed component of the CILSS program will be ready by Fall 1977.

e. Bring to the attention of CILSS conferees the AID views expressed in Recommendations #1 and #5 in Attachment 1 to this paper."

Recommendations: (1) That you approve the position outlined in the preceding paragraph as the current U.S. position vis-a-vis the CILSS Plant Protection Program.

APPROVED [Signature]
DISAPPROVED _____
DATE 5/26/77

(2) That you authorize AFR design personnel to commence work on resolving the issues outlined in Attachments 1 and 2 for purposes of drafting an AID Project Paper.

APPROVED [Signature]
DISAPPROVED _____
DATE 5/26/77

Clearances:

AFR/DP: WTate [Signature]
AFR/GC: STisa (draft)
AFR/SFWA: IRosenthal (draft)

AFR/DR/SFWA: JRe [Signature]: 5/26/77

ECONOMIC BACKGROUND

A. INTRODUCTION

The Sahel represents one of the more economically disadvantaged areas of the world. Five of its eight states are classified among the world's twenty-five poorest countries. Table I provides some key indicators of the level of economic development in these eight states. Agriculture, including livestock and fishing, and largely at a subsistence level, represents the main activity in these countries which have few known exploitable mineral deposits and a narrow base for industrial growth.

TABLE I

Selected Indicators of Economic Development

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
	<u>Pop.</u>	<u>GNP</u>	<u>3 Labor</u>	<u>Literacy</u>	<u>Life</u>
	<u>millions</u>	<u>per Capita</u>	<u>Force in</u>	<u>(3 1976)</u>	<u>Expectancy</u>
		<u>US\$ 1975</u>	<u>Agriculture</u>		<u>1976</u>
			<u>(1976)</u>		
Chad	4.0	88	91	5-10	38
Cape Verde	0.5	163	84	5-10	40
Mali	5.6	73	91	5	38
Mauritania	1.2	196	85	1-5	38
Niger	4.6	125	91	5	38
Senegal	4.4	252	76	5-10	40
Upper Volta	6.0	79	89	5-10	29

Food crop production is mainly concentrated in cereal grains. Production estimates of the major cereal crops are shown below for the Sahelian states excluding Cape Verde for which data was not available.

TABLE II

Cereal Production in various years (1972-1975)

	Corn		Sorghum & Millet		Rice		Wheat		Sorghum & Millet Area
	000 MT	%	000 MT	%	000 MT	%	000 MT	%	000 Ha
Chad	-	-	450*	89	51	10	5	1	1 050
The Gambia	10	14	42	57	21	29	-	-	42
Mali	110	10	800	72	200	18	-	-	1 300
Mauritania	5	10	40	83	3	6	-	-	100
Niger	3	**	1134	97	23	2	1	**	2 000
Senegal	42	5	680	31	114	14	-	-	1 050
Upper Volta	54	5	1000	92	32	3	-	-	1 889
Total:	214		4146		449		6		

* Questionable estimate.

** Less than 1%

Cereal food demands by 1990 projected to be as follows:

TABLE III

Estimated Food Grain Consumption Requirements, 1990

	Wheat	Rice	Sorghum, millet and Corn
	000 tons	000 tons	000 tons
Chad	41	81	1 026
The Gambia	8	84	58
Mali	41	232	1 405
Mauritania	37	64	208
Niger	15	65	1 202
Senegal	202	603	738
Upper Volta	50	71	1 265
Total:	394	1 200	5 902

B. ECONOMIC ASPECTS

1. Crop Losses

The present chronic shortages of food in the Sahel can be attributed in part to the heavy food crop losses caused by pests. A number of factors intensified by the recent drought have moreover aggravated the threat of pest damage. These are :

- the extended and intensified growing of rainfed crops, which have eliminated extensive areas of natural grasses where pests also fed; moreover, intensification of agricultural practices generally leads to heavier pest attacks;
- the overgrazing and deforestation which has denuded the soil over large areas, particularly in the Northern Sahel, and left a constricted vegetation favorable to the reproduction of grasshoppers;
- the spread of off-season crops in the river basins which creates favorable conditions for pests at the height of the dry season, and has thus provided them with a facility for carrying over from one main season crop to the next.

Virtually no statistically reliable information on the losses caused by insects, diseases, weeds or vertebrate pests exists in the Sahelian region. A small number of projects conducted at research stations have attempted to measure the losses caused by individual pests, but these are normally conducted as small-scale experiments and the results obtained from them cannot easily be multiplied to provide data on a national or regional scale.

2. Inherent Difficulties in the Evaluation of Plant Protection Projects

The preliminary report of the Government Consultation on Crop and Post-harvest Protection Needs in the Sahel proposes that crop loss estimates should be undertaken as a means of evaluating the impact of proposed actions.

For a first analysis an economic approach of this kind poses serious difficulties in the present circumstances and is based on ambiguity which should be removed. It is accepted that every development project should be based on objective data and on measurable anticipated results.

But even in countries where agriculture is well advanced, such approaches remain imperfect in the case of pest control. In view of our imperfect knowledge of food crops in the Sahel

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and the lack of statistics (those that do exist represent no more than orders of magnitude) it would be unwise to take too rigorous an approach to project appraisal, particularly as crop protection is only one of several possible crop production improvements (labor, planting dates, fertilizer, etc.), and cannot be dissociated from them.

a) It is worth bearing in mind that the ambiguity mentioned above arises from the fact that the losses caused by pests and their economic impact becomes known only when research on the pest is well advanced. Anticipation is dangerous as is any attempt to extrapolate from data on losses in other parts of the world or caused by other pests, or from experiments undertaken in the Sahel in much earlier periods, e.g., by ICRP. Reference to these conditions are diverse and non-comparable.

In practice the insects and diseases observed as a permanent feature of traditional crops are seen as one element or parameter among other agricultural constraints. This is why their economic impact has been scarcely analyzed and remains imprecise.

There has been unanimous implicit agreement on the need for plant protection in the Sahel. The recent drought has had the catalytic effect of making this appreciation explicit. But an appreciation of this kind, however based, remains subjective. Various attempts - in themselves subjective - to estimate the impact of plant protection projects can however be made.

b) Their impact can be estimated by the extent to which the producers' basis socio-economic activity increases when the farmers are fully absorbed into the project. The producers' demand for the services of pest control agents and specialists can serve as another indicator. A demand of this kind will assure the continuation and takeover of the project - it represents participation by those most directly involved.

c) A contrast between improved and traditional methods of cultivation can be provided. For example, cowpea, a protein-rich legume, which can be used for both human and animal consumption, is subject to pest attack both in the field and in storage. Yields vary between 300 and 500 Kg/ha in traditional cultivation. At research stations the yield is frequently between 1300 and 4000 Kg/ha but the contribution of plant protection to this difference in yield has not been determined.

In years of good rainfall, it is the weather conditions which have a more important bearing on yields than do crop protection measures. On the other hand, in years of unfavorable weather, plant protection prevents a serious decline in production and assures a certain food supply. There is therefore a need for more research into varieties which guarantee a certain minimum

of production than into those that are high yielding but susceptible to drought and pest attack.

d) At the same time, it should be emphasized that the benefits of the project's activities cannot be measured in terms of an overall short-term increase in the amount of food products coming onto the market. There are two reasons for this: first, home consumption will rise until each family's food intake requirement has been satisfied and carry-over stocks have been built up. The Canadian report on development in Kara district (Mali) suggests that the consumption of traditional cereals will rise from 175 kg per head p.a. to approximately 185 kg per head p.a. Second, the profit motive is not a primary consideration among those producing food crops at this stage of development. It should be added that the volume of sales of surpluses is also dependent on the price level.

a) For pests which tend to occur unexpectedly and in large numbers, such as locusts, birds and occasionally rodents, the evaluation of the activities of regional control organizations is even more difficult. Their primary task is prevention via the surveillance of migration areas and control in laying sites. In periods of recession or of moderate locust activity, pesticide application made at the right time can keep losses to a negligible level. While this situation continues, support of the states involved tends to diminish and there is a risk that the necessary financial effort will not be made. The running costs of the regional control organizations are not negligible. They are inevitable and constitute an insurance premium paid by individual countries against possible catastrophes.

3. Economic Aspects

The difficulty of using classical methods of economic appraisal of projects does not mean that all attempts at economic analysis should be rejected. In fact, a deeper investigation of the impact of pest control measures can be subject to a certain degree of economic analysis.

A number of studies have been carried out, principally on cash crops such as cotton, sugar cane, groundnuts and irrigated rice. The FAO, for example, has compiled a list of methods of measuring crop losses pre- and post-harvest. It remains to be seen how they can be adapted and applied in the field.

Until such times as more reliable data become available and can be incorporated into project proposals, it is necessary to rely on estimates of the impact of certain hypothetical loss levels on national food production. For the purposes of this exercise, the physical and financial losses that would be caused if pests kept actual production 10% and secondly 25% below potential

production are estimated. It should be noted that if pests have consumed one quarter of potential production, this amount, statistically, is one-third of actual (remaining) production. This exercise is performed for the countries presented in Table II and the results are given below:

TABLE IV

Total annual physical (000 m.t.) and financial (000\$) losses in food production for 7 CISS countries caused by hypothetical 10% and 25% losses from potential production.

	<u>Maize</u>	<u>Millet/ Sorghum</u>	<u>Pulses</u>	<u>Rice</u>	<u>Wheat</u>	<u>Total</u>
Actual production	214	4,146	387	449	6	5,202
Actual value	32,100	579,440	50,130	89,800	1,020	752,670
10% loss:						
Physical	23.8	460.7	43.0	49.9	0.7	579.1
Financial	3,570	64,493	5,690	9,980	119	83,857
25% loss:						
Physical	71.3	1,382.0	129.0	149.7	2.0	1,734.0
Financial	10,695	193,430	16,770	29,940	340	251,225

Notes: Actual production taken from Table II

Prices based on estimated means of local prices over all CISS countries. Prices used are as follows:

Maize	\$150 per m.t.
Millet/Sorghum	\$140 "
Paddy rice	\$200 "
Wheat	\$170 "
Pulses	\$130 "

It should be noted that the financial values presented are extremely approximate. Several factors mitigate against greater financial precision:

1. It is thought invalid to use world market prices for these crops, since they are not, on the whole, exported. It is recognized, however, that they are import substitutes and a more detailed analysis would make allowance for this fact.
2. Lack of data prevents the calculation of precise weighted average grain prices.
3. Prices in all countries are subject to severe seasonal fluctuations.
4. In all countries there are at least two levels of pricing in the main market area - the "official" and "traditional" market prices.
5. Geographical isolation means that prices may vary widely even within countries.

Since the CISSS plan a rapid expansion of agricultural output by 1990, much of which is to be produced on irrigation schemes, it was thought appropriate to repeat the hypothetical loss estimation exercise above for the estimated 1990 crop outputs. Data from this exercise were taken from the FAO perspective study. Prices used were those prevailing in 1976, but these may represent an underestimation of the true value of losses insofar as there could be increases in the real unit value of the crops by 1990. Furthermore, the development of large irrigated areas may lead to the increased potential for pest damage, so that the real damage may be higher in 1990 per unit area than currently if no controls were undertaken. The results of applying 10% and 25% hypothetical losses from potential output in 1990 are presented in the table below.

TABLE 7

		Millet/ Sorghum/ Maize	Pulses	Rice	Wheat	Total
Total projected 1990 output	Physical	6.356	731	1.143	124	8,609
	Value	912,840	101,530	229,600	21,080	1,220,050
10% Loss	Physical	723.4	36.3	127.5	13.3	956.5
	Value	101,976	11,234	24,300	2,346	139,906
25% Loss	Physical	2133.3	250.3	332.2	41.3	2,867.6
	Value	295662	33839	75540	7021	413,062

Notes:

In the source document 1990 output of maize was combined with millet and sorghum. This convention therefore has to be repeated here. Since little maize is produced, the millet and sorghum price was applied to the combination.

C. RELATIONSHIP OF CROP LOSSES TO PROPOSED INVESTMENT IN CROP PROTECTION

From these data in tables IV and V we can see that at current 1975 prices, a 10% loss would be worth over \$64m at current production levels, and worth over \$10m at projected 1990 production while for a 25% loss of potential production the value of loss would be \$251m and \$112m respectively on a per annum basis.

By comparison with these figures the total anticipated disbursement of the proposed program over the 5 years of phase I is about \$68.5m - i.e., \$13.7m per annum approximately.

In order to cover the annual costs of the proposed phase I, the program would have to generate an increase in output, over the 1975 base of some 2.0% and maintain this increased level for each of the first five project years. It must be emphasized that this does not imply a cumulative annual increase (i.e., 2.0% being added each year) but the achievement of a 2.0% increase and the maintaining of this higher absolute level of output. For later phases of the program, assuming that annual disbursements of a similar order were envisaged, the required higher level of annual output in absolute terms would remain approximately the same, but the rising base of agricultural production achieved through measures other than pest control would translate this same absolute level into a lower percentage increase.

None of the estimated annual disbursements include the proposed expenditures of national plant protection organizations (estimated elsewhere in this submission at approximately \$1.5m p.a., of which a portion may be allocated to cash crops, with which we are not concerned here), nor do they include proposed increases in expenditures on pesticides, for which no value-estimate is available. If these annual expenditures were to be included in the annual disbursement figures presented above, the annual increase in output would have to be slightly larger to cover them.

D. EFFECTS OF PLANT PROTECTION ON PRODUCTION, PRICES AND FARMER INCOME

Because the elasticity of demand for millet and sorghum tends to be less than one, there arises the theoretical possibility of farmers' incomes actually declining because the greater output resulting from plant protection would tend to cause an even greater proportional decrease in prices. The demand elasticity for millet and sorghum is estimated in the FAO Perspective Study on Agricultural Development in the Sahelian Countries, 1975-1990 to be about .2 in most Sahelian countries. Thus a 1 percent increase in the quantity of grain going to market would result in a 5 percent drop in prices and a corresponding, although not necessarily equal,

fall in farmer income. Inelasticity of demand presents a problem in efforts to increase agricultural production and farmers' incomes, but there are mitigating factors which combine to reduce the problem, and, because of the particular relationship of plant protection to other productivity-increasing interventions and to increasing output, the role of plant protection as a causal agent is secondary relative to other types of interventions. Before proceeding further, it is noted that the demand elasticity for rice and wheat is estimated to be one or greater; therefore, the following discussion is mainly applicable to millet and sorghum. Millet is used in the discussion because it comprises the greatest proportion of total grain production.

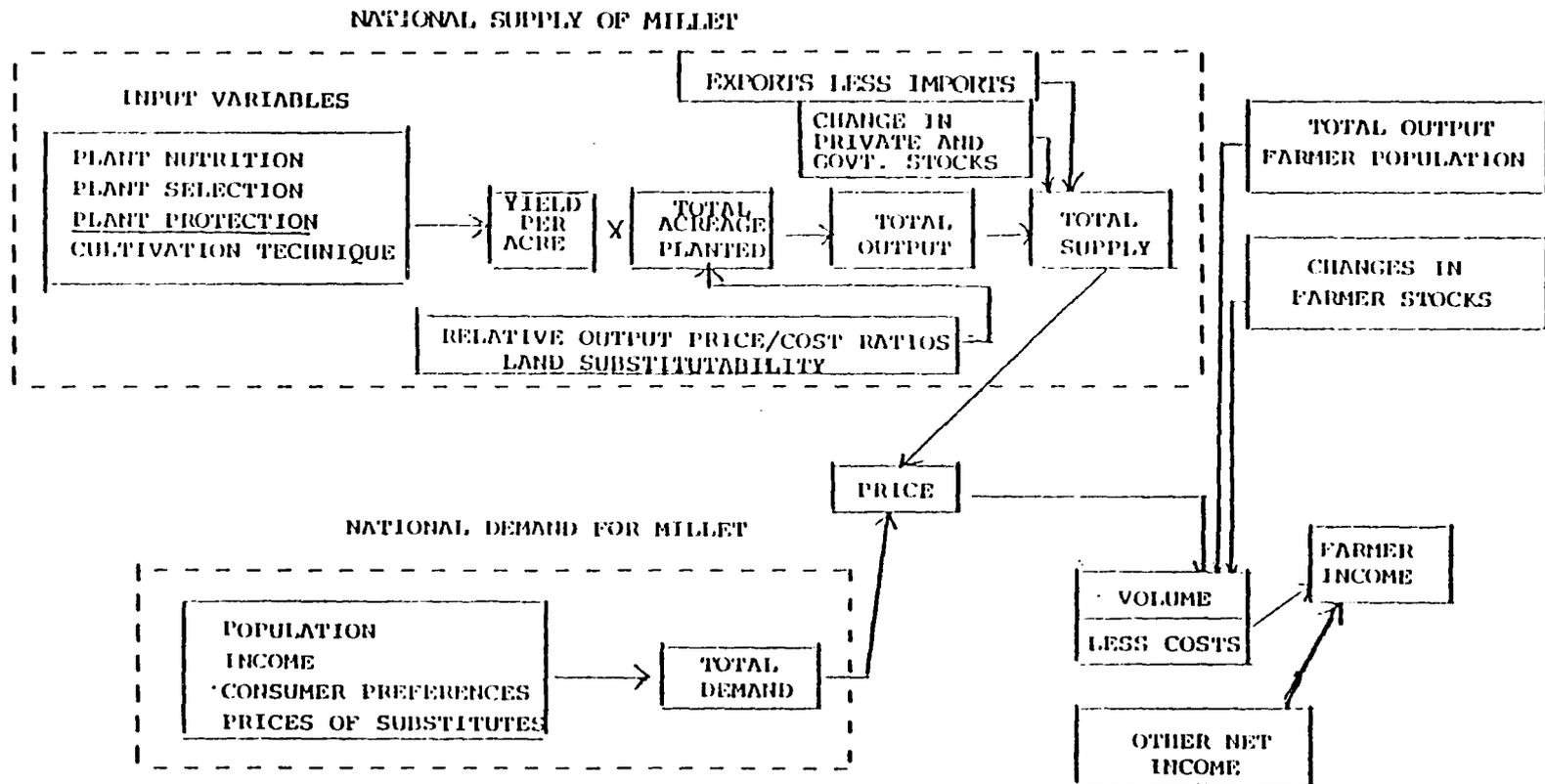
1. The Technical-Economic Relationship

First consider the technical-economic function of plant protection within the general scheme to increase agricultural productivity in the Sahel. The central point is that the primary purpose and effect of plant protection is to insure that excessive losses do not occur, including losses of gains brought about by improvements in plant nutrient levels, plant selection, and so on. That is, the main effect of protection is to reduce the magnitude of downward changes in output. In this respect, and to the extent there is a relationship between plant protection measures and farmer income, protection would keep farmer income from experiencing drastic reductions. This is particularly significant in a context in which the output constitutes the major food source for the farmer, because the marginal value of output increases substantially as its supply dips below the subsistence level. Besides helping insulate the farmer against calamity, the passive nature of protection suggests that the inelasticity issue is misdirected. This issue is more appropriately directed to the basic policy of increasing agricultural productivity as constituted by the collection of measures to increase and insure greater yields.

2. The Macroeconomic Relationship between Plant Protection and Farmer Income

Examination of the relationship between plant protection and farmer income indicates that there are a number of variables which are much more significant in affecting income and which, when considered in a dynamic context, support the argument that plant protection facilitates increasing farmer income. The diagram below depicts the main non-natural variables which interact to influence the supply and demand for millet and which ultimately combine to influence farmer income. Rainfall is the major natural variable, and government agricultural policy may be seen as a variable which both influences and is influenced by many of the variables in the diagram. Similar diagrams could be provided to represent the supply and demand situations of other grains

DETERMINATION OF FARMER INCOME



which influence farmer income. In the context of the discussion, it would also be appropriate to include sorghum; but such inclusion does not change the argument.

Although it is not possible to make a definitive statement without specific knowledge of the relationships among the variables, logic, our general knowledge of economic relationships, and experience with plant protection suggest plant protection is a minor actor in influencing farmer income. Another way of expressing this relationship is to trace backward through the diagram from farmer income to plant protection. Farmer income is based on the price and volume of marketed millet, and its importance as an income source will vary with the degree of diversification of the farmer. (It is understood that diversification tends to be relatively low.) The price the farmer receives is determined by the interaction of the major variables of supply and demand. The major determinants of total supply are stock adjustments, acreage planted, and yield per acre. Plant protection is one of several variables influencing yield per acre.

Combining this overview of plant protection with its technical nature suggests that it is not a significant factor in increasing total supply because of the number of other important variables involved and the technical character of plant protection. On the other hand, it is significant in preventing a fall in output (the other half of the price-volume income determinants) because it is the only input variable specifically designed to prevent losses due to pests. In the overall scheme, it may plausibly be argued that the main effect of plant protection is to dampen downward fluctuations in farmer income.

3. Microeconomic Aspects of Plant Protection

One of the principles of economic logic is that the producer will, to the maximum extent possible, adjust his output level so that his marginal production cost will approximate his marginal revenue. Without elaborating on the underlying theoretical conditions, it can be stated that, to the extent plant protection causes average output to increase, average-- and therefore marginal--costs must decrease. The farmer will then increase his output in the first instance, and as price falls he will decrease output to keep his marginal costs on a par with marginal revenue. This implies that productivity increases will tend to counteract a price decline and that the farmer will adjust his output level in a way which maximizes his profitability from grain production. It is possible that his income will increase as a result.

It is also reasonable to expect that farmer income may increase as a result of increased productivity in grain production, because he can devote less land and labor to grow a certain quantity of grain. He then has more land and labor

available to devote to other crops such as groundnuts. Grain production may not increase substantially, grain prices may not decline substantially, and farmer income may rise appreciably from increased production of cash crops.

The central point which emerges from a discussion of the relationship between plant protection and farmer income is that the relationship is multifaceted and extremely complex. It is also evident that, while it is not possible to make a definitive statement, it is entirely reasonable to posit that the positive effects will tend to cancel the negative effects and that there are several indications that the farmer will experience a net gain. The second major point is that if there is a question of the overall economic viability of plant protection based on the price inelasticity of certain key food grains, the question can be addressed only in the larger context of agricultural goals, overall price policy, and development strategy.

E. IMPACT ON GDP (GROSS DOMESTIC PRODUCT)

It is impossible to forecast with any degree of accuracy the impact that plant protection measures will have on GDP, since, as was indicated above, the precise scope for preventing crop losses is not known. However, it is evident that plant protection measures should be able to achieve a substantial increase in food crop production which, as can be seen from previous tables, constitutes an important element in total agricultural production. It is also envisaged that the employment of local staff and the local expenditures planned for the projects will generate increases in GDP through multiplier effects.

In all CILSS countries, agriculture accounts for a high but declining proportion of GDP. The rate of decline in its relative importance is so slow as to be insignificant over the project's life. The following table gives details of the national importance of agriculture in each country. The impact of a project designed to increase agricultural production will have a strong impact on GDP because of the major role of agriculture, but the degree of impact remains as a function of the particular measure.

TABLE VI

Importance of Agriculture in GDP in CILSS countries

	Value (\$000) 1970		Agriculture as % of GDP	Annual linear growth (1960-70)	
	Agriculture	GDP		Agric.	GDP
Gambia	14,762	23788	62.1	4.4	4.8
Upper Volta	103,460	165764	62.4	2.5	5.9
Mali	127,678	227347	56.2	-2.5	0.2
Mauritania	49,764	83290	59.7	1.3	7.0
Niger	162,520	245737	57.1	2.0	3.4
Senegal	243,573	685640	35.5	-0.8	0.3
Chad	135,084	250407	53.9	-1.1	-0.5

Note: Values are given at constant 1970 prices. Table is adapted from FAO Perspective Study on Agricultural Development in the Sahelian Countries 1978-1990.

Value of agricultural output represents Gross Agricultural product. GDP is given at factor cost.

If more precise data were available, it would be possible to estimate the combination of food crops to the value of agricultural production in each country, and from this, to estimate more precisely the impact of, say, a 1% increase in food crop production through pest control measures on the value of total agricultural production and on GDP. Since, however, both the estimation of the total value of food crops and of GDP are subject to wide margins of error, no attempt was made to undertake this exercise.

F. INCOME DISTRIBUTION

Several reports, particularly the FAO Perspective Study, 1975-1990, have drawn attention to the growing disparity between urban and rural sectors in all CILSS countries. The recent rise in agricultural input prices with stagnating product prices have exacerbated this situation. The focus of the proposed projects is on food crop producers, who tend to be the most disadvantaged among the rural poor. It is therefore expected that the implementation of the proposals will both improve the relative position

of food crop producers in the agricultural community, and raise the living standards of the rural vis-à-vis the urban sector. Realization of this expectation is dependant on a number of other variables including the demand for various food grains and price policies which relate to inputs and outputs.

G. FOREIGN TRADE EFFECTS

The CISS countries have, over recent years, been spending approximately one-third of their foreign exchange earnings for imports of foodstuffs. Between 9 and 36 percent of imports by value were accounted for by food imports on average over 1969-71. Whilst it is impossible to predict the precise impact of the proposals on foreign trade, it is likely that the main impact will be in the area of saving foreign exchange and substituting for imports. Whilst certain specific imports (e.g., wheat flour for bread) are non-substitutable without taste-changes among consumers there remains, nonetheless, a high potential for absorbing more food at household level and for replacing part of the existing import requirement.

SECRET

RELATIONSHIPS WITH THE CILSS PLANT PROTECTION PROGRAM AND OTHER PROGRAMS AND PROJECTS

1. CILSS Plant Protection Program

Although the principles of integrated pest management permeate the entire program and there is an obvious need for a systematic flow of information between all of the elements of the overall program, projects within the program which deal with locusts, birds, rodents, and stored crop protection address pest problems which are in large measure distinct from those being attacked by the integrated pest management project. The methodology which is being developed under the latter for pest surveillance and loss assessments, however, will be applicable to the other projects.

On the other hand, two of the projects in the overall program, Strengthening of National Plant Protection Services (Annex A) and the Information/Documentation/Training Services Unit (Annex G), are closely linked with the Integrated Pest Management Project (Annex B). National plant protection services are involved, at some level, in all aspects of implementation of the IPM project. Annex G provides an indispensable centralized facility to insure needed interchanges between individual elements of the program, between this program and other research efforts in Africa or elsewhere, and between research and outreach via the backstopping of national programs or the training of national cadres.

Annex A proposes assistance in improving the operations of the national plant protection services throughout the full range of their activities including the organization of pest control programs. It calls mainly for the provision of technical assistance, infrastructure development, equipment and material support and pesticide supplies.

On-going or planned projects already meet much of the five-year assistance requirement indicated in Annex A.

- a) The AID Sahel Crop Protection Project provides for the technical assistance and training needs inter-alia of Senegal, Gambia, Mauritania and Chad. Some equipment support is also being furnished to these countries. The project includes the construction and establishment of two regional training centers - one in Dakar and one in Yaounde. Training at these centers will focus on the areas of pesticide use, toxicology, equipment maintenance, efficacy tests, pesticide legislation, etc. but they are broadly prepared to develop courses to meet identified needs. These

centers will be used as a training resource for the Integrated Pest Management Project. The initial phase of the Sahel Crop Protection Project is scheduled for completion in 1978 but a continuation of the assistance is projected.

- b) The Canadian International Development Agency (CIDA) has set up programs for assistance in crop protection in Niger and Upper Volta and is planning a comparable effort in Mali. CIDA aid goes directly to the national plant protection services and provides technical assistance, professional and technical training, equipment, pesticides and funding for the construction of physical facilities to expand the field infrastructure of the national services. This assistance fills substantially all of the five-year needs indicated in Annex A for Niger and Upper Volta and will probably do the same for Mali.
- c) It is expected that the German assistance program will provide all the needs indicated in Annex A for Cape Verde.

This assistance to national plant protection services will enable them to expand both the scope and the reach of their activities and, working in large measure through national extension services or other outreach instrumentalities, to more effectively provide the delivery system through which pest and disease control practices and programs are extended for the farmer.

Annex B is more specifically focused on research into and development of applicable techniques of integrated pest management, the development of a methodology and system for making crop loss assessments and determining economic loss thresholds of pest infestation and strengthening the linkages between plant protection research and extension. In support of these primary aims, it includes involvement in data gathering, surveillance, testing, field trials, and demonstrations in actual farm situations. In these latter functions, Annex B operated through the same governmental entities as Annex A - the distinction being that Annex B concerns itself with the development of integrated pest management practices or intervention packages while Annex A is concerned with their dissemination to influence production.

Annex C is recognized as an essential support function to all elements of the overall program. The Information, Documentation and Training Services Unit provides the means through which research results can be promptly and effectively disseminated on a regional basis, in a manner and by methods easily comprehensible to the most affected user. It further fulfills the need for a centralized and comprehensive center of documentation

for all those working on crop protection activities in the Sahel. Finally, it responds to the CISSA priority for Africanization of the program through timely planning and execution of training activities at all levels. It is intended that this unit be a part of the Sahel Institute and that detailed design of the project be completed by the end of 1977. This design effort will more clearly define the role and functions of the unit and the manner in which it will interface with other elements of the program.

2. UNDP/ICRISAT Cooperative Program for the Improvement of Sorghum and Millet

The objectives of this program are:

- to develop non-photo periodic sorghum and millet varieties having a shorter growing cycle to be better adapted to shorter rainy seasons. The varieties have to be resistant to grain moulds that will develop during the wet season.
- to undertake studies on conservation of soil fertility and soil moisture. Marketing systems will also be studied to ensure the availability of necessary inputs.
- to carry out research on diseases such as rust and ergot as well as on striga, a weed causing considerable losses.
- to improve and to promote certain other crops including cowpea and groundnuts by strengthening existing programs.

The total program provides for the stationing of 10 research workers, including 1 entomologist and 2 phytopathologists, to be stationed at Bambey (Senegal), Ouagadougou (Upper Volta) and Samaru (Nigeria). The major role of the entomologists/phytopathologists will be the study of resistance of newly introduced varieties to pests and diseases.

In the integrated pest management program, varietal resistance is one of the factors considered of major importance to ensure a reduction of pest impact. Two aspects have to be considered in particular 1) the early testing of the susceptibility of any new plant material to major and minor pests, 2) the selection of resistant varieties.

3. SAFGRAD (Semi Arid Food Grain Research and Development Project

This project directly complements the UNDP/ICRISAT project by providing additional research/study staff from ICRISAT, IITA and American Universities. It also supports extension service activities through the stationing of an Accelerated Crop Production Officer (ACPO) in each of the 13 participating countries. The project intends to increase production of food crops in Africa by considerable strengthening of research means and liaison between research and application.

Close collaboration with the ICRISAT/SAFGRAD activity will be established to take full advantage of the work undertaken and to avoid duplication of effort.

4. AGRHYMET (World Meteorological Organization Program on Training and Application in Operational Agrometeorology and Hydrology in the Sanel)

The objectives of the AGRHYMET program are to aid the Sahelian countries in strengthening their national meteorological and hydrological services to allow them to play an effective role in the use of meteorology and hydrology for the benefit of national economic development. This use should especially further the rational utilization of lacking water resources and contribute to the increase of agricultural production. It should reduce production costs and diminish as much as possible the unwanted effect of meteorological and hydrological constraints on agricultural production.

Two parallel activities will be undertaken to achieve the objectives:

- strengthening of national services, including building, training of personnel, installation of a network of observation stations, collection of data, transmission and checking of data, analysis of data, diffusion of information.
- the establishment of a regional centre at Niamey that will play a coordinating role - it will participate in the analysis of data collected, in the preparation of information to be distributed, in the development of a regional training program as well as in the evaluation and application of new techniques. The preparatory phase of this program is almost completed and it will become fully operational in 1979. It could also service other related programs starting in 1980. In total there will be 150-170 observation stations.

In crop protection, the correct evaluation of possible damage and the timely planning of control operations will largely be dependent on an effective pest surveillance and at a later stage (after sufficient knowledge has been acquired) forecasting system. The combined use of meteorological information and biological data will be the basis of such a system. Close collaboration with AGRHYMET in the regional plant protection programs is essential therefore.

5. Regional Remote Sensing Project (LANDSAT)

This project, headquartered in Ouagadougou, Upper Volta, has already demonstrated that satellite imagery can provide a useful tool for the identification of locust breeding grounds and emphasis now is on integrating sensing methodology within the operational framework of control programs. The usefulness of LANDSAT to integrated pest management will, however, probably be limited, at least during the first few years of the project. Liaison with this project should, nonetheless, be maintained to allow for increased cooperation as more sophisticated techniques become available and research experience grows. It is possible that crop protection specialists who are located in Upper Volta under the IPM project could cooperate profitably with imagery interpretation specialists at the Remote Sensing Center to help determine if high densities of certain pests can be detected by remote sensing.

6. Ahmadu Bello University, Nigeria

A considerable amount of research on various pests is carried out at the Institute for Agricultural Research of the Ahmadu Bello University at Zaria, northern Nigeria. A summary of the results achieved in the latest years as well as the current research program is provided in the CIISS Program document. It is evident that an intense system of information exchange and regular collaboration between the pest management program and the Institute will greatly contribute to achieving earlier and effective results to the benefit of agriculture in the CIISS countries.

7. GERDAT (Groupement d'Etudes et de Recherches pour le Développement de l'Agriculture Tropicale)

GERDAT is responsible for all the agricultural research carried out by eight French research institutes which have their main activity in francophone Africa. The research carried out on grasshoppers has already been mentioned in the paragraph on pest problems. This research is done within the framework of a three year project. Experience for this has already been gained during similar activities carried out earlier in Madagascar. The major research on food crops is carried out by IRAT (Institut de Recherches Agronomique Tropicale). As far as crop protection research is concerned, three research workers (entomologist, phytopathologist and weed control specialist) are working with the Institut Sénégalais de Recherches Agronomiques at Bambay. One entomologist is stationed at Fankoba, Upper Volta. Research workers of IRAT work in close collaboration with their African counterparts and with workers in other disciplines, agronomy and breeding, as has been indicated in the technological analysis.

8. COPR (Centre for Overseas Pest Research), U.K. Ministry
for Overseas Development

COPR will continue to work closely with CCLAV in the grasshopper control activities first begun by CSRO. Three scientists are taking part in the current project which aims at research and development of a grasshopper monitoring and information service as a sound basis for rational control, study of control measures appropriate to local conditions especially at the small farmer level, and training of the plant protection service personnel by participation in above activities. Techniques already developed should find useful application in the IPM project.

9. Texas A&M/USAID Project

USAID supports a research project entitled "Development of Improved, High Yielding Sorghum Cultivars with Disease and Insect Resistance", at Texas A&M University, College Station, Texas, U.S.A. The objectives of this research are as follows:

- 1) To identify and catalog sources of insect and diseases resistance, improved grain quality, and other identifiable agronomic traits in partially converted and converted exotic and other sorghums in the world sorghum collection.
- 2) To develop high yielding, agronomically acceptable sorghums with high levels of resistance to insect, diseases, lodging and environmental stress.
- 3) To develop several agronomically superior breeding lines of sorghum with high levels of resistance to insects, diseases, lodging, environmental stress and having improved quality of grain.
- 4) To develop satisfactory techniques for screening, detection and evaluation of pest resistance in sorghum.
- 5) To collect and evaluate populations of plant pathogens for their ranges or changes in virulence to sorghum.
- 6) To develop improved integrated systems for managing the arthropod pests of sorghum.

Texas A&M University and the U.S. Department of Agriculture initiated a sorghum conversion program in 1963 where exotic sorghums from the world collections are converted from tall, late maturing, photoperiodically-sensitive types to shorter, earlier maturing, less photoperiodically-sensitive, pest-resistant types. The convergence program is maintained in Puerto Rico while the major breeding effort is located in Texas.

Sources of resistance have been found for the following diseases: head smut (Sphacelotheca reiliana), downy mildew (Sclerospora sorghii), antraknose (Colletotrichum graminicola), white dwarf mosaic (MDMV), charcoal rot (Macrophomina phaseolina) and a number of common foliar diseases. Resistance also has been located for the sorghum midge (Catantops sorghicola) breederfly (Schizophtis graminum), bank's grass mite (Oligonychus brassicae) and various other mites and aphids. Also resistance to lodging has been found in several cultivars. The results of continuing research under this project will be of direct relevance to both the ICRISAT/SAREGRAD activity and the IPM project.

10. ORSTOM (Office de Recherches Scientifiques et Techniques Ouaga-Mari)

This is another French organization mainly involved with basic research. Dakar is the only centre of ORSTOM in the CRSS countries. At this centre a great deal of attention is paid to crop pests. It concerns especially nematology, rodent research, entomology and ornithology. In these particular fields it could certainly be of great support to the integrated pest management program and close collaboration should be established.

11. OCIAAV (Organisation Commune de Lutte Antiacridienne en Antilwanza)

This organization is responsible mainly for control of desert locust (Schistocerca gregaria) and grain-eating birds (Quelaa Quelaa). Its work is meant to supplement that of national services. Its scope includes the preparation of technical notes on control methods, contribution to training national personnel, setting of survey teams and direct intervention in instances where national services are overloaded or airplanes are required. OCIAAV has been able in this way to assist in grasshopper control.

12. OICMA (Organisation Internationale contre le Criquet Migrateur Africain)

OICMA is responsible for predicting outbreaks of African migratory locust (Locusta migratoria migratorioides) and implementing campaigns for the control of this pest. In the past two years, OICMA, like OCIAAV, has assisted national services in grasshopper control.

ISSUES PAPER ON "PLANT PROTECTION IN CISSS COUNTRIES"

I. Introduction

The Project Committee held two lengthy sessions to review the program document - "Plant Protection in CISSS Countries". The IAO representatives, who coordinated this CISSS-sponsored design, were present at the first review session and greatly facilitated the Committee's task. The outline of issues, which follows, is divided into two sections: program issues and project feasibility issues. The Committee focused primarily on project-related issues which arose in connection with its review of Annex B - "Research and Development of Integrated Management for Basic Crops in the Sahel". The Committee's views on program issues are also included herein with the intent that they may prove of interest/assistance to the project designers. Recommendations at the conclusion of each issue/discussion item in the issues paper are tentative and will be finalized after ICR deliberations.

A. Program Issues

1. Issue: Whether the high priority assigned to this program has been fully analyzed within the context of CISSS's overall priorities for agricultural sectoral development in the Sahel.

Discussion: This total program contemplates an intervention of \$72 million during the first five year period. The appropriateness of this magnitude of intervention within one specific area of the Sahelian agricultural sector needs to be assessed in cost/benefit terms vis-a-vis the broad range of agricultural interventions currently planned by CISSS. The need for such an assessment is underscored by the realization that the dramatic reduction of crop losses envisioned under this activity could either diminish or increase the need for capital intensive crop production interventions. In discussing this question, the Committee was informed by the SDP advice that "...the priority assigned to the program has been fully analyzed both by the CISSS Agricultural Production Teams as well as the Synthesis Working Group. In both cases, the program has been given a very high priority."

Recommendation: (a) That the ECPR Committee accept the SDP statement as to relative priority of this program; (b) That the appropriateness of the five year \$72 million investment be clarified during CILSS/Club meeting in Ottawa.

2. Issue: Whether the economic analysis in the overall program section of the CILSS document is sufficiently convincing in terms of the \$72 million investment being requested.

Discussion: The economic analysis section should be strengthened. For example, it makes a key point that the annual cost of the project is equivalent to approximately two percent of the value of annual food crop production but there is no evidence which indicates the likelihood of actually saving two percent of the food crop. This is a technical point rather than an economic point, but its inclusion is absolutely essential to close the economic argument. Specific attention should be directed to this point. It would be useful if an estimate of potential savings were made, possibly based either on data from the Sahel or from similar experiences elsewhere. It is also important that the process of estimating the two percent savings estimate be fully explained. What are the assumptions on output mix, output quantities and output prices? How and why are these figures chosen?

Recommendation: That a section be added to the CILSS Program Document which presents in a thorough and systematic manner the expected value of savings (classified by crop and pest) which will result from the program in order to support the two percent savings estimate and thereby justify the magnitude of investment proposed.

3. Issue: Whether AID should proceed with any element of a Plant Protection Program prior to being assured that adequate attention is being given to on-farm post harvest crop protection efforts.

Discussion: Much more value is attached to food commodities after harvest than before harvest, i.e. the producer has made an enormous investment of time, energy, seed, etc., in producing and harvesting his commodity. It should also be recognized that the technology ^{1/} for protecting a commodity after harvest can be applied more simply, more reliably, and often at much less cost than in the case of protecting the commodity in the field. Thus, the return on investment in on-farm post harvest protection should be considerably greater than in the case of pre-harvest protection.

1/ Examples of pertinent technology include (a) proper drying techniques, (b) proper construction of storage structure, and (c) use of safe materials such as diatomaceous earth to protect against insect invasion.

With respect to protecting crops in the field, technology must be adapted for each locality. By contrast, the technology for protecting commodities after harvest is more generally applicable. Thus much of the technology needed by farmers in the Sahel has already been developed elsewhere. Innovative and knowledgeable extension personnel could accomplish much with only modest research support. As a rule-of-thumb, USDA suggests that the level of RD&A effort devoted to on-farm post harvest commodity protection should not be less than ten percent of the RD&A effort dedicated to protection of the commodities before harvest.

Recommendation: That more emphasis in the CILSS program be placed on protecting post-harvest crops. If no funds are available for financing a post harvest effort, it is recommended that existing commitments should be re-directed to accomplish this objective.

4. Issue: Whether the program adequately addresses the question of the availability of African personnel to staff the proposed projects.

Discussion: The proposed program places a very heavy emphasis on the training of African cadres at all levels; professional, middle-level and basic. Personnel are to be drawn from existing staffs, recruited into the service to fill new positions, or engaged on a part-time basis to perform specific time limited tasks. No mention is made concerning any special, pre-service training requirements for pest management techniques which may be appropriate. The CILSS program does not intend to utilize the national plant protection services to perform all aspects of the outreach function of bringing improved techniques to the farm level. Rather, it proposes to draw upon existing institutional capabilities such as they are found within each country. The program document, however, has not made clear how the extensive training effort will impact upon the manpower requirements of the various services involved, e.g. the extent to which it represents (a) training of on-board personnel, (b) the extent to which on-board or planned staff will be trained through existing agricultural training institutions to fill more than one of the skill requirements of the program, (c) whether the curriculum of such training programs needs to be revised to reflect new pest management techniques, or (d) the extent to which new staff will need to be recruited and trained. The program document also does not discuss the ability or willingness of the participating governments to make available the candidates required by the training program.

It should also be borne in mind that the problem of availability of African personnel will be present in and compounded by other activities in the overall Sahel Development Program with their competing demands on the Sahelian manpower pool.

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Recommendation: (a) That project designers analyze and quantify the manpower requirements of the Crop Protection Program and provide a time-phased assessment of the need for and source of training candidates; (b) That participating governments give assurance that candidates for training will be available in accordance with the training program outlined in the annual implementation plan; (c) That participating governments be required to undertake the establishment of positions within appropriate organizational staffing patterns prior to the initiation of training for newly recruited personnel; (d) That the CRSS states give consideration to the manpower implications of the total Sahel Development Program and, through its working groups, develop long-term plans for meeting manpower requirements.

5. Issue: Whether the implications of donor financing of local and recurring costs are adequately discussed in this program.

Discussion: This program is based on the premise that the early launching of a major effort for crop protection in the Sahel requires the assumption of local and recurring costs by the donors during the entire first five-year phase. It should be noted, however, that annual recurring costs induced by the crop protection program during the second five-year phase for the eight Sahelian countries is expected to increase from approximately \$5,500,000 to about \$8,000,000 including allowance for a 10% annual inflation rate. (These figures do not include allowance for depreciation of capital plant and equipment.) For the integrated Pest Management Project alone, these costs in the second phase increase from about \$3,100,000 to \$4,600,000. It would appear inappropriate for AID to enter into agreement to provide some \$30,000,000 to a first phase integrated pest management project without some assurance that participating countries are prepared to assume at least part of the project's recurring costs during the second five year phase of the program.

Recommendation: (a) That AID raise the issue of host country financing of local recurring costs at the upcoming CRSS/Club des Aids meeting in Ottawa looking toward the establishment of a schedule or graduated scale of assumption of these costs by the Sahelian states; (b) That the AID implementation agreements for the first phase integrated Pest Management Project include a commitment by participating countries to the financing of local recurring costs during ongoing phases of the project.

6. Issue: Whether AID's active participation in one or more components of a program such as "Plant Protection in Grass Member Countries" implies an endorsement of the total program.

Discussion: The Committee was informed by the SDP office that "...AID's participation in one or more components of a program implies neither an endorsement nor a non-endorsement of the total program. Participation

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in one component provides an opportunity for AID to play a role in sectoral programs without having any fiscal or financial involvement in all elements. In the case of "Plant Protection in CILSS Member Countries" we would hope that the ECPR would support the entire program, even though the U.S. will not be asked to fund each component."

Recommendation: (a) That the ECPR indicate its support en principe for the CILSS-sponsored Plant Protection Program; (b) That ECPR views on the program strategy and project approaches outlined in the "Plant Protection in CILSS Member Countries" document be transmitted to CILSS.

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3. Project Issues

1. Issue: Whether the economic analysis in the Integrated Pest Management Section (Annex 3) adequately takes into account the impact of existing price and marketing policies as these policies relate to attainment of project objectives.

Discussion: The first response is no, price and marketing policies are not adequately addressed. This is a significant omission because output prices might be sufficiently high to elicit a surplus or so low that absolute production will not change appreciably. The ultimate results depend on a number of elements in addition to price policy and marketing, such as the degree of substitutability of land among alternative uses; farmer responsiveness to changes in the prices of inputs and outputs; the relative prices of alternative crops, and what productivity changes are taking place in other kinds (cash crops) of agricultural production. It is evident that systematic incorporation of relevant economic factors is a significant undertaking, and an in-depth examination is probably beyond the scope of the analysis for this project. Nevertheless, the issue should be discussed in the economic analysis section. In providing some additional economic material, it is suggested that the work of the Club Working Group on Price Policy, Marketing and Storage, although still at an early stage, would be useful. The fact that policies and factors outside of actual production schemes interact with the schemes and exert a major influence on their outcome poses a major dilemma in preparing the economic analyses for production projects. Reference to work such as the Price Policy, Marketing and Storage study may be the best way to provide more detailed and systematic economic analysis.

Recommendation: That project designers seek further guidance from the Club Working Groups in drawing up a more illuminating economic analysis section in support of the \$30 million investment called for in Annex 3.

2. Issue: Whether innovative techniques for plant protection can be derived from project (Annex 3) research which will be within the economic grasp of the small farmer.

Discussion: Even though there appears to be a paucity of information on specific biological and ecological characteristics of pests in the region, there is a sufficient body of information available worldwide which, when adapted to specific crops and climatic regions, will have a profound effect on crop losses now suffered by Sahelian small farmers. Non-chemical methods such as modified planting time, post harvest stalk destruction, crop rotation, animal traction for machine weeding, plant breeding and seed soaking will be fully tested for applicability in the Sahel during project implementation. Incremental inclusion of chemicals in coordination with such techniques can be tested for effectiveness,

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costed out against potential benefits and scaled to be economically feasible for application by small farmers.

Recommendation: That the project research objectives be viewed as realistic and acceptable to AID.

3. Issue: Whether the social analysis (Annex 3) has been adequately treated, particularly with respect to end user (local farmer) participation and likelihood that the technical package will be acceptable to the recipient.

Discussion: The project acknowledges the need for active farmer participation at all stages of the project in order to accumulate accurate data on food targeted food crops, evaluate the contribution of crop protection to other crop production improvements and identify the microeconomic benefits of pest control to the farmer. Without analysis of the farmers' relationships to past and ongoing government agricultural and cooperative programs, however, and specifically the relationships between farmers and extension/cooperative agents, it cannot be assumed that field-level demonstrations and training will successfully convey information and promote the use of pest and disease control measures.

The project strategy tends to oversimplify the appropriateness of traditional village leaders as the most effective means to introduce effective crop protection measures. While any agricultural development project must work through the village authorities, the traditional leaders are often not representative farmers. Thus, to test and introduce crop protection measures, ways should be found (in cooperation with village authorities) to identify and work with a representative sample of farmers.

Recommendation: The the socio-economist now projected to arrive mid-way through the project be recruited at project commencement and undertake the requisite analysis referred to above.

4. Issue: Whether the project outreach plans have been adequately described and related to existing institutional capabilities of Sahel crop production programs.

Discussion: The project document clearly states that the development of methodologies for operating pest/disease surveillance systems, for determining economic thresholds of crop damage and for identifying the production constraints associated with pests, weeds, and diseases is a basic prerequisite for an effective plant protection program. The document also cites the recommendation of a multidisciplinary team (University of California, AID-rod-3296) that practical programs of pest management

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must be integrated into local agricultural schemes.

The institutional capabilities within the Sahelian ministries of agriculture/rural development to implement an effective integrated pest management program vary considerably. Each country exhibits a different degree of success and level of advancement in the implementation of its agricultural programs. It is surprising then that the project proposal focuses primarily on staffing/upgrading the centralized research centers in these countries and pays only cursory attention to the validation of project technologies in the rural areas. If the project purpose is to be achieved, the fit between the project activities, extension facilities and other crop improvement projects in each Sahelian country must be more clearly defined. More specifically, an analysis of the organization of the agricultural production services at the local level in each country such as the ORDs in Upper Volta and the "Operations" in Mali, as well as specific recommendations on the organization of the field-level demonstrations and on the use of cooperative structures are needed.

Recommendation: That Part VI.3., Implementation Plan of Annex 3, contain a brief description of the relationship of the project activities to the existing crop protection efforts as well as a search and agricultural extension systems in each Sahelian country.

5. Issue: Whether there should be a closer integration of the R & D element (Annex 3) and the Information/Documentation/Training (Annex G) element in this program.

Discussion: Annex G, which calls for a centralized facility for information, documentation and training coordination, is presented as a separate project proposal since it is intended to service all elements of the overall crop protection program. The centralized facility is to insure a systematized flow of information between individual elements of this program, between this program and numerous other research efforts in Africa and elsewhere, and between research and outreach via the backstopping of national programs or the training of national cadres. It will also provide the link with other existing or planned networks such as the AGRISTAR facility at Niamey. These functions are fundamental to the successful implementation of the plant protection program and especially to the Integrated Pest Management Project (Annex 3). It is planned to locate the Information/Documentation/Training Center on the same premises as the Coordination Unit of the Integrated Pest Management Project. Given the importance of the Centralized Facility to the realization of project objectives, donor financing for this program element must be assured.

Recommendation: That AD express its views regarding the essentiality of the Information/Documentation/Training Center at the Ottawa CILSS/Club des Amis meeting and solicit other donor participation in funding of the proposal. Failing other donor interest, AD should be prepared to

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fund the project proposal contained in Annex G and should offer to assist CISS in a design effort to incorporate Annex G into the Integrated Pest Management Project to insure that this component comes on stream concurrently or prior to the Annex I components.

6. Issue: Whether the project document (Annex I) has adequately anticipated and defined links with other information networks such as AGREM and LANDSAT.

Discussion: The proposed program should draw upon the resources and capabilities of two other Sahel related programs, the WHO/CISS AGREM regional project headquartered at Niamey and the proposed regional remote sensing project (Ouagadougou). As a result of the AGREM program, the meteorological and hydrological data gathering networks of the CISS countries are being expanded, and many of the stations will, for the first time, be linked to the national capitals and to the Regional Center at Niamey. Thus the Sahel countries will soon have a capability for weather and river basin run off data in real time, and be able to correlate this data with the breeding and other biological characteristics of pests. In addition, the new network of telecommunications facilities will permit the reporting of pest outbreaks much more rapidly than is now the case, thus increasing the response capability of affected countries or areas.

In regard to the proposed LANDSAT receiving station, it will provide repetitive coverage every eighteen days of the entire Sahel area, thereby permitting the constant monitoring of such ecological phenomena as surface water, ground temperature and extent of biomass. These conditions directly affect the breeding, migratory and other life cycles of grasshoppers and desert locusts. Correlations of these phenomena will enable specialists to estimate the likelihood of outbreaks of these pests.

The data requirements of the Plant Protection Program need to be formulated and made known to the AGREM Center at Niamey so that these can be factored into the data collection and dissemination functions of the AGREM network. Close linkages will need to be established between the Ouagadougou Remote Sensing Center and the plant protection program headquarters so that LANDSAT data can be put to widely productive uses. In this connection, several members of the plant protection headquarters staff should be trained in LANDSAT imagery interpretation.

Recommendation: That project designers outline desired linkages with existing and planned data gathering networks so that these network outputs can be effectively utilized to facilitate Plant Protection program objectives.

7. Issue: Whether planned outputs and intermediate targets have been sufficiently identified to permit effective progress tracking.

Discussion: The project document does not include a concise summary of planned project outputs. From discussion with designers, however, it would appear that the major project outputs are as follows:

- Seven research laboratories for plant protection will have been built and/or equipped in Senegal, Mali, Upper Volta, Niger and Chad and an operating research program will be generating and testing, on a continuing basis, improved and adapted crop protection practices for the principal food crops.
 - Twenty African professionals will have been trained to at least the M.S. level in various disciplines.
 - Seventy local assistants or technicians will have been trained and assigned to the research programs.
 - A methodology will have been developed for operating a surveillance system, quantifying production constraints, assessment of crop losses, and determination of economic thresholds to guide the implementation of plant protection programs in the Sahel.
 - Seventy pest surveillance/loss assessment stations will have been installed in the Sahelian countries.
 - Seventy Demonstration Study Areas will have been established and will be carrying out a continuous program of outreach to the farmer level.
 - One hundred thirty field agents, appropriately qualified in plant protection, will have been trained to conduct the work in the stations and demonstration areas.
 - A system of information flow on major diseases and pests will have been set up to guide research and enable a forecasting system to become operational.
- The project document does not identify intermediate targets which could assist project evaluation during the first five years.
- Recommendation: Prior to approval of AID financing, a statement of major project outputs and targets should be obtained from project designers. In addition, AID's agreement with an implementation agent should provide for the preparation of annual implementation plans which the participating countries against which project progress can be monitored.

Approved by: _____
Date: _____

8. Issue: Whether there is sufficient "implementation plan" analysis in Annex 3.

Discussion: While there is some discussion in the document on implementation plans (see p. 101-102), the analysis would appear deficient. Project designers budgeted the project to be fully operational only in the fourth year with project personnel increasing from ten in the first year to forty in full implementation. As a result, certain inconsistencies appear with respect to this rate of mobilization, the budgeted funds and the various tasks called for in the project. For example, if the project outreach element mobilizes fifteen persons in two years (as projected in the text) 70% of first year manpower would be devoted to this activity, leaving only 30% for research, training, coordination elements. This raises two serious problems. First, in view of project objectives, a more logical first year mobilization would show greater emphasis on fielding research and coordination personnel. Secondly, the mobilization rate allows for only two supervisory personnel during the first two years to coordinate all project activities, including procurement of 68% of the equipment and the completion of 100% of the construction (total value \$4.1 million).

Recommendation: That prior to project authorization a PERT-type document be drawn up to facilitate project management and evaluation.

9. Issue: Whether the plans for developing baseline data for the evaluation of overall project impact are adequate.

Discussion: The strategy for gathering and monitoring baseline data is based on the assumption that the project addresses two ecosystems - one typified by the Bambey Ziguinchor region of Senegal, representing an intensive, river basin agriculture, and a true Sahelian ecosystem, typified by Central Upper Volta. Two scientists will be based in each location to develop crop loss profiles. Their data will be processed by the Regional Office, using AGRONORM facilities, and fed back to integrated pest management scientists in the eight countries. The latter will check the reported results against local conditions and feed the resulting data to Region for processing and redistribution. Such data will then be considered as reliable, economic profiles and should provide adequate baseline data.

Recommendation: That the plans for developing baseline data for the evaluation of overall project impact are adequately described in the project documentation.

10. Issue: Whether the composition of the proposed team of technical assistance personnel in Annex B represents the optimum distribution between the various professional disciplines represented.

Discussion: Annex B calls for twelve entomologists and two weed scientists. The apparent imbalance on the professional team is in the area of the management of weed problems which is an important aspect of dealing with the problem of reducing pillage. Weeds are major competitors with crops for available soil moisture. Therefore, a pest R&D effort in an area the size of the Sahel is deficient if only two weed scientists are included on the technical assistance team. USDA experts have suggested the following mix of professional personnel: one toxicologist, two plant pathologists, six weed scientists, eight entomologists.

Recommendation: That further thought be given to the mix of technical assistance personnel on the R&D team.

11. Issue: Given the limited scope of the Integrated Pest Management Project set forth in Annex B (involving research, testing and field trials), to what extent is a detailed consideration of the environmental issue required because of the project's relation to Annex A (strengthening of National Plant Protection Services) which provides the delivery system for pest control programs and includes financing of pesticides?

Discussion: AID environmental regulations requiring an initial environmental examination (and subsequent action depending on the outcome of the examination) are applicable to each project to which A.I.D. contributes funds. When A.I.D. is a minor donor (less than \$1,000,000 and less than 25% of project cost) in a multidonor project, an environmental assessment and an environmental impact statement are not required. The regulations are not applicable to a discrete project to which A.I.D. does not contribute funds. Normally, there would be no question regarding whether A.I.D. should be concerned about the environmental considerations involved in Annex A unless A.I.D. participates in the financing of Annex A.

The whole package (Annexes A through CII) has, however, been prepared as an integrated crop protection program and presented to the donors for review. The issue then arises to what extent does the purported integration of the program require the application of AID's environmental regulations to the entire program. The project committee believes that the several projects involved in this program are not so integrated as to require application of the A.I.D. environmental regulations to the entire program. The projects are integrated in much the same way as the components of a development plan. Each of the projects is useful in achieving the overall development goal for the sector, but progress can be made independently in each project.

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On the other hand, A.I.D. has special environmental concerns and can attempt to play a role with respect to environmental matters in projects not financed by A.I.D. within this program. The committee believes it would be appropriate for A.I.D. to provide its views regarding the kinds of technical assistance that should be considered for Annex A and the kinds of pesticides and safety measures that should be involved in that project. This role would probably be limited to one of persuasion because A.I.D. must recognize the limited amount of leverage available in a project to which A.I.D. does not make a contribution.

Recommendation: That a mechanism be developed to permit A.I.D. to share its views with other program participants on the specific elements of Annex A that involve obvious environmental consequences.

12. Issue: Does the project document (Annex B) adequately address A.I.D. legal and policy requirements such as Section 611(a)(1) planning, external audit of the books and records of the project and source/origin waivers of goods and services procured?

Discussion:

A. Section 611(a)(1). The 1978 authorization bill in both the House and Senate includes the S.D.P. in Chapter 1 of the Foreign Assistance Act, as Section 120. Section 611(a) is applicable to obligations in excess of \$100,000 made with funds authorized under Chapter 1 although it is not applicable to assistance provided under Chapter 9 in which the executive branch proposed that SDP be included. Section 611(a)(1) requires, prior to the obligation of funds, that there be adequate planning to identify the assistance being provided, to indicate how it will be provided and, in general, the goods and services required to provide the assistance. It also requires a reasonably firm estimate of the cost of the assistance to the U.S. This requirement is applicable to all forms of assistance being provided by the U.S., not just construction, although it is not applicable to assistance provided by other donors.

The planning described in Annex B is presently inadequate with respect to (a) how the pest surveillance systems will be developed (the paper merely states that one expatriate will be assigned to each country to implement the pest surveillance system); (b) how the outreach system will be developed (the paper merely indicates that an advisor will be assigned to each national plant protection service when the significant elements of integrated cultural techniques would not be extended to farmers through plant protection services but rather through national extension services; (c) construction and equipping of research and surveillance stations in that the paper does not indicate that the preliminary plans and cost estimates of these facilities have been prepared and reviewed by SIR/ENGR or that equipment requirements have been established and reviewed by appropriate technical offices; (d) how the participating national governments will accumulate economic data necessary for establishing economic threshold levels in integrated pest management, and (e) the kinds of pesticides that will be procured and the measures taken to assure safe storage and use.

Recommendation: It is recommended that Annex B be revised to reflect the degree of planning necessary to describe what A.I.D. is providing, how it will be provided and used, and the goods and services required to provide it.

3. External Audit. The document suggests that the FAO be considered as the executing agency on behalf of the donors, that the accounting records will be part of the financial records of the FAO and the External Auditor of the FAO will perform an audit of the financial operation of the program.

Donor auditing books and records of the FAO and other U.N. agencies has been a source of controversy and irritation, particularly to the Congress, for some time. UN agencies generally refuse to permit donor auditors to examine their financial records. The procedure used by these agencies is generally to have an internal audit staff whose audit reports are subject to examination by the so called External Auditor, which is a national audit agency, like the GAO, selected every several years from among the countries participating in the FAO.

There are several problems with this procedure. First, the External Auditor merely reviews the internal audit reports. Second, the internal audit staff is inadequate in that it is undermanned and actually audits only a very small percentage of the projects undertaken by the FAO. Third, the reports of the internal audit staff and of the External Auditor are created as confidential by the FAO. Although the countries participating in the FAO have agreed to this procedure with respect to contributions to the budget of the FAO for its general operations, the grants contemplated by this project are not contributions to the budget of the FAO. They are clearly for the benefit of the CILSS member states, even if the form of the financing involves the FAO as grantee. A.I.D. cannot expect the Congress to provide the amounts of assistance contemplated for the SDP without being able to have available, for itself, the Congress and the public, independent audit reports of the projects to which A.I.D. contributes funds. During the Congressional hearings on the proposed SDP, the committees insisted, and A.I.D. witnesses, including the Acting Assistant Administrator for Africa, agreed that the SDP projects financed by A.I.D. would be subject to an independent external auditor (not the FAO External Auditor).

Recommendation: That the External Audit issue be resolved with FAO if that Agency is selected as the Implementation Instrument for Annex B.

C. Source/Origin Waiver. The generally authorized source/origin of procurement with A.I.D. grant funding is the U.S. and host country. When the financing is through an international organization, Code 935 is authorized if A.I.D. funds are commingled with those of other donors which are similarly untied. Congress has been informed of the possibility of developing special procurement rules for the SDP and appears to have approved, although the context of such approval includes an arrangement among the SDP donors to untie procurement generally. The document does not discuss procurement, it does not indicate that A.I.D.

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funds will be commingled with other untied donor funds; it does not discuss a general untying arrangement among the donors in the SDR. Nor does the document identify and justify specific waivers needed for the project, although it is obvious that procurement will not be limited to the U.S. and OASIS member states (for example, motor vehicles, construction materials).

Recommendation: That the design team re-examine the procurement aspects of Annex 3 and revise the paper as need be.

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ATTACHMENT 2

ECPR FINDINGS ON THE CILSS DOCUMENT "PLANT PROTECTION
IN CILSS MEMBER COUNTRIES" - MAY 18, 1977

I. The ECPR reviewed and endorsed the exposition of program issues and the recommendations presented in the attached issues paper. The ECPR also endorsed all the project issues/recommendations with the exception of portions of Issues Number 3, 5, and 11. ECPR comments on these issues were as follows:

A. Protect Issues 3 and 10. It was agreed that the mix of professional consultants needed to accomplish social analysis objectives during the course of the project would have to be clarified. It was also agreed that the results of preliminary social analysis, based on existing data, should be included in the final project paper.

B. Protect Issue 5. Since the Information/Documentation/Training Unit (i.e. Annex G) represents a vital support service to the entire program, the ECPR suggested that it would be desirable if all donors participating in the Plant Protection Program should contribute to financing of this support unit. The ECPR also urged that Annex G be implemented at the outset of the CILSS Plant Protection Program.

C. Protect Issue 11. It was agreed that a mechanism (i.e. Technical Consultative Committee) already exists whereby A/D can share its environmental concerns with other program participants.

II. The ECPR raised the following issues which were not presented in Attachment 1.

A. Issue. Whether the relationship between Annex A ("Strengthening of National Protection Services") and Annex B ("R&D of Integrated Pest Management for Basic Food Crops in the Sahel") is clear in the CILSS document.

Discussion: The relationship between Annex A and Annex B has not been sufficiently described in the CILSS program document.

Annex A outlines a project assistance effort directed at improving the operations of the National Plant Protection Services which would commence in FY 78. It builds on the existing A/D Sahel Crop Production Project (625-0916) and the CIDA Crop Protection Project currently being planned and implemented in Niger, Mali and Upper Volta. These ongoing projects work through the National Extension Services and support the delivery system through which pest/disease control technology and commodities will increasingly be furnished to Sahel farmers.

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Annex 3 is an R&D effort with the objective of developing a methodology for assessing crop losses and determining economic loss thresholds of pest infestation. In support of these primary aims, project efforts call for data-gathering, surveillance, testing, field trials, and demonstrations in actual farm situations.

In summary, Annex 3 concerns itself with the development of improved pest management technologies while the Annex A effort will be aimed at disseminating these technical packages to small farmers. AID's ultimate concern, of course, is with the impact the CILSS research effort will have on field production efforts. While much of the first phase Annex 3 project will be devoted to building a data and research base, training staff and generating initial research results, program emphasis at some point in time will have to shift to an outreach emphasis so as to insure widespread application of research findings to production practices.

Recommendation: That project designers clarify the relationship between Annex A and Annex 3 and trace the linkage between the ongoing USAID/Canadian plant protection efforts in the Sahel and activities proposed by CILSS for period 1978-82.

3. Issue. Whether funding implications are clearly spelled out in the CILSS document (i.e. What is the total cost of the program? What is AID's present commitment? What is being asked of AID in Annexes A, B and G? What percentage of the total program is being requested of AID?).

Discussion: The total cost of the CILSS Plant Protection Program would appear to be \$253 million - over a fifteen year period (1978-1992) (See Table A). Of this total, AID is committed in its existing Sahel Crop Production Project to provide \$3,150,000 during the period 1975-1978. Canada has also made a commitment of approximately \$3 million for Sahel Plant Protection activities. It is anticipated that AID and CIDA will continue their present crop protection activities at approximately the same funding level for the next fifteen years. Based on this assumption, AID would furnish a total of \$17,500,000 and Canada \$15,900,000 in following through on existing commitments.

Over and above these totals, AID is being asked to finance a portion of Annex 3 (Totaling \$64,302,000) of the CILSS program document which calls for a total of \$90,302,000. In addition, AID is interested in having the critically important Annex G funded. The total funding for Annex G over the fifteen-year period is projected at \$10,349,000.

In sum, then, of a total projected program cost of \$262,642,000 for fifteen years, it appears that AID is presently being asked to fund approximately \$90,951,000 or 35% of the total project program.

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Recommendation: That funding implications for donors be clearly spelled out by project designers.

C. Issue. The ECPR questioned the assertion on page 22 of the program document that ... "virtually no statistically reliable information on the losses caused by insects, diseases, weeds or vertebrate pests exists in the Sahel region." This statement should be clarified by project designers in light of data-collecting efforts sponsored by IRAT, SAFGRAD and the Major Cereals Program during the 1960s.

III. FRP Interim Requirements

The documentation presented by CILSS satisfies interim requirements imposed by the FRP review with the exception of the environmental issue which necessarily remains pending (see Attachment 1, page 12, Issue 11 and Attachment 2, page 1, Issue A).

It is understood that in clarifying the relationship between Annex A and B project designers will suitably highlight environmental considerations which should be examined prior to AID's authorization of funds in the Plant Protection area.

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ESTIMATED COSTS FOR 15 YEAR CISS
PLANT PROTECTION PROGRAM

<u>Existing</u>	<u>Planned</u>	<u>1975-78</u>	<u>1978-82</u>	<u>1983-87</u>	<u>1988-92</u>	<u>TOTAL</u>
	Annex A					
	Strengthening Nat. Plant Protection CISS		18,220	26,000	33,000	77,220
Sahel Crop Protection U.S. existing		(3,150)*	(3,900)	(4,900)	(5,600)	(17,500)
Canadian Crop Protection Project - existing		3,000	3,500	4,500	4,900	15,900
	Annex B					
	Integrated Pest Mgmt U.S. portion		29,802 (29,802)	33,000 (25,000)	28,000 (10,000)	90,802 (64,802)
	Annex C					
	OICMA requirement		8,815	13,200	17,000	39,015
	Annex D					
	Migratory locusts and birds		6,686	6,700	4,900	18,286
	Annex E					
	Post-Harvest Storage		2,925	3,675	5,750	12,350
	Annex F					
	Rodent Control		2,620	2,850	2,500	7,970
	Annex G					
	Training/Information Unit U.S. portion		4,149 (4,149)	4,000 (3,000)	2,700 (1,500)	10,849 (8,649)
	TOTALS	6,150	73,217	89,425	93,850	262,642
						(90,951) (35%)

*Bracketed figures represent AID funding

* Authorized on-going Sahel Crop Protection Project (625-916).

Assumptions: Column 1983-87: Expatriates budgeted at 50%, all other costs retained. Final figure multiplied by 50% to cover inflation.

Column 1988-92: Expatriates budgeted at 5%, all other costs retained. Final figure multiplied by 100% to cover inflation.

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ANNEX B
III B

CILSS RESPONSE TO
SELECTED ISSUES

COMITE PERMANENT INTERETATS DE LUTTE
CONTRE LA SECHERESSE DANS LE SAHEL



PERMANENT INTERSTATE COMMITTEE FOR
DROUGHT CONTROL IN THE SAHEL

Secretariat : Ouagadougou (Haute-Volta)

Téléphone 24-35 B. P. 7049

Télex : 5263 COMITER Ouaga

Ref. : DPP/VS/PLP 115 P.7.

9 August 1977

Ref. :

Dear Mr. Kelly,

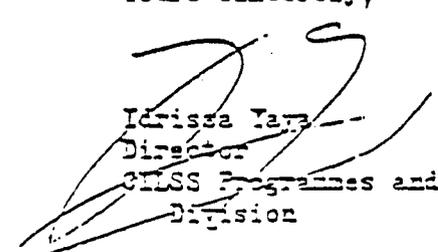
I appreciated the opportunity to meet with you in Washington last week and hope that the established contact will be on a regular basis between your office and the CILSS Secretariat. Following our meeting, we had an opportunity to review the Issue Paper you provided on the Crop Protection Programme and, with Mr. Bingham, agreed on the questions to which we at the CILSS could most constructively respond.

... Consequently, please find enclosed our contribution to programme issues "A" (1) (3) (5) and on project issues "B" (5). We trust our views will be of some help to you in what I now understand to be a very complex approval process.

If there is anything further we can add, please do not hesitate to contact us. We will do our best to be of assistance to you and your office.

In the meantime, please accept my best wishes, as I remain,

Yours sincerely,


Idrissa Tamba
Director
CILSS Programmes and Project
Division

Mr. James Kelly
APR/RD/SWAP Room 2645
Agency for International Development
Department of State
Washington, D.C., 20523
U.S.A.

cc.: Mr. Bingham/SPAI/SDP
Washington

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Sahel Crop Protection Programme

Programme Issues

1. Whether the high priority assigned to this programme has been fully analysed within the CILSS overall priorities for agricultural sectoral development in the Sahel.

No nation, Sahelian or not, can afford not to protect its agricultural production. The CILSS member nations see crop protection not as a priority but as a necessity. Protection of crops is difficult enough under normal ecological and meteorological conditions. Within the Sahel context, with its unpredictable rainfall and biological conditions, the question of crop protection could mean the difference between satisfaction of bare minimum food requirements and starvation. Periods of drought could be followed by one year of normal rainfall. But the latter condition can also be counted upon to bring along unpredictable ground or airborne pests in larger numbers and more insidious forms than pre-drought periods and thereby wipe-out the promise brought by normal weather conditions. The condition described is not theoretical. 1975, for example, which was a year of near-normal rain, brought with it a devastating infestation by rats which made a significant negative difference in the food production of some CILSS countries.

The CILSS Council of Ministers has consistently expressed the importance it attaches to crop protection programmes. In 1974 at its meeting in Banjul, it ordered a meeting of national crop protection directors, regional organizations and CILSS to examine personnel and equipment/supplies requirements of the region. In March 1975 in Niamey, the Council again reaffirmed the importance it attached to crop and harvest protection.

In September 1975 the CILSS organized the meeting ordered by the Council of Ministers in Banjul and brought together the directors of the crop protection services of CILSS member countries, representatives of the two regional organizations CCLALAT and OICMI and a number of other international organizations and bi-lateral donors. The meeting examined the capabilities of both national and regional organizations and determined unanimously that current structures did not possess either staff or equipment resources capable of facing a serious pest infestation.

The 4th Council of Ministers meeting in Nouakchott (December 1975) voted an extraordinary and unprecedented 30 million CFA of assistance to the CCLALAT organization as an exceptional emergency measure. This decision was reinforced by the Conference of CILSS Heads of States during their meeting of the same month.

In March 1976 the CILSS created the Sahel Institute and charged it with special responsibility for agronomic research and more specifically with a permanent role in the field of crop protection.

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The creation of the Club du Sahel in March 75 again emphasized the importance of crop protection to Sahelians and in May 1975 the CILSS organized the design team headed by Dr. Brader of FAO. It charged it with specific analysis of the need for an integrated pest control programme in each of the member states. In drawing up the terms of reference for this mission, the CILSS stated "that the meteorological vagaries of the Sahel coupled with massive uses of pesticides could produce significant ecological and biological disequilibrium including perhaps the rise of new and more control-resistant types of pests."

In December 1976 the Council of Ministers, in elaborating the role of the Sahel Institute underscored once again the special activities needed in the field of crop protection. And at the Ottawa Conference of the Club du Sahel, the collective will of participating Sahelians and donors was expressed in Resolution No. 3 which states in part: "... that crop protection constitutes a key factor in achieving self-sufficiency in food production in the Sahel" and that "the (natural) enemies of crops constitute a major constraint especially for irrigated agriculture development and certainly for the intensification of rain-fed agriculture."

As to the relative cost of the proposed programme, the CILSS Council of Ministers has twice examined the level of investment required (at its meeting in Ouagadougou in April 1977 and at Ottawa) and has twice decided to support the level of investments recommended by the joint donor-Sahelian working team. The cost/benefit figures provided by the working team and outlined in the synthesis report show that:

- a. yearly programme investments required will amount to approximately US\$ 13.7 million
- b. to cover the annual cost of the first phase of the programme would necessitate a yearly reduction of crop losses by 2%, non-cumulative, each year. In achievement considered reasonable and achievable
- c. by contrast and for the immediate future (the next five years) no production improvements, by whatever methods, promise so far a 2% annual increase in yield
- d. table 7 on page 21 of the synthesis report (of the crop protection programme) shows value of production at 1975 and 1990 prices and the relative cost of projected production losses. Even at 1975 prices, losses estimated at a conservative 10% would cost a staggering \$ 83 million, versus \$ 68.6 for the cost of the programme.

2. Whether ID should proceed with any element of a plant protection programme prior to being assured that adequate attention is being given to on-farm post-harvest crop protection efforts.

The CILSS crop protection programme is a comprehensive long-term effort.

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Local level

designed by a team of internationally recognized experts. What the team has proposed is not to be viewed in its component parts and certainly there has been no attempt on the part of CIUSS and its member countries to separate those parts. It has been the consistent position of CIUSS that all programme components (including the post-harvest operation proposed project) must receive equal treatment in terms of implementation.

Specific declaration to fund activities in harvest protection were made in Ottawa by several donors and at the Paris meeting by the Federal Republic of Germany (FRG) which proposed the following plan of action :

- a. Consultation with all interested donors on this programme component (Annex 2) between August and November. The donors already identified as having an interest in Annex 2 are, so far, United Kingdom, France, Belgium, Canada and the USA in addition to the FRG.
- b. Holding of a design team by December 1977 to analyze specific project implementation requirements in each CIUSS member country following CIUSS-IRG consultations on terms of reference for the joint mission.
- c. Provision by the IRG of 5 man-months of expert assistance in calendar year 1978 to begin project implementation.
- d. Launching of Annex 2 activities in Niger and Cape Verde in 1977-78 since these two countries' project preparations and IRG-requested design elements are complete along with in the other CIUSS countries.

It can be seen therefore that Annex 2 activities will get underway at approximately the same time as those planned for Annex 3, Integrated Pest Management.

3. Whether the implications of donor financing of local and recurrent costs are adequately discussed in this programme.

Issues related to local and recurrent costs financing were not discussed in depth in any Club programme. The subject is recognized as having profound implications for all CIUSS member nations, for all proposed Club programmes and it is to be treated, as it has been thus far, as a special study.

Preliminary work (including development of a computer model), on local and recurrent costs issues was done by a team of experts composed of Messrs. Beazer, Bursstein and Pulley. Their first findings were completed in May 1977 and presented in draft at the Ottawa Conference. The conference in turn recommended pursuit of the study by a joint Sabelian-donor team whose terms of reference would be first drawn up by Mr. Beazer and the CIUSS following a country by country and a donor by donor situational review.

The review is expected to get underway in September 1977.

Specifically in regard to the crop protection programme, local/recurrent costs must be considered in three component parts :

- a. National Crop Protection services. The support of these by national governments is an assumed fact. There is no longer any question of national will to do so and in fact, the reinforcement of these services is already taking place in some CILSS countries, notably Cape Verde, Niger, Senegal and Mali.
- b. Regional Crop Protection Organizations. Governments of countries belonging to these have already requested a study of the possible fusion of OICMI and CCLALAT in order to develop one, efficient, well-supported regional organization that would not, among other things, require duplicate financing. For the moment funds are not available to CILSS countries to both strengthen national services and support regional organizations. Hence the Club proposal to seek donor support for OICMI and CCLALAT activities within the context of Annexes C and D of the programme.
- c. The third factor in the equation is the requirement for inputs such as pesticides and insecticides. Assistance is requested here by CILSS countries to establish a revolving fund to assure first phase availability of these inputs and to subsequently replenish the fund through sales to farmers, at cost. It is hoped that higher output in terms of productivity and commercialization (the subject of another major Club study) will assure the continuous functioning of the Fund.

CILSS member countries are committed to factoring-in, on a progressive basis, recurrent costs assumptions in their national development plans starting with third, fourth and fifth year (depending on country and planning cycle) of programme operation.

Project Issues

4. Whether there should be a closer integration of the R & D element Annex B and the Information/Documentation/training element (Annex G) of this programme.

Annex G is an integral part of the crop protection programme and responds to CILSS national concern that research be applied and that research results be immediately and effectively disseminated in a manner and by methods easily comprehensible to the most affected users. The proposed projects in Annex G further respond to the need for a centralized and comprehensive center of documentation easily accessible to Sahelians and others working

..../..

on crops protection activities. And finally this "Annex" respond to one of CISS' highest priority, the Africanization of management through timely planning and execution of training activities for all levels of personnel needed to assure Sahelian assumption of the crop protection programme in the shortest possible time.

From CISS' perspective, Annex G is the mean by which Annex B is rendered useful to the average Sahelian farmer. Its presentation as a separate component was meant only to focus attention on the need, and not to separate it from the other activities.

If the component parts of the Crop Protection Programme have received separate attention, it has been because of particular donor interest and not Sahelian choice.

At the Paris 18-19 July meeting commitments were made by both CISS and donors (notably Netherlands, England, France, Germany and the USA) to assure completion of design work on Annex G by the end of 1977. It is the CISS hope that donor interest will translate into donor funding so that Annex G can be made operational at the same time as Annex . . .

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ANNEX B: IV. ILLUSTRATIVE BUDGET: NOT DIRECTLY RELATED TO FINANCIAL ANALYSIS SECTION

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	<u>Annual cost at full implementation</u>	<u>Capital investment cost (\$)</u>
<u>SENEGAL (Banbey)</u>		
1. <u>Construction</u>		
Lab/office Complex		180,000
Screenhouse		32,000
3 houses (52,000 x 3)		<u>156,000</u>
		368,000
2. <u>Equipment</u>		
Vehicles (5)		50,000
Lab/office Equipment		100,000
Field Equipment		90,000
Material - dispensable	4,000	<u>240,000</u>
non-dispensable	16,000	
3. <u>Other Costs</u>		
Personnel (local)*	213,000	
Operation Maintenance	55,000	
Travel (including per diem)	19,000	
Subcontracts	15,000	
Training	10,000	
4. <u>Professional Staff</u>		
5 Experts	350,000	
Consultants	25,000	
<u>SENEGAL (Saint Louis)</u>		
1. <u>Construction</u>		
Lab/office Complex		360,000
2. <u>Equipment</u>		
Vehicles (4)		40,000
Lab Equipment		30,000
Field Equipment		40,000
Material - dispensable	5,000	
non-dispensable	25,000	
3. <u>Other Costs</u>		
Personnel Local	92,000	
Operation Maintenance	70,000	
Travel	14,000	
Subcontracts	15,000	
Training (In-country)	10,000	

* Local personnel costs concern mainly the training of sufficient technicians in each of the CILSS countries

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	<u>Annual cost at full implementation</u>	<u>Capital investment cost (\$)</u>
4. <u>Personnel</u>		
Project Staff (4 Experts)	290,000	
Consultants 4 m/m	20,000	
<u>NIGER (Maradi)</u>		
1. <u>Construction</u>		
2. <u>Equipment</u>		
Vehicles (4)		40,000
Laboratory Equipment		60,000
Field Equipment		40,000
Material - dispensable	5,000	
non-dispensable	20,000	
3. <u>Other Costs</u>		
Personnel Local	135,000	
Operation and Maintenance	30,000	
Travel	20,000	
Subcontracts	10,000	
Training (In-country)	10,000	
4. <u>Personnel</u>		
Project Staff (3 Experts)	210,000	
Consultants	20,000	
<u>CHAD</u>		
1. <u>Construction</u>		
2. <u>Equipment</u>		
Vehicles (6)		60,000
Laboratory Equipment		60,000
Field Equipment		30,000
Material - dispensable	5,000	
non-dispensable	25,000	
3. <u>Other Costs</u>		
Personnel Local	160,000	
Operation and Maintenance	25,000	
Travel	21,000	
Subcontracts	10,000	
Training (In-country)	10,000	
4. <u>Personnel</u>		
Project Staff (5 Experts)	350,000	
Consultants 6 m/m	30,000	

	<u>Annual cost at full implementation</u>	<u>Capital investment cost (\$)</u>
4. <u>Personnel</u>		
Project Staff (3 Experts)	210,000	
Consultants 4 m/m	20,000	
<u>UPPER VOLTA (Farakoba/Bobo)</u>		
1. <u>Construction</u>		
Entomology/Plant Pathology Lab		120,000
Office Complex		50,000
Refurnishing Lab		
2. <u>Equipment</u>		
Vehicles (5)		60,000
Laboratory Equipment		120,000
Field Equipment		30,000
Material - dispensable	6,000	
non-dispensable	24,000	
3. <u>Other Costs</u>		
Personnel Local	244,000	
Operation and Maintenance	30,000	
Travel	21,000	
Subcontracts	20,000	
Training (in-country)	15,000	
4. <u>Personnel</u>		
Project Staff (6 Experts)	420,000	
Consultants (6 m/m x 5)	30,000	
<u>WALI</u>		
1. <u>Construction</u>		
Entomology/Pathology Labs, office complex		220,000
2. <u>Equipment</u>		
Vehicles (4)		40,000
Laboratory Equipment		80,000
Field Equipment		40,000
Material - dispensable	5,000	
non-dispensable	20,000	
3. <u>Other Costs</u>		
Personnel Local	144,000	
Operation and Maintenance	35,000	
Travel	14,000	
Subcontracts	10,000	
Training (In-country)	10,000	

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	<u>Annual cost at full implementation</u>	<u>Capital investment cost (\$)</u>
<u>CAPE VERDE</u>		
1. <u>Construction</u>		
2. <u>Equipment</u>		
Vehicles		10,000
Laboratory Equipment		
Field Equipment		20,000
Material - dispensable	1,000	
non-dispensable	2,000	
3. <u>Other Costs</u>		
Personnel Local	60,000	
Operation and maintenance	10,000	
Travel	5,000	
Subcontracts		
Training (In-country)	5,000	
4. <u>Personnel</u>		
Project Staff (1 Expert)	70,000	
Consultants	5,000	
<u>COORDINATION CENTRE</u>		
1. <u>Construction</u>		200,000
2. <u>Equipment</u>		
Vehicles (6)		60,000
Laboratory and Office Equipment		30,000
Field Equipment		
Material - dispensable	5,000	
non-dispensable	15,000	
3. <u>Other Costs</u>		
Personnel Local	58,000	
Operation and Maintenance	48,000	
Travel	20,000	
Publications	30,000	
Subcontracts	25,000	
Training		
4. <u>Personnel</u>		
Project Staff (6 Experts)	350,000	
Consultants	30,000	

	<u>Annual cost at full implementation</u>	<u>Capital investment cost (\$)</u>
<u>GAMBIA</u>		
1. <u>Construction</u>		
2. <u>Equipment</u>		
Vehicles (1)		10,000
Laboratory Equipment		5,000
Field Equipment		20,000
Material - dispensable	1,000	
non-dispensable	2,000	
3. <u>Other Costs</u>		
Personnel Local	60,000	
Operation and maintenance	10,000	
Travel	5,000	
Subcontracts		
Training (In-country)	5,000	
4. <u>Personnel</u>		
Project Staff	70,000	
Consultants	5,000	
<u>MAURITANIA</u>		
1. <u>Construction</u>		
2. <u>Equipment</u>		
Vehicles		20,000
Laboratory Equipment		15,000
Field Equipment		20,000
Material - dispensable	2,000	
non-dispensable	9,000	
3. <u>Other Costs</u>		
Personnel Local	85,000	
Operation and Maintenance	20,000	
Travel	7,000	
Subcontracts	5,000	
Training (In-country)	5,000	
4. <u>Personnel</u>		
Project Staff (2 Experts)	140,000	
Consultants	10,000	

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ANNEX B: V. OVERVIEW OF MANPOWER IN EACH COUNTRY WITHIN THE RESEARCH AND OUTREACH PROGRAM

Country	SENEGAL	UPPER VOLTA	MALI	NIGER	CHAD	GAMBIA	MAURITANIA	CAPE VERDE
<u>Source of Personnel</u>								
<u>Pest Management Program Proposals</u>	1 IPM (1) 1 Path. 1 Weed Sci. (3) 2 Ent. (2)	1 Weed Sci. 2 IPM	2 IPM	1 IPM	1 Weed Sci. 1 IPM 1 Path.			
a. Research								
b. Outreach:	1 Ent. (2) 1 Path.	1 Path. (Farakoba) 1 Ent. (Saria)				(1)		
- Surveillance Economic Losses								
- Demonstration/Liaison	1	1	2	2	2	1	1	1
Project Total	0	6	4	3	5	1	1	1
I. <u>National Programs</u>	1 Cereal Ent. 2 Cereal Path. 1 Weed Sci. 1 Stored Prod. Sci.							
<u>Bilateral Aid ICRISAT</u>	1 Ent.	1 Botanist 1 Ent. 1 Path.		4 Ent.				2 Ent.
II. Total Research (Including National/Bilateral PMP)	12	7	4	0	4	-	-	2
V. Total Personnel	15	10	6	10	6	1	1	3

- 1) IPM - Integrated Pest Management - Entomologist
- 2) Will also be responsible for Gambia
- 3) Senegal River Valley team, also responsible for Mauritania and Mali.

ANNEX B: VI. TRAINING SCHEDULE

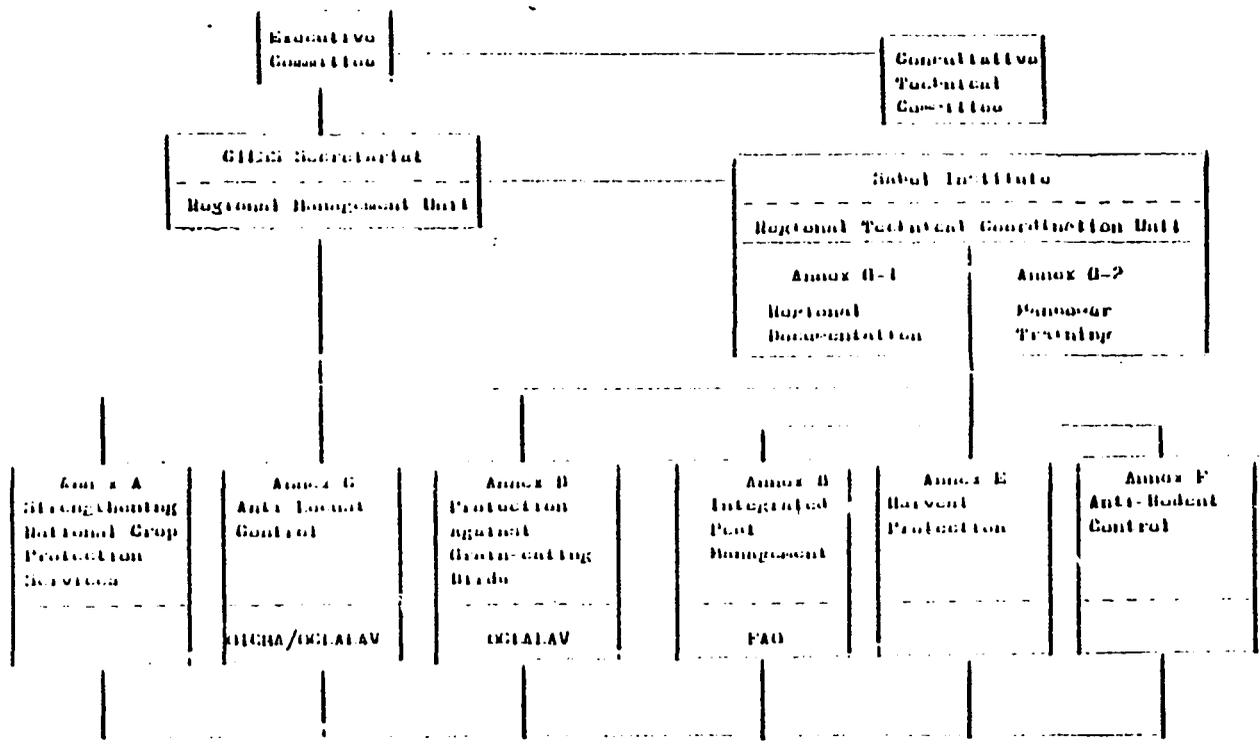
	Year 1	Year 2	Year 3	Year 4	Year 5
Local Scientists	10	10	10	10	
Technicians	20	60	50		
Training Overseas	2	7	6		

VII. Administrative Structure

A. CISS

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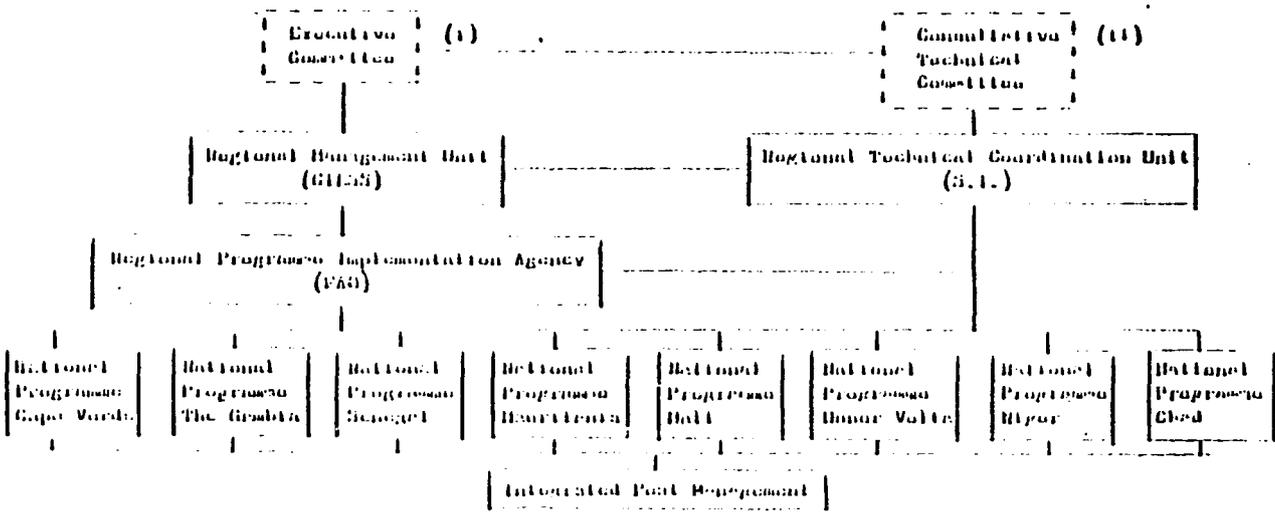
a. For the (total) Crop & Harvest Protection Programs



100/1000

77:59/4911111

b. For Annex B, Integrated Pest Management, of Crop Protection Programs



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- (1) The Executive Committee for Annex B has the basic composition, authority and responsibility as the Executive Committee of the total Crop Protection Programme. It may have separate or lower degree representation depending on donor participation in the totality or the component parts of the programme.
- (11) The Consultative Committee for Annex B has the basic authority and responsibility as the Consultative Committee of the entire programme. Its membership may be different for Annex B than for the rest of the programme.

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THE EXECUTIVE COMMITTEE

THE EXECUTIVE COMMITTEE

Article 1: Composition.

- one representative of the OTHER (1)
- the Director of the National Film Foundation Service of each STATE member country (4)
- one representative of the Social Scientists (1)
- one representative of business (1)
- one representative of labor (1)
- one representative of the general public (1)
- one representative of the National Film Foundation Service of each STATE member country (1)

Article 2: Executive Committee.

- the Executive Committee (as each member country appoints)
- the Director of the National Film Foundation
- the Director of the National Film Foundation

Article 3: Officers.

The Executive Committee shall elect a President, elected as the first meeting for a term of one year.

Article 4: Executive Committee.

The Executive Committee shall elect a President, elected as the first meeting for a term of one year. The Executive Committee shall elect a President, elected as the first meeting for a term of one year.

- (1) Executive Committee shall elect a President, elected as the first meeting for a term of one year.
- (2) Executive Committee shall elect a President, elected as the first meeting for a term of one year.
- (3) Executive Committee shall elect a President, elected as the first meeting for a term of one year.
- (4) Executive Committee shall elect a President, elected as the first meeting for a term of one year.
- (5) Executive Committee shall elect a President, elected as the first meeting for a term of one year.

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- (g) advises and consents on the appointments of senior management personnel.
- (h) approves rules and regulations for recruitment of staff to programme management.
- (i) approves amendments in programme budget, structure and implementation.
- (j) approves financial procedures used in programme implementation and audit requirements.
- (k) coordinates programme execution among participating member states.
- (l) provides advice of general nature to assure the smooth and efficient running of the programme.
- (m) establishes ad-hoc committees to deal with special problems.

Article 5: Meetings.

- (a) The Executive Committee shall meet at least once every year. More frequent meetings may be called by the Chairman or by the Council of the permanent membership.
- (b) Each member of the Executive Committee shall be notified in writing one month in advance except in extraordinary circumstances of purpose, time and place of meetings.
- (c) Minutes of each meeting shall be considered part of the official records; shall be approved and signed by the Chairman and distributed, with the shortest delay, to the membership.

Article 6: Decision-Making.

The Executive Committee shall reach decisions on a consensus basis.

The Consultative Committee

Article 7: Composition.

- Six members from the African scientific community, having particular expertise in the field of crop and forest protection, nominated by the FAO.
- Six members from the international scientific community, having particular expertise in the field of crop and forest protection. These will be nominated by the FAO with the advice and consent of the senior members of the Executive Committee.

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Article 8: Ex-officio Members.

- The Programme Manager(s).
- The Director of the Technical Cooperation Unit.
- Experts invited on an ad-hoc basis by the permanent secretariat.

Article 9: Officers.

The Consultative Committee shall elect a Chairman, elected by the permanent secretariat for a term of one year.

Article 10: Meetings.

1. The Consultative Committee shall meet at least twice per year at fixed dates. It may meet more frequently:
 - at the request of the Chairman.
 - at the request of the Executive Committee.
 - at the request of the Programme Manager(s).
2. Each member of the committee shall be notified in writing at least three weeks in advance (barring extraordinary circumstances) of purpose, time and place of meeting.
3. Minutes of each meeting shall be considered part of the official records, shall be approved and signed by the Chairman and distributed with the report to the permanent secretariat.

Article 11: Responsibilities and composition

The Consultative Committee shall be the technical advisory body of the Crop and Forest Protection Programme. It will

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be responsible, in general, for overseeing that programme implementation is occurring according to accepted international scientific standards and practices. It will act as the technical quality-control arm of the Executive Committee. Specifically, the Consultative Committee will:

- (a) review and approve the technical and scientific goals established for the programme and the research objectives and results expected;
- (b) provide guidance and approve procedures for attaining the technical aspects of the programme on a regular and systematic basis;
- (c) consider technical projects proposals and make recommendations;
- (d) review and approve scientific technical objectives;
- (e) respond to Executive Committee needs for technical advice;
- (f) respond to requests for technical advice from participating national governments;
- (g) review and approve technical and scientific progress reports.

Article 12: Decision Making.

The Consultative Committee shall reach decisions on a consensus basis.

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The National Endowment for the Arts

Article 13: Terms and Conditions.

The National Endowment for the Arts (NEA) will be located within the State Executive Secretariat. It will be composed of a Director named by the State and such other professional and support staff as may be deemed necessary to carry out the functions of the Executive Secretariat.

Article 14: Responsibilities.

- (1) The Director of the National Endowment for the Arts shall be responsible for the following:
 - (a) The NEA, in general, shall have the function of Executive Secretariat functions.
 - (b) The NEA shall, specifically, be responsible for aspects of the program, especially those involving such responsibilities as:
 - (i) The NEA shall provide regular reports to the Executive Secretariat, including quarterly financial reports.
 - (ii) The NEA shall be responsible for the preparation, review, approval and submission of all requests for funding to the Executive Secretariat and shall be responsible for the preparation and submission of all reports to the Executive Secretariat.
 - (iii) The NEA shall be responsible for the preparation and submission of all reports to the Executive Secretariat.
 - (iv) The NEA shall be responsible for the preparation and submission of all reports to the Executive Secretariat.
- (2) The NEA shall be responsible for the preparation and submission of all reports to the Executive Secretariat.
- (3) The NEA shall be responsible for the preparation and submission of all reports to the Executive Secretariat.
- (4) The NEA shall be responsible for the preparation and submission of all reports to the Executive Secretariat.

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The Regional Technical Coordination Unit

Article 15: Focus and Composition.

The Regional Technical Coordination Unit (RTCU) will be located within the Ecol Institute. It will be composed of a Director named by the Institute and such other professional and support staff as may be needed necessary to carry out the functions of the Consultative Committee.

Article 16: Responsibilities.

- (a) The Director of the RTCU is the Secretary of the Consultative Committee.
- (b) The RTCU, in general, supervises the execution of Consultative Committee deliberations.
- (c) The RTCU supervises, functionally, the technical and scientific aspects of the programs, especially those concerned with research and its applications, information and dissemination.
- (d) The RTCU prepares regular reports to the Consultative Committee, including quarterly technical reports to track the technical aspects of the projects and programs and their respective technical objectives in participating countries.
- (e) The RTCU maintains a regional technical coordination center for the programs and its component units.
- (f) The RTCU carries out the deliberations of the Consultative Committee especially in such regards programs technical evaluations. It supervises the coordination of these and transmits their findings to the Consultative Committee.
- (g) The RTCU is the focal point of liaison between the Executive and the Consultative Committees and with the Regional Management Unit.

Regional Programs Implementing Agencies:

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Article 17: Identity and Scope.

- (a) The Implementing Agencies of the Sahel Crop and Livestock Protection Programs shall be named by the OMSB.
- (b) The Food and Agriculture Organization of the United Nations (FAO) has been named and is the Implementing Agency of Annex B of the Programs.
- (c) The FAO shall have sole responsibility for administrative and technical project management, carrying out the policies of the Executive Committee.
- (d) The FAO shall carry out the responsibilities under the direction of the Regional Management Team (RMT).
- (e) The FAO shall name a Programs Manager (for Annex B) with the advice and consent of the RMT, to whom it shall be solely responsible.
- (f) The FAO shall establish an operational office in the Sahel for the purpose of implementing Programs Annex B which shall have a separate and distinct identity and function from all other FAO activities in OMSB member countries.
- (g) The FAO shall recruit all project staff (for Annex B) whose status shall be equal to the status of personnel posted to the Sahel under the terms of most international organizations.
- (h) The FAO shall be responsible for negotiating project implementation agreements with participating OMSB member nations, with the advice and consent of the RMT.
- (i) The FAO shall prepare and present to the RMT for approval each year a detailed scope of work for each of the major project activities in each of the eight participating OMSB member countries. The scope of work shall outline specific, measurable, time-bound project objectives, including expected short-term outputs and methods for tracking progress. Generally, Annex B shall be implemented on a management by objectives basis.
- (j) The administrative, managerial, planning and financial activities of the FAO shall be supervised by the RMT; the technical, scientific and research activities of the Regional Technical Documentation Team on behalf of each respective Committee.

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Article 18: Complementary Implementation Agencies.

- (a) The National Crop Production Services of the UNEP member countries shall be the implementing agencies of Programme Annex 1. The ECF and the UNEP will ensure project coordination support, documentation, technical assistance, and information dissemination for and among participating services on an as needed basis.
- (b) The regional Sahelian organizations ORSTOM and ORSTAD shall jointly be the implementing agencies of Programme Annex 2. Relations with the ECF and the UNEP will be based on the provisions of Article 17, Sections (c), (d), (e) only as it regards international personnel. (a), (b), (f).
- (c) The regional organization ORSTAD shall be the implementing agency of Programme Annex 3, under the same provisions of Article 17 as cited in (b) above.
- (d) The _____ shall be the implementing agency of Programme Annex 4 under the same coordination and supervision provisions as in (b) above.
- (e) The _____ shall be the implementing agency of Programme Annex 5 under the same coordination and supervision provisions as in (b) above.
- (f) The Sahel Institute shall be the implementing agency of Programme Annexes 6a and 6b.

Article 19: Implementation Arrangements.

- (a) Specialized agreements between the STSS and inter-national donors shall govern the financing of programme activities generally and its component parts. These agreements, once negotiated and signed, become an integral part of this management protocol.
- (b) Specialized agreements between the STSS and local-governing agencies shall govern programme operational activities generally and its component parts. These agreements, once negotiated and signed, become an integral part of this management protocol.

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CONFIDENTIAL

1. Agreement between the Comité Inter-Etats de lutte contre la
Sécheresse dans le Sahel and

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VII. Administrative Structure
8. CILSS/FAO Agreement (draft)

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AGREEMENT

between

and

(Hereinafter referred to as the Donor)

The Food and Agriculture Organization of the United Nations (Hereinafter referred to as FAO)

Whereas the Donor wishes to make funds available to FAO, as provided in this Agreement, for the purpose of implementing the project described in Appendix 1 attached hereto.

Whereas the Director-General of FAO may, under Financial Regulation 6.7, accept voluntary contributions and establish trust funds to cover them, provided the purposes of such contributions are consistent with the policies, aims and activities of FAO.

Now therefore the Donor and FAO agree as follows:

ARTICLE I

1. The Donor undertakes, as provided in this Agreement, to contribute to FAO an amount of US \$ _____ for the purpose of implementing the project (symbol and title) _____ described in Appendix 1 attached hereto.

2. The above amount will be deposited with FAO as Funds-in-Trust and will include a charge of _____ % to cover FAO's technical and administrative costs. Contributions will be administered and accounted for in accordance with the financial regulations of FAO. Any costs incurred by FAO in connection with the project will be chargeable to the Trust Fund, it being understood that FAO will not incur any financial liabilities in excess of the amounts actually received.

3. The Funds-in-Trust will be used exclusively for implementation of the project as set out in the Plan of Operation, a copy of which will be transmitted to the Donor.

4. An initial contribution of US\$ _____ shall be made by the Donor immediately after the Plan of Operation for the project has been duly processed. All remittances should be made in US dollars to the following account with the indication that the deposit is for the credit of Trust Fund No. _____

5. The Donor undertakes to pay each year thereafter a contribution in an amount to be determined in accordance with a provisional statement of accounts from FAO covering the current year and advice on the funds needed and budgeted for the subsequent year. Such statement of accounts shall be made and the contribution shall be payable one month prior to the beginning of each subsequent annual period.

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6. Experts will be recruited by FAC in accordance with the terms and conditions of services applicable to FAC personnel. They will in all respects be treated as FAC staff members and will be directly responsible to FAC for the conduct of their duties.

7. Fellowships shall be administered in accordance with FAC's rules relating to fellowships. All material, equipment and supplies purchased by FAC will be used exclusively for the execution of the project and shall be purchased and utilized in accordance with FAC's rules and administrative practices.

8. According to the Financial Regulations of FAO, all costs incurred by the Organization in connection with the project are borne by trust funds. The costs chargeable to trust funds may include unforeseen expenditures such as, but not limited to, the cost of repatriation of experts and their dependents; payment of terminal emoluments of experts or travel costs in connection with reassignment of experts; the medical costs and other payments due to experts under the Regulations of the Organization.

ARTICLE III

1. The Donor shall deposit its contribution to the project in accordance with the banking arrangements to be agreed upon between the Donor and FAC.

2. The Donor may also make bilateral contributions to the project for volunteers and other purposes but FAC will not be responsible for the use and accounting of such contributions.

3. FAC shall submit to the Donor, not later than end of June of each year while the project is operational, a statement of account after audit showing the use of the fund expended for the implementation of the project during the previous calendar year. If the total costs incurred should exceed the amount estimated, FAC will notify the Donor of the reasons therefor and the Donor will give consideration to payment of an additional sum to cover the difference. If the actual costs are less than estimated, the balance remaining unspent on completion of the project shall be returned to the Donor, or, after consultation and agreement with the Donor, allocated to another project implemented by FAC.

4. Responsibility for the execution of the project shall rest with FAC and any organizations, companies or persons designated by FAC for such purpose. The Donor shall not be responsible for these arrangements or for the ultimate execution of the project.

5. FAC shall be free to delegate and/or subcontract its responsibilities for the whole or any part of the project, in accordance with the rules and practices of the Organization.

6. The obligations of FAC are contingent upon the receipt of necessary funds from the Donor in accordance with this Agreement.

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- 7. FAO agrees to provide the Donor with regular reports on the progress of the project and to make appropriate provision in the Plan of Operation for the required data for such reports to be made available.
- 8. The Donor may arrange for a representative to visit the project and will inform FAO Headquarters of its plans in advance of such visit.
- 9. FAO agrees to provide the Donor with a final report on the operation and results of the project, as well as a statement of account after audit.

ARTICLE III

- 1. The obligations of FAO and the Donor under this Agreement are subject to the constitutional, financial and budgetary rules of FAO and to any decision of the FAO Conference.
- 2. This Agreement may be modified by mutual consent between FAO and the Donor, each of which shall give full and sympathetic consideration to any proposal for its amendment.

ARTICLE IV

This Agreement shall enter into force upon signature by both parties.

For the Donor	For the Food and Agriculture Organization of the United Nations
.....
.....

I. Description of Project

This project is a discrete part of a coordinated Sahel wide effort to provide the member states of CILSS with a capability to implement a program of integrated pest management . A number of factors are involved in the development of such a capability including evaluation of the economic importance of pests, establishment of a pest surveillance system, performance of laboratory research to develop the best integrated control techniques for each of the major food crops of the Sahel, the establishment of field test areas (Demonstration Study Areas) to validate the laboratory research, and the development of a mechanism to transfer the technology developed to plant protection agencies in the Member States of CILSS.

The emphasis of this project is upon research which will be performed and validated in all individual Sahelian countries as well as in a pilot regional basis in the Senegal River Basin. In order to perform the necessary research it will be necessary to construct, expand or renovate laboratory buildings at six locations, each of which is relatively small in size and constitutes an increment to existing general agriculture research facilities. Although specific construction sites within each of these general agriculture research stations have not been selected, due consideration will be given, in the development of detailed plans and cost estimates for purposes of bill(a) determination, to assure that all environmental requirements are met.

A second component necessary for research is the provision of expatriate technical assistance (17 researchers) to perform research and train counterpart personnel and strengthen or redirect any local research capability along the lines of integrated pest management. Research will be directed toward determining which pests are most destructive (from an economic point of view) and what techniques are most effective on a least cost basis, with due consideration being given to any environmental consequences. Thus, the development of a tested integrated pest management system necessarily runs the gamut from exclusive reliance on cultural practices, natural control agents, and improved seed, etc., toward the heavy reliance on pesticides found in advanced commercial agriculture practiced in developed countries (a practice from which Sahelian states have thus far been largely spared, at least as far as food crops are concerned). Training of the counterpart researchers who will ultimately replace the expatriates will consist of a mix of on-the-job training, U.S. academic training and third country training in Africa as well as Europe.

Validation of laboratory research is a critical component in the development of integrated pest management technique packages. To do this, the project will establish 70 field trial areas (text refers to DSA's) consisting of small plots ($\frac{1}{4}$ a hectare) widely dispersed across the Sahel to assure coverage of a range of soil and climatic conditions. Each field trial area will be under the research supervision of one of the laboratories, where tests will be conducted on food crops grown in the area. Adequate research supervision will be available to assure that these very small field trial areas will pose no threat to the environment.

As noted above, an integral aspect of integrated pest management research is the use of pesticides, under controlled laboratory or field conditions, to determine the extent of reliance that any given technical package may have on pesticide use. All pesticide application will be for research purposes, not for crop production purposes.

Research will be restricted to small replicated plots, each being at most a few rows wide and 50 to 100 feet long. Replication is necessary to statistically validate data obtained. Check (untreated) plots are necessary, and it likely would be desirable to include initially a standard pesticide of known efficacy in the Sahel even if not registered on sorghum and millet in the United States. (It should be noted that the Interim Pesticide Regulations do not require that pesticides be registered with EPA when the pesticides are to be used for controlled experimentation of limited scope and not involving the application of pesticides for crop production purposes). Such actions will be limited in time and space and, in addition, the extremely small quantities used (a few grams total) can hardly pose an environmental problem. However, the data obtained will be invaluable in studying the ecology of the crop ecosystem and in providing comparative data on the efficacy of registered pesticides.

A third element of the project is the development of a mechanism to implement results of the field tested laboratory research at the national plant protection agency level. The project proposes placing a total of 15 expatriate outreach/surveillance personnel (mostly trained entomologists) physically in the national plant protection services to coordinate with and act as a liaison between the research to be performed under this project and the national extension services. These personnel will also study and evaluate traditional methods of pest control to examine their applicability in research as well as collect pest surveillance data (including base line data) and participate in forecasting activities and crop loss assessment.

A critical feature of the role of these outreach/surveillance personnel will be to serve as the conduit through which proven packages, resulting from the research, of integrated pest management techniques can be provided to the national plant protection and extension services. From the environmental point of view, this project has no significant direct effect because funds from this project are not for use in extending the use of these packages across the Sahel. A refinement of environmental interest arises, however, as to whether pesticides are to be included in any of the integrated pest management technical packages. If pesticides are to be included in such packages the research will include a risk/benefit study of the pesticide. In addition, the pesticide regulations will be complied with before each technical package involving use of pesticides is released to the outreach individual. Should use of a particular pesticide in one of these technical packages require an environmental assessment of that package, such assessment will be conducted. (Given the mass of scientific research developed prior to the inclusion of such a pesticide in a technical package, the performance of an environmental assessment is not seen as difficult).

II. Identification and Evaluation of Environmental Impacts

The attached check list reflects the conclusion that none of the activities in this project described in Para I above has the potential for having a significant effect on the environment. The main thrust of the project, integrated pest management research, is aimed at identifying to the maximum extent possible non-chemical methods for pest control, and thus will hopefully result in the use of some such techniques. These by their nature are environmentally much more acceptable than chemicals.

The projects will, however, also carry out research with chemicals. Such research will be on very small plots for non-productive purposes, and will be closely monitored to observe all the consequences that result from the use of the chemicals being tested. A major purpose of these trials will be to identify pesticides that are effective with the minimum possible secondary effects on the environment. As such, none of these tests, because of their small size and limited scope, are expected to impact significantly on the environment.

The project will make available to national extension institutions those results of its research which are found to satisfy the two requirements of efficacy and environmental acceptability. The extent to which these criteria are satisfied will be examined, prior to transfer of the knowledge to extension agencies, through a risk/benefits analysis such as is contemplated in AID's new draft pesticide regulation.

While not being involved with the use of chemicals for production, the project prepares the basis for a pilot level effort in production use monitoring. This concerns the monitoring of the environmental consequences of the extension by national extension services of the results of the research which are generated by the project and made available to such agents. Thus, while not being involved in production itself, the project will generate very useful environmental information concerning the activities of national extension services.

Finally, the project as noted in Para I, will include the construction of buildings. These buildings (small laboratories) will be sited on existing research station grounds at Bambey, Senegal, Richard Toll, Senegal, Farakoba, Upper Volta, Sotuba, Mali, Bebedjia, Chad, and Maradi, Niger. The attached memo from SER/ENGR presents the case that discrete, individual IEE documents for such small construction elements are not necessary, and that this IEE is sufficient to cover all aspects of the project. Nevertheless, the AID engineer reviewing the preliminary plans and cost estimates for each laboratory in order to comply with Section 611(a) will also ensure that each is consistent with this IEE.

III. Recommendation of Environmental Action

In view of the foregoing a Negative Determination is considered in order.

IMPACT IDENTIFICATION AND EVALUATION FORM

<u>Impact Areas and Sub-areas 1/</u>	Impact Identification and <u>Evaluation 2/</u>
--------------------------------------	---

A. LAND USE

- | | |
|--|-------|
| 1. Changing the character of the land through: | |
| a. Increasing the population----- | N |
| b. Extracting natural resources----- | N |
| c. Land clearing----- | N |
| d. Changing soil character----- | N |
| 2. Altering natural defenses----- | N |
| 3. Foreclosing important uses----- | N |
| 4. Jeopardizing man or his works----- | N |
| 5. Other factors | |
| _____ | _____ |
| _____ | _____ |

B. WATER QUALITY

- | | |
|--|-------|
| 1. Physical state of water----- | N |
| 2. Chemical and biological states----- | N |
| 3. Ecological balance----- | N |
| 4. Other factors | |
| _____ | _____ |
| _____ | _____ |

1/ See Explanatory Notes for this form.

2/ Use the following symbols: N - No environmental impact
 L - Little environmental impact
 M - Moderate environmental impact
 H - High environmental impact
 U - Unknown environmental impact

IMPACT IDENTIFICATION AND EVALUATION FORM

C. ATMOSPHERIC

- | | |
|-------------------------|-------|
| 1. Air additives----- | Y |
| 2. Air pollution----- | N |
| 3. Noise pollution----- | N |
| 4. Other factors | |
| _____ | _____ |
| _____ | _____ |

D. NATURAL RESOURCES

- | | |
|---|-------|
| 1. Diversion, altered use of water----- | N |
| 2. Irreversible, inefficient commitments----- | N |
| 3. Other factors | |
| _____ | _____ |
| _____ | _____ |

E. CULTURAL

- | | |
|---|-------|
| 1. Altering physical symbols----- | N |
| 2. Dilution of cultural traditions----- | N |
| 3. Other factors | |
| _____ | _____ |
| _____ | _____ |

F. SOCIOECONOMIC

- | | |
|---|-------|
| 1. Changes in economic/employment patterns----- | N |
| 2. Changes in population----- | N |
| 3. Changes in cultural patterns----- | N |
| 4. Other factors | |
| _____ | _____ |
| _____ | _____ |

IMPACT IDENTIFICATION AND EVALUATION FORM

G. HEALTH

- | | |
|--|-------|
| 1. Changing a natural environment----- | N |
| 2. Eliminating an ecosystem element----- | N |
| 3. Other factors | |
| _____ | _____ |
| _____ | _____ |

H. GENERAL

- | | |
|--------------------------------|-------|
| 1. International impacts----- | N |
| 2. Controversial impacts----- | N |
| 3. Larger program impacts----- | N |
| 4. Other factors | |
| _____ | _____ |
| _____ | _____ |

I. OTHER POSSIBLE IMPACTS (not listed above)

- | | |
|--|---|
| <u>Replicated, small plot evaluation of</u> | |
| <u>pesticides for research purposes during</u> | |
| <u>preliminary phases of Project.</u> | N |

See attached Discussion of Impacts.

UNITED STATES GOVERNMENT

Memorandum

TO : AF/SFWAP, J. Graham

DATE: October 17, 1977

FROM : ENGR/SP/E&S, W. Davies *W. Davies*

SUBJECT: IEE(s) for Regional Project 625-0928, Integrated Pest Management.

As was stated in the project committee meeting on October 13, 1977, SER/ENGR does not see the necessity of making IEE's for each of the expanded and/or renovated laboratory buildings envisioned in the project. If more detail of such facilities is needed, it should be incorporated into the initial IEE. Even though exact locations are unknown, the statement is made that these buildings or additions will be small and will be devoted almost exclusively to the problems in the Sahel, these should fall into a few major categories.

1. research on resistant varieties of plants
2. research on parasites/pathogens effecting pests/plant disease.
3. research on chemical control of pests/pathogens.
4. research on persistence in the environment of chemical control agents.

For research in these fields, basic requirements are more or less limited to (exclusive of field test plots).

1. Chemical analysis--both qualitative and quantitative--facilities.
2. Microbiological laboratory facilities.
3. Insectaries
4. Plant isolation facilities (greenhouses).

Since common and ordinary laboratory equipment, construction and procedures are envisioned in both the design and training phases of the project, none of these in themselves pose any significant threat to the environment.

Chemical analysis, which would be primarily and almost entirely for pesticide analysis, is limited to extraction, concentration and destructive testing (chromatography, spectrography). Little escapes to the environment since the methods used include solvent recovery and re-use.

Microbiological laboratory facilities would be similar in nature to any small medical or teaching laboratory and, since they will be designed



5010-110

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and operated consistent with normal and ordinary procedures they would pose no significant threat to the environment.

Insectaries and plant isolation facilities, in themselves or in their normal operation pose little or no threat to the environment, especially when one considers that native species or variants are all that would be likely to be dealt with.

Short-term disruption of the environment such as dust production, noise, etc. would be limited to the construction phase and very few people would be exposed to them due to the rural or semi-rural nature of the facilities. In this respect, we are only concerned with effects due to construction of small building and can follow HUD's example as it pertains to small structures.

Waste products from operations may be classified as: 1) liquid wastes from laboratories, greenhouses, etc. 2) solid wastes from same, and 3) gaseous or aerosol emissions. Both liquid and solid wastes from this type of operation may be adequately controlled and/or treated by underground treatment methods. As stated previously, gases or aerosol emissions would be minimal to non-existent from this type of facility.

Therefore, it is our opinion that individual IEE's for each of the small test buildings contemplated in the project is a needless paperwork burden and wasteful of the time and money required to make them. The overall IEE for the project should be reworded to omit this requirement and, if necessary, to add supporting evidence that the construction and operation of these facilities is environmentally non-significant and deserves a negative determination.

cc: . Stearns, SER/ENGR
J. Cassanos, ENCR/E&S

ANNEX D

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Title of Project: _____
 From FY 78 to FY 82
 Total US Funding \$25,200
 Date Prepared: Oct. 1977

Project Title & Number: CILSS - IPM RESEARCH 625-0920

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal. The broader objective to which this project contributes:</p> <p>To increase the yield per hectare of food crops in the Sahel by reduction of crop losses due to pests.</p>	<p>Measures of Goal Achievement:</p> <p>a. Food crop losses due to pest consumption in the Sahel will decrease by 2% per year from FY 1983 through FY 1988.</p> <p>b. After FY 1990 the total losses of food crops due to pests will not amount to more than 1% of the total annual crop.</p> <p>*The first five years of the project will accumulate base line data and develop targets for reduction of crop loss during subsequent phases.</p>	<p>a. Annual evaluation of losses of Sahel food crops attributable to pests, the technique for which is to be developed by this project.</p>	<p>Assumptions for achieving goal targets:</p> <p>a. That exogenous variables will not seriously disrupt food crop yields in the Sahel.</p>
<p>Project Purpose:</p> <p>To implement an integrated pest management program of proven effectiveness for food crops throughout the Sahel.</p>	<p>Conditions that will indicate purpose has been achieved. End of project status</p> <p>Integrated Pest Management programs designed for each country in the Sahel and funding for said programs arranged for between international donors and host governments.</p>	<p>a. Annual budget and programming documents of international donors and host governments.</p> <p>b. Annual program evaluation documents.</p>	<p>Assumptions for achieving purpose:</p> <p>a. That international coordination of pest management activities will be sufficient to achieve project targets.</p> <p>b. That integrated pest management programs are cost effective.</p>
<p>Outputs:</p> <p>An integrated pest management program for food crops in the Sahel.</p> <p>a. Research labs constructed</p> <p>b. Field Experiments Developed</p> <p>c. Trained counterparts proven</p> <p>d. Technical packages developed</p> <p>e. Evaluation techniques developed</p> <p>f. Surveillance/crop loss assessment techniques developed</p> <p>g. Outreach Liaison work plans developed</p>	<p>Magnitude of Outputs:</p> <p>a. 7</p> <p>b. 70</p> <p>c. 170</p> <p>d. To be determined</p> <p>e. N.A.</p> <p>f. N.A.</p> <p>g. 15 agents in place</p>	<p>a. CILSS reports</p> <p>b. Annual A.I.D. evaluations of project implementation activities</p> <p>c. Field visits</p> <p>d. A.I.D. country office monitoring</p> <p>e. Host country quarterly management reports</p>	<p>Assumptions for achieving output:</p> <p>a. That sufficient number of personnel are available to be trained and retained</p>
<p>Inputs:</p> <p>T.A.</p> <p>Commodities</p> <p>Construction</p> <p>Training</p> <p>Other Costs</p>	<p>Implementation Target (Type and Quantity)</p> <p>See Financial Plan</p> <p>Section 3. B.</p>	<p>See annual budgets, audit reports, evaluation reports of donor and implementing agencies.</p>	<p>Assumptions for providing inputs:</p> <p>a. That inputs from all sources will be provided according to the schedule.</p>

ANNEX E - Initial Implementation Schedule

<u>Month</u>	<u>Action</u>
0	Approval PP
1	Signature GA
2	Signature CILSS/FAO Agreement
2	Commence country negotiations (4 months duration).
2	Arrival initial FAO experts
3	A & E contract signed
4	All initial C. P.'s met
4	Procurement agent contracted for
5	Baseline study performed
5	Overall training plan developed
6	All country negotiations complete

ANNEX F

ORGANISATION DES NATIONS UNIES POUR
L'ALIMENTATION ET L'AGRICULTURE



ORGANIZACION DE LAS NACIONES UNIDAS
PARA LA AGRICULTURA Y LA ALIMENTACION

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

Via delle Terme di Caracalla, 00100 - ROME

Cables: FOODAGRI ROME

Telex: 61181 FOODAGRI

Telephone: 5797

Ref. DP 9/1 RAF 76/008 AGPP

14 October 1977

Dear Mr Kelly,

... Attached please find:

1) Copy of a letter sent to Mr John E. Murphy, Acting Administrator, AID, Department of State, Washington, D.C. 20523.

2) Building plans for laboratory at Bambej. I would appreciate it if you could return this to me at your earliest convenience.

Yours sincerely,

Lukas Brader
Chief, Plant Protection Service
Plant Production and Protection Division

Mr J. Kelly
AFR-DR-SFWAP
USAID
Washington D.C. 20523
USA

ANNEX F

ORGANISATION DES NATIONS UNIES POUR
L'ALIMENTATION ET L'AGRICULTURE



ORGANIZACION DE LAS NACIONES UNIDAS
PARA LA AGRICULTURA Y LA ALIMENTACION

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

Via delle Terme di Caracalla 00100-ROME

Cables: FOODAGRI/ROME

Telex: 51181 FOODAGRI

Telephone: 5797

Ref. DP 9/1 RAF 76/006

typed on 10.4.77

LDH:1

sent to Invitation List, Club des Amis du
Sahel meeting, Ottawa, 25 May-4 June

cc: Ngantjoo, ICP

Doyler, ACP

Ciro, CIRCO, ACP

ACP Registry (2) ~~Circo (Bredar)~~

J'ai l'honneur de vous faire parvenir des propositions d'action concernant la protection des végétaux dans les pays membres du CISS qui ont été élaborées dans le cadre des Groupes de Travail conjoint du Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel et du Club des Amis du Sahel.

Ces documents vous sont adressés de la part du CISS et du Club des Amis du Sahel. Ils ont été révisés à la suite de la réunion du groupe de synthèse CISS/Club tenue à Ouagadougou du 6 au 9 avril 1977. Ils seront soumis pour approbation au Conseil des Ministres du CISS qui se tiendra à Ouagadougou le 25 avril 1977.

Ces propositions font partie des programmes qui seront présentés lors de la prochaine réunion du Club des Amis du Sahel qui se tiendra à Ottawa du 25 mai au 1er juin, 1977.

Je vous prie d'agréer,
haute considération.

, l'assurance de ma

L. BRADER
Chef d'Equipe
Protection des Végétaux

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ANNEX G

A.I.D. Project Number: 625-0928

PROJECT GRANT AGREEMENT

BETWEEN

The Permanent Interstate Committee for
Drought Control in the Sahel

and the

UNITED STATES OF AMERICA

for

Research and Development of Integrated Pest
Management for Basic Crops in the Sahel

Preliminary Draft
Dated: September 23, 1977

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Project Grant Agreement

Dated 19__

Between the Permanent Interstate Committee for Drought Control in the Sahel ("Grantee"), an international organization consisting of the countries of Cape Verde, Chad, Gambia, Mali, Mauritania, Niger, Senegal and Upper Volta (the "Member States"),

and the United States of America, acting through the Agency for International Development ("A.I.D.").

Article 1: The Agreement

The purpose of this Agreement is to set out the understandings of the parties named above ("Parties") with respect to the undertaking by the Grantee of the Project described below, and with respect to the financing of the Project by the Parties.

Article 2: The Project

SECTION 2.1. Definition of Project. The Project, which is further described in Annex 1, will consist of Annex 1, attached, amplifies the above definition of the Project. Within the limits of the above definition of the Project, elements of the amplified description stated in Annex 1 may be changed by written agreement of the authorized representatives of the Parties named in Section 3.3, without formal amendment of this Agreement.

BEST COPY AVAILABLE

BEST COPY AVAILABLE SECTION 2.2. Incremental Nature of Project.

(a) A.I.D.'s contribution to the Project will be provided in increments the initial one being made available in accordance with Section 3.1 of this Agreement. Subsequent increments will be subject to availability of funds to A.I.D. for this purpose, and to the mutual agreement of the Parties, at the time of a subsequent increment, to proceed.

(b) Within the overall Project Assistance Completion Date stated in this Agreement, A.I.D., based upon consultation with the Grantee, may specify in Project Implementation Letters appropriate time periods for the utilization of funds granted by A.I.D. under an individual increment of assistance.

Article 3: Financing

SECTION 3.1. The Grant. To assist the Grantee to meet the costs of carrying out the Project, A.I.D., pursuant to the Foreign Assistance Act of 1961, as amended, agrees to grant the Grantee under the terms of this Agreement, not to exceed _____ United States ("U.S.") Dollars (\$ _____) ("Grant").

The Grant may be used to finance foreign exchange costs, as defined in Section 3.1, and local currency costs, as defined in Section 3.2, of goods and services required for the Project.

SECTION 3.2. Grantee Resources for the Project.

(a) The Grantee agrees to provide or cause to be provided for the Project all funds, in addition to the Grant, and all other resources required to carry out the Project effectively and in a timely manner.

(b) The resources provided by Grantee for the Project will be not less than the equivalent of U.S. \$ _____, including costs borne on an "in-kind" basis.

SECTION 3.3. Project Assistance Completion Date.

(a) The "Project Assistance Completion Date" (PACD), which is _____, 19___, or such other date as the Parties may agree to in writing, is the date by which the Parties estimate that all services financed under the Grant will have been performed and all goods financed under the Grant will have been furnished for the Project as contemplated in this Agreement.

(b) Except as A.I.D. may otherwise agree in writing, A.I.D. will not issue or approve documentation which would authorize disbursement of the Grant for services performed subsequent to the PACD or for goods furnished for the Project, as contemplated in this Agreement, subsequent to the PACD.

(c) Requests for disbursement, accompanied by necessary supporting documentation prescribed in Project Implementation Letters are to be received by A.I.D. or any bank described in Section 7.1 no later than nine (9) months following the PACD, or such other period as A.I.D. agrees to in writing. After such period, A.I.D., giving notice in writing to the Grantee, may at any time or times reduce the amount of the Grant by all or any part thereof for which requests for disbursement, accompanied by necessary supporting documentation prescribed in Project Implementation Letters, were not received before the expiration of said period.

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Article 4: Conditions Precedant to Disbursement

SECTION 4.1. First Disbursement. Prior to the first disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(a) An opinion of counsel acceptable to A.I.D. that this Agreement has been duly authorized and/or ratified by, and executed on behalf of, the Grantee, and that it constitutes a valid and legally binding obligation of the Grantee in accordance with all of its terms;

(b) A statement of the name of the person holding or acting in the office of the Grantee specified in Section 3.3., and of any additional representatives, together with a specimen signature of each person specified in such statement;

(c) An executed contract with the Food and Agriculture Organization of the United Nations ("FAO") for technical services required for the Project;

(d) Executed agreements between the Grantee and the Government of the Federal Republic of Germany, the Government of France and the Government of England under which such governments agree to provide their contributions required for the effective implementation of the Project and evidence that conditions precedent to disbursement under such agreements, if any, have been satisfied; and

(e) SECTION 4.2. Additional Disbursement: Prior to disbursement under the Grant for any purpose in each Member State of the Grantee other than to

(a) An executed contract for engineering design services for laboratories and other facilities which will be constructed under the Project

and (e), finance the services referred to in Section 4.1(c) / or the issuance of documentation pursuant to which disbursement will be made with respect thereto, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D.:

(a) An executed agreement with such Member State describing the rights and obligations of the Grantee and such Member State required for the effective implementation of the Project, including, but not limited to, the contribution to be made by the Member State to the Project;

(b) Documentary evidence of the development of a procurement system adequate to ensure that goods and services will be procured in an effective and timely manner to achieve the objectives of the Project;

(c) A plan describing the manner in which the training required for effective implementation of the Project will be provided;

(d) A study providing baseline information regarding the effect of pests on crop production in the Project area; and

(e) A plan, developed in consultation with Sahel Water Data Project and with Regional Remote Sensing Project, describing the manner in which the activities conducted under this Project will be coordinated with Sahel Water Data Project and Regional Remote Sensing Project.

SECTION 4.3. Condition Precedent for Equipment. Prior to disbursement under the Grant for equipment procurement, or to issuance by A.I.D. of documentation pursuant to which disbursement will be made for equipment, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D.:

(a) Detailed specifications for such equipment; and

(b) An executed contract for such equipment.

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SECTION 4.4. Conditions Precedent to Construction Services. Prior to the first disbursement under the Grant for each construction activity, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made with respect thereto, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D. with respect to such construction activity, in form and substance satisfactory to A.I.D.:

(a) An executed contract ~~for engineering design and~~ for construction supervision, or a description of the arrangements made for public agencies of the Member State in which the construction is undertaken to perform these services; and

(b) Plans and specifications, bid documents and time schedules for such construction; and

(c) An executed contract for construction services with a firm acceptable to A.I.D. or arrangements satisfactory to A.I.D. for providing the construction services by force account.

SECTION 4.5. Notification. When A.I.D. has determined that the conditions precedent specified in Section 4.1, 4.3 and 4.4 have been met, it will promptly notify the Grantee.

SECTION 4.6. Terminal Dates for Conditions Precedent.

(a) If all of the conditions specified in Section 4.1 have not been met within 90 days from the date of this Agreement, or such later date as ⁷ A.I.D. may agree to in writing, A.I.D., at its option, may terminate this Agreement by written notice to Grantee.

(b) If all of the conditions specified in Section 4.3 have not been met within 180 days from the date of this Agreement, or such later date as

A.I.D. may agree to in writing, A.I.D. at its option, may cancel in whole or in part the then undisbursed balance of the Grant, to the extent not irrevocably committed to third parties, and may terminate, in whole or in part, this Agreement by written notice to the Grantee.

Article 5: Social Covenants

SECTION 5.1. Project Evaluation. The Parties agree to establish an evaluation program as part of the Project. Except as the Parties otherwise agree in writing, the program will include, during the implementation of the Project and at one or more points thereafter:

- (a) evaluation of progress toward attainment of the objectives of the Project;
- (b) identification and evaluation of problem areas or constraints which may inhibit such attainment;
- (c) assessment of how such information may be used to help overcome such problems; and
- (d) evaluation, to the degree feasible, of the overall development impact of the Project.

SECTION 5.2. A.I.D. Pesticide Regulations. The Grantee agrees that the procurement and use of pesticides under this Project shall be in accordance with A.I.D. Pesticide Regulations, as may be amended from time to time.

Article 6: Procurement Sources

SECTION 6.1. Foreign Exchange Costs. Disbursements pursuant to Section 7.1, other than those required to finance the contract for technical services with the FAO, will be used exclusively to finance the costs of goods

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and services required for the Project having their source and origin in the United States (Code 000 of the A.I.D. Geographic Code Book as in effect at the time orders are placed or contracts entered into for such goods or services) ("Foreign Exchange Costs"), except as A.I.D. may otherwise agree in writing, and except as provided in the Project Grant Standard Provisions Annex, Section C.1(j) with respect to marine insurance.

?
This section
should be
crossed out
and replaced
with the
following
text:

SECTION 6.2. Local Currency Costs. Disbursements pursuant to Section 7.2 will be used exclusively to finance the costs of goods and services required for the Project having their source and, except as A.I.D. may otherwise agree in writing, their origin in the Member States of the Grantee ("Local Currency Costs").

Article 7: Disbursement

SECTION 7.1. Disbursement for Foreign Exchange Costs.

(a) After satisfaction of conditions precedent, the Grantee may obtain disbursements of funds under the Grant for the Foreign Exchange Costs of goods or services required for the Project in accordance with the terms of this Agreement, by such of the following methods as may be mutually agreed upon:

- (1) by submitting to A.I.D., with necessary supporting documentation as prescribed in Project Implementation Letters, (A) requests for reimbursement for such goods or services, or, (B) requests for A.I.D. to procure commodities or services in Grantee's behalf for the Project, or (C) requests for advances which shall be made by Federal Reserve Letter of Credit;

(2) by requesting A.I.D. to issue Letters of Commitment for specified amounts (A) to one or more U.S. banks, satisfactory to A.I.D., committing A.I.D. to reimburse such bank or banks for payments made by them to contractors or suppliers, under Letters of Credit or otherwise, for such goods or services, or (B) directly to one or more contractors or suppliers, committing A.I.D. to pay such contractors or suppliers for such goods or services.

(b) Banking charges incurred by Grantee in connection with Letters of Commitment and Letters of Credit will be financed under the Grant unless Grantee instructs A.I.D. to the contrary. Such other charges as the Parties may agree to may also be financed under the Grant.

SECTION 7.2. Disbursement for Local Currency Costs.

(a) After satisfaction of conditions precedent, the Grantee may obtain disbursements of funds under the Grant for Local Currency Costs required for the Project in accordance with the terms of this Agreement, by submitting to A.I.D., with necessary supporting documentation as prescribed in Project Implementation Letters, requests to finance such costs.

(b) The local currency needed for such disbursements may be obtained by acquisition by A.I.D. with U.S. Dollars by purchase.

SECTION 7.3. Other Forms of Disbursement. Disbursements of the Grant may also be made through such other means as the Parties agree to in writing.

SECTION 7.4. Rate of Exchange. Except as may be more specifically provided under Section 7.2, if funds provided under the Grant are introduced into any Member State by A.I.D. or any public or private agency for purposes of carrying out obligations of A.I.D. hereunder, the Grantee will make such

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arrangements as may be necessary so that such funds may be converted into currency of such Member State at the highest rate of exchange which, at the time the conversion is made, is not unlawful in such Member State.

Article 3: Miscellaneous

SECTION 3.1. Communications. Any notice, request, document, or other communication submitted by either Party to the other under this Agreement will be in writing or by telegram or cable, and will be deemed duly given or sent when delivered to such party at the following addresses:

To the Grantee:

Mail Address:

Alternate address for cables:

To A.I.D.:

Mail Address:

Alternate address for cables:

All such communications will be in English, unless the Parties otherwise agree in writing. Other addresses may be substituted for the above upon the giving of notice. The Grantee, in addition, will provide the USAID Mission with a copy of each communication sent to A.I.D.

SECTION 3.2. Representatives. For all purposes relevant to this Agreement, the Grantee will be represented by the individual holding or acting in the office of _____ and A.I.D. will be represented by the individual holding or acting in the office of _____, each

of whom, by written notice, may designate additional representatives for all purposes other than exercising the power under Section 2.1 to revise elements of the amplified description in Annex 1. The names of the representatives of the Grantee, with specimen signatures, will be provided to A.I.D., which may accept as duly authorized any instrument signed by such representatives in implementation of this Agreement, until receipt of written notice of revocation of their authority.

SECTION 3.3. Standard Provisions Annex. A "Project Grant Standard Provisions Annex" (Annex 2) is attached to and forms part of this Agreement.

SECTION 3.4. Language of Agreement. This Agreement is prepared in both English and French. In the event of ambiguity or conflict between the two versions, the English Language version will control.

IN WITNESS WHEREOF, the Grantee and the United States of America, each acting through its duly authorized representative, have caused this Agreement to be signed in their names and delivered as of the day and year first above written.

PERMANENT INTERSTATE COMMITTEE FOR DROUGHT
CONTROL IN THE SAHEL

By: _____

Title: _____

UNITED STATES OF AMERICA

By: _____

Title: _____

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Project Grant Standard

Provisions Annex

Definitions: As used in this Annex, the "Agreement" refers to the Project Grant Agreement to which this Annex is attached and of which this Annex forms a part. Terms used in this Annex have the same meaning or reference as in the Agreement.

Article A: Project Implementation Letters

To assist Grantee in the implementation of the Project, A.I.D., from time to time, will issue Project Implementation Letters that will furnish additional information about matters stated in this Agreement. The parties may also use jointly agreed-upon Project Implementation Letters to confirm and record their mutual understanding on aspects of the implementation of this Agreement. Project Implementation Letters will not be used to amend the text of the Agreement, but can be used to record revisions or exceptions which are permitted by the Agreement, including the revision of elements of the amplified description of the Project in Annex 1.

Article B: General Covenants

SECTION B.1. Consultation. The Parties will cooperate to assure that the purpose of this Agreement will be accomplished. To this end, the Parties, at the request of either, will exchange views on the progress of the Project, the performance of obligations under this Agreement, the performance of any consultants, contractors, or suppliers engaged on the Project, and other matters relating to the Project.

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SECTION 3.2. Execution of Project. The Grantee will:

(a) carry out the Project or cause it to be carried out with due diligence and efficiency, in conformity and sound technical, financial, and management practices, and in conformity with those documents, plans, specifications, contracts, schedules or other arrangements, and with any modifications therein, approved by A.I.D. pursuant to this Agreement; and

(b) provide qualified and experienced management for, and train such staff as may be appropriate for the maintenance and operation of the Project, and as applicable for continuing activities, cause the Project to be operated and maintained in such manner as to assure the continuing and successful achievement of the purposes of the Project.

SECTION 3.3. Utilization of Goods and Services.

(a) Any resources financed under the Grant will, unless otherwise agreed in writing by A.I.D., be devoted to the Project until the completion of the Project, and thereafter will be used so as to further the objectives sought in carrying out the Project.

(b) Goods or services financed under the Grant, except as A.I.D. may otherwise agree in writing, will not be used to promote or assist a foreign aid project or activity associated with or financed by a country not included in Code 933 of the A.I.D. Geographic Code Book as in effect at the time of such use.

SECTION 3.4. Taxation.

(a) The Grantee shall ensure that this Agreement and the Grant will be free from any taxation or fees imposed under laws in effect in the territory of the Member States of the Grantee.

(b) To the extent that (1) any contractor, including any consulting firm, any personnel of such contractor financed under the Grant, and any property or

transaction relating to such contracts and (2) any commodity procurement transaction financed under the Grant, are not exempt from identifiable taxes, tariffs, duties or other levies imposed under laws in effect in the territory of the Member States of the Grantee, the Grantee will, as and to the extent provided in and pursuant to Project Implementation Letters, pay or reimburse the same, or cause a Member State to pay or reimburse the same, with funds other than those provided under the Grant.

SECTION 3.3. Reports, Records, Inspections, Audit.

The Grantee will:

- (a) furnish A.I.D. such information and reports relating to the Project and to this Agreement as A.I.D. may reasonably request;
- (b) maintain or cause to be maintained, in accordance with generally accepted accounting principles and practices consistently applied, books and records relating to the Project and to this Agreement, adequate to show, without limitation, the receipt and use of goods and services acquired under the Grant. Such books and records will be audited regularly, in accordance with generally accepted auditing standards, and maintained for three years after the date of last disbursement by A.I.D.; such books and records will also be adequate to show the nature and extent of solicitations of prospective suppliers of goods and services acquired the basis of award of contracts and orders, and the overall progress of the Project toward completion; and
- (c) afford authorized representatives of a Party the opportunity at all reasonable times to inspect the Project, the utilization of goods and services financed by such Party, and books, records, and other documents relating to the Project and the Grant.

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SECTION 3.6. Completeness of Information. The Grantee confirms:

(a) that the facts and circumstances of which it has informed A.I.D., or caused A.I.D. to be informed, in the course of reaching agreement with A.I.D. on the Grant, are accurate and complete, and include all facts and circumstances that might materially affect the Project and the discharge of responsibilities under this Agreement;

(b) that it will inform A.I.D. in timely fashion of any subsequent facts and circumstances that might materially affect, or that it is reasonable to believe might so affect, the Project or the discharge of responsibilities under this Agreement.

SECTION 3.7. Other Payments. Grantee affirms that no payments have been or will be received by any official of the Grantee in connection with the procurement of goods or services financed under the Grant, except fees, taxes or similar payments legally established under the charter of the Grantee or legally established in the Member States.

SECTION 3.8. Information and Marking. The Grantee will give appropriate publicity to the Grant and the Project as a program to which the United States has contributed, identify the Project site, and mark goods financed by A.I.D., as described in Project Implementation Letters.

Article C: Procurement Provisions

SECTION C.1. Special Rules.

(a) The source and origin of ocean and air shipping will be deemed to be the ocean vessel's or aircraft's country of registry at the time of shipment.

(b) Premiums for marine insurance placed in the territory of a Member State of the Grantee will be deemed an eligible Foreign Exchange Cost, if otherwise eligible under Section C.7(a).

(c) Any motor vehicles financed under the Grant will be of United States manufacture, except as A.I.D. may otherwise agree in writing.

(d) Transportation by air, financed under the Grant, or property or persons, will be on carriers holding United States certification, to the extent service by such carriers is available. Details on this requirement will be described in a Project Implementation Letter.

SECTION C.2. Eligibility Date. No goods or services may be financed under the Grant which are procured pursuant to orders or contracts finally placed or entered into prior to the date of this Agreement, except as the Parties may otherwise agree in writing.

SECTION C.3. Plans, Specifications, and Contracts. In order for there to be mutual agreement on the following matters, and except as the Parties may otherwise agree in writing:

(a) The Grantee will furnish to A.I.D. upon preparation,

(1) any plans, specifications, procurement or construction schedules, contracts, or other documentation relating to goods or services to be financed under the Grant, including documentation relating to the prequalification and selection of contractors and to the solicitation of bids and proposals. Material modifications in such documentation will likewise be furnished A.I.D. on preparation;

(2) such documentation will also be furnished to A.I.D., upon preparation relating to any goods or services, which, though not financed under the Grant, are deemed by A.I.D. to be of major importance to the Project. Aspects of the Project involving matters under this subsection (a)(2) will be identified in Project Implementation Letters;

(b) Documents related to the prequalification of contractors, and to the

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(b) Documents related to the prequalification of contractors, and to the solicitation of bids or proposals for goods and services financed under the Grant will be approved by A.I.D. in writing prior to their issuance, and their terms will include United States standards and measurements;

(c) Contracts and contractors financed under the Grant for engineering and other professional services, for construction services, and for such other services, equipment or materials as may be specified in Project Implementation Letters, will be approved by A.I.D. in writing prior to execution of the contract. Material modifications in such contracts will also be approved in writing by A.I.D. prior to execution; and

(d) Consulting firms used by the Grantee for the Project but not financed under the Grant, the scope of their services and such of their personnel assigned to the Project as A.I.D. may specify, and construction contractors used by the Grantee for the Project but not financed under the Grant, shall be acceptable to A.I.D.

SECTION C.4. Reasonable Price. No more than reasonable prices will be paid for any goods or services financed, in whole or in part, under the Grant. Such items will be procured on a fair and, to the maximum extent practicable, on a competitive basis.

SECTION C.5. Notification to Potential Suppliers. To permit all United States firms to have the opportunity to participate in furnishing goods and services to be financed under the Grant, the Grantee will furnish A.I.D. such information with regard thereto, and at such times, as A.I.D. may request in Project Implementation Letters.

SECTION C.6. Shipping

(a) Goods which are to be transported to the territory of the Member States of the Grantee may not be financed under the Grant if transported either: (1) on an ocean vessel or aircraft under the flag of a country which is not included in A.I.D. Geographic Code 935 as in effect at the time of shipment, or (2) on an ocean vessel which A.I.D., by written notice to the Grantee has designated as ineligible; or (3) under an ocean or air charter which has not received prior A.I.D. approval.

(b) Costs of ocean or air transportation (of goods or persons) and related delivery services may not be financed under the Grant, if such goods or persons are carried: (1) on an ocean vessel under the flag of a country not, at the time of shipment, identified under the paragraph of the Agreement entitled "Procurement Source: Foreign Exchange Costs," without prior written A.I.D. approval; or (2) on an ocean vessel which A.I.D., by written notice to the Grantee, has designated as ineligible; or (3) under an ocean vessel or air charter which has not received prior A.I.D. approval.

(c) Unless A.I.D. determines that privately owned United States-flag commercial ocean vessels are not available at fair and reasonable rates for such vessels, (1) at least fifty percent (50%) of the gross tonnage of all goods (computed separately for dry bulk carriers, dry cargo liners and tankers) financed by A.I.D. which may be transported on ocean vessels will be transported on privately owned United States-flag commercial vessels, and (2) at least fifty percent (50%) of the gross freight revenue generated by all shipments financed by A.I.D. and transported to the territory of the Grantee on dry cargo liners shall be paid to or for the benefit of privately owned United States-flag commercial vessels. Compliance

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with the requirements of (1) and (2) of this subsection must be achieved with respect to both any cargo transported from U.S. ports and any cargo transported from non-U.S. ports, computed separately.

SECTION C.7. Insurance.

(a) Marine insurance on goods financed by A.I.D. which are to be transported to the territory of the Member States of the Grantee may be financed as a Foreign Exchange Cost under this Agreement provided (1) such insurance is placed at the lowest available competitive rate, and (2) claims thereunder are payable in the currency in which such goods were financed or in any freely convertible currency. If a Member State (or government of a Member State), by statute, decree, rule, regulation, or practice discriminates with respect to A.I.D.-financed procurement against any marine insurance company authorized to do business in any State of the United States, then all goods shipped to the territory of such Member State financed by A.I.D. hereunder will be insured against marine risks and such insurance will be placed in the United States with a company or companies authorized to do a marine insurance business in a State of the United States.

(b) Except as A.I.D. may otherwise agree in writing, the Grantee will insure, or cause to be insured, goods financed under the Grant imported for the Project against risks incident to their transit to the point of their use in the Project; such insurance will be issued on terms and conditions consistent with sound commercial practice and will insure the full value of the goods. Any indemnification received by the Grantee under such insurance will be used to replace or repair any material damage or any loss of the goods insured or will be used to reimburse the Grantee for the replacement or repair of such goods. Any such replacements will

be of source and origin of countries listed in A.I.D. Geographic Code 933 as in effect at the time of replacement, and, except as the Parties may agree in writing, will be otherwise subject to the provisions of the Agreement.

SECTION C.3. U.S. Government-Owned Excess Property. The Grantee agrees that wherever practicable, United States Government-owned excess personal property, in lieu of new items financed under the Grant, should be utilized. Funds under the Grant may be used to finance the costs of obtaining such property for the Project.

Article D: Termination; Remedies.

SECTION D.1. Termination. Either Party may terminate this Agreement by giving the other Party 30 days written notice. Termination of this Agreement will terminate any obligations of the Parties to provide financial or other resources to the Project pursuant to this Agreement, except for payment which they are committed to make pursuant to noncancellable commitments entered into with third parties prior to the termination of this Agreement. In addition, upon such termination A.I.D. may, at A.I.D.'s expense, direct that title to goods financed under the Grant be transferred to A.I.D. if the goods are from a source outside a Member State of the Grantee, are in a deliverable state and have not been offloaded in ports of entry of a Member State.

SECTION D.2. Refunds.

(a) In the case of any disbursement which is not supported by valid documentation in accordance with this Agreement, or which is not made or used in accordance with this Agreement, or which was for goods or services not used in accordance with this Agreement, A.I.D., notwithstanding the availability or

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exercise of any other remedies under this Agreement, may require the Grantee to refund the amount of such disbursement in U.S. Dollars to A.I.D. within sixty (60) days after receipt of a request therefor.

(b) If the failure of Grantee to comply with any of its obligations under this Agreement has the result that goods or services financed under the Grant are not used effectively in accordance with this Agreement, A.I.D. may require the Grantee to refund all or any part of the amount of the disbursements under this Agreement for such goods or services in U.S. Dollars to A.I.D. within sixty (60) days after receipt of a request therefor.

(c) The right under subsection (a) or (b) to require a refund of a disbursement will continue, notwithstanding any other provision of this Agreement, for three years from the date of the last disbursement under this Agreement.

(d) (1) Any refund under subsection (a) or (b), or (2) any refund to A.I.D. from a contractor, supplier, bank or other third party with respect to goods or services financed under the Grant, which refund relates to an unreasonable price for or erroneous invoicing of goods or services, or to goods that did not conform to specifications, or to services that were inadequate, will (A) be made available, first for the cost of goods and services required for the Project, to the extent justified, and (B) the remainder, if any, will be applied to reduce the amount of the Grant.

(e) Any interest or other earnings on Grant funds disbursed by A.I.D. to the Grantee under this Agreement prior to the authorized use of such funds for the Project will be returned to A.I.D. in U.S. Dollars by the Grantee.

SECTION D.3. Nonwaiver of Remedies. No delay in exercising any right or remedy accruing to a Party in connection with its financing under this Agreement will be construed as a waiver of such right or remedy.

SECTION D.4. Assignment. The Grantee agrees, upon request, to execute an assignment to A.I.D. of any cause of action which may accrue to the Grantee in connection with or arising out of the contractual performance or breach of performance by a party to a direct U.S. Dollar contract with A.I.D. financed in whole or in part out of funds granted by A.I.D. under this Agreement.

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60(1) - COUNTRY CHECKLIST *

Listed below are, first, statutory criteria applicable generally to FAO funds, and then criteria applicable to individual fund sources: Development Assistance and Security Supporting Assistance funds.

A. GENERAL CRITERIA FOR COUNTRY

1. FAO Sec. 115. Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in consistent pattern of gross violations of internationally recognized human rights?

Tested pest control techniques will greatly assist the needy farmers of the Sahel to produce more food.

2. FAO Sec. 481. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully?

No

3. FAO Art. 620(a). Does recipient country furnish assistance to Cuba or fail to take appropriate steps to prevent ships or aircraft under its flag from carrying cargoes to or from Cuba?

No.

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FAO Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the International Communist movement?

Yes.

FAO Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government?

No cases are known within the 6 member states of CILSS.

4. FAO Sec. 620(d)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalization, expropriation, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

Same as above.

This project furnishes assistance to a regional organization consisting of 8 Sahelian States. As such, the legislative requirements relating to specific countries are inapplicable. This country checklist has, however, been completed to reflect the compliance of the individual member of the regional organization. A yes or no answer, if given, is applicable to all participating states. Otherwise, an appropriate explanation is provided.

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- 7. FAA Sec. 620(f); App. Sec. 102. Is recipient country a Communist country? Will assistance be provided to the Democratic Republic of Vietnam (North Vietnam), South Vietnam, Cambodia or Laos? No.
- 8. FAA Sec. 620(f). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression? No.
- 9. FAA Sec. 620(i). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property? No.
- 10. FAA Sec. 620(j). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason? No.
- 11. FAA Sec. 620(k); Fishermen's Protective Act, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters, No.
 - a. Has any deduction required by Fishermen's Protective Act been made?
 - b. Has complete denial of assistance been considered by AID Administrator?
- 12. FAA Sec. 620(l); App. Sec. 604. (a) Is the government of the recipient country in default on interest or principal of any AID loan to the country? (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which loan not appropriates funds, unless debt was earlier defaulted, or appropriate steps taken to cure default? None of the 8 member states of CILSS is presently in default of any AID Loan.
- 13. FAA Sec. 620(s). What percentage of country's budget is for military expenditures? How much of foreign exchange resources spent on military equipment? How much spent for the purchase of sophisticated weapons systems? Consideration of these points is to be coordinated with the Bureau for Program and Policy Coordination, Regional Coordinators and Military Assistance Staff (PPC/RO). Varies widely among the 8 member states of CILSS, but there is no sophisticated weaponry

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14. FAA Sec. 620(c). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?
 15. FAA Sec. 620(d). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrears taken into account by the AID Administrator in determining the current AID Operational Year Budget?
 16. FAA Sec. 620A. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism?
 17. FAA Sec. 655. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA?
 18. FAA Sec. 692. Has the country delivered or received nuclear reprocessing or enrichment equipment, materials or technology, without specified arrangements on safeguards, etc.?
 19. FAA Sec. 911. Has the country denied its citizens the right or opportunity to emigrate?

No.

Varies widely among the 8 member states of CILSS, but all are in good standing in the U.N.

No.

No.

No.

No.

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B. FUNDING CRITERIA FOR COUNTRY

1. Development Assistance Country Criteria

a. FAA Sec. 102(c), (d). Have criteria been established, and taken into account, to assess commitment and progress of country in effectively involving the poor in development, on such indexes as: (1) small-farm labor intensive agriculture, (2) reduced infant mortality, (3) population growth, (4) equality of income distribution, and (5) unemployment.

b. FAA Sec. 201(b)(5), 17 & (4); Sec. 202; 204(a)(4), (5). Describe extent to which country is:

- (1) Making appropriate efforts to increase food production and improve means for food storage and distribution.
- (2) Creating a favorable climate for foreign and domestic private enterprise and investment.

B.1.a. This assistance is being provided pursuant to a comprehensive long-term development plan being developed by the Club du Sahel which includes the recipient organization and its member states. This plan includes, in one form or another, criteria to measure such progress on a multidonor and regional basis. Individual member states have likewise developed such criteria relating to their specific countries

Pest control packages will assist the small farmers to avoid food crop losses due to pests, thus increasing food production.

61b

- (3) Increasing the public's role in the developmental process.
- (4) (a) Allocating available budgetary resources to development.
(b) Diverting such resources for unnecessary military expenditure and intervention in affairs of other free and independent nations.
- (5) Making economic, social, and political reforms such as tax collection improvements and changes in land tenure arrangements, and making progress toward respect for the rule of law, freedom of expression and of the press, and recognition and importance of individual freedom, initiative, and private enterprise.
- (6) Otherwise responding to the vital economic, political, and social concerns of the people, and demonstrating a clear determination to take effective self-help measures.

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c. EA Sec. 101 - In the country among other countries in which development assistance loans may be made in this fiscal year, among the 40 in which development assistance grants (other than for technical projects) may be made?

N/A

d. EA Sec. 101 - Will countries be furnished in some fiscal year, either security cooperation assistance, or Middle East peace funds? In so, is assistance for humanitarian programs, humanitarian and through international organizations, or technical programs?

No.

2. Security and Human Rights Country Criteria

N/A.

a. EA Sec. 101 - In the country exposed to a continuing pattern of gross violations of internationally recognized human rights? If so, is compliance with policy of the Department?

b. EA Sec. 101 - Will countries be furnished through the Department, organizations, or other eligible to receive assistance?

c. EA Sec. 101 - If determined to be granted a loan, have proceeds will accrue to the recipient country, have financial Account (counterpart) arrangements been made?

6C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Security Supporting Assistance funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? IDENTIFY. HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

GENERAL CRITERIA FOR PROJECT.1. App. Unnumbered; FAA Sec. 653(b)

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project;
(b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure plus 10%)?

This project was presented in the FY 1978 Congressional Presentation. Any changes would be brought to the attention of the Congress through the normal Congressional notification procedures.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

Yes. See accompanying Action Memorandum and PAF Part II.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

No legislative action required.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

No water-related land construction is intended in this project.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

N/A.

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A.

6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multi-lateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multi-lateral organizations or plans to the maximum extent appropriate?

This project which includes other donor inputs from UK and France, is provided to the regional organization.

7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

The ultimate objective of the research to be performed in this project is to improve the technical efficiency of agricultural production.

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

Although procurement of commodities (other than motor vehicles) and services, other than those provided by the FAO, is permitted in Code 941 countries, it is expected that most of the equipment and commodities will be procured in U.S.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

The countries involved will contribute local services to the extent possible to assist in achieving the project purpose.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?

There is no U.S. owned excess foreign currency in any of the countries.

B. FUNDING CRITERIA FOR PROJECT1. Development Assistance Project Criteria

a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?

Research phase will not directly involve participation of poor or develop cooperatives. Feedback from poor farmers will, however, be an important research input.

b. FAA Sec. 103, 104, 105, 106, 107. is assistance available: [include only applicable paragraph -- e.g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

Although this provision is inapplicable, the project provides for the following:

- (1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;
- (2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;
- (3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;
- (4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:
 - (a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;
 - (b) to help alleviate energy problem;
 - (c) research into, and evaluation of, economic development processes and techniques;
 - (d) reconstruction after natural or manmade disaster;
 - (e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;
 - (f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

Better pest control will permit the Sahelian farmers to increase production of food crops which will in turn increase their income. Research will be directed specifically toward producing pest control packages which are designed to be economically and technically feasible for the small farmers.

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(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing?

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

This is a multi-donor project to a regional organization under Section 121 and thus the 25% requirement is not applicable.

N/A.

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Pest Control research will assist in meeting the country's food needs by reducing losses to pests.

Although the project relies on expatriates to provide specialized technical services, Africans, including women, will be trained, both on the job and in institutions in the U.S. and Africa, to replace those expatriates during the course of the project.

Project implementation in each country will rely heavily on manpower in that country. In addition, CILSS, as an African institution, will coordinate project activities. Although the project relies expatriates to provide specialized technical services, Africans, including women, will be trained both on the job and in the U.S. and Africa, to replace these expatriates during the course of the project.

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g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). Does the activity give reasonable promise of contributing to the development: of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?

The project shows that if crop losses due to pests can be reduced, the value of the project saved is sufficient to contribute both to continuation of the project and to the economy in general.

h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.

U.S. personnel will be hired by FAO and considerable U.S. equipment will be procured in the project.

2. Development Assistance Project Criteria (Loans only)

N/A.

a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.

b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.

c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds \$100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?

d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?

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e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?

f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

3. Project Criteria Solely for Security Supporting Assistance

N/A.

FAA Sec. 531. How will this assistance support promote economic or political stability?

4. Additional Criteria for Alliance for Progress

N/A.

[Note: Alliance for Progress projects should add the following two items to a project checklist.]

a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?

b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?

5. Additional Criteria for Sahel Development Project

How will this assistance contribute to the long-term development of the Sahel region in accordance with a long-term multidonor development plan?

This project contributes the first five year phase in research to increase food production by reduction of losses to pests and is an integral part of a multidonor designed and implemented crop protection program.

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are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport. Fair Competitive Practices Act, 1974.

If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available?

Yes

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B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest?

N/A. This is not a capital project.

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

Yes

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million?

N/A

C. Other Restrictions

1. FAA Sec. 201(f). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?

N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?

N/A. There will not be a fund established consisting solely of contribution by the U.S. Any fund established for the project by CILSS, the I.O., that is the grantee, will contain contributions made by the U.K. and the French.

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-Bloc countries, contrary to the best interests of the U.S.?

Yes

4. FAA Sec. 635(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S. or guaranty of such transaction?

Yes, AID regulations on vehicle procurement will be enforced.

5. Will arrangements preclude use of financing:
- a. FAA Sec. 114. to pay for performance of abortions or to motivate or coerce persons to practice abortions? **Yes.**
 - b. FAA Sec. 620(g). to compensate owners for expropriated nationalized property? **Yes.**
 - c. FAA Sec. 650. to finance police training or other law enforcement assistance, except for narcotics programs? **Yes.**
 - d. FAA Sec. 662. for CIA activities? **Yes.**
 - e. App. Sec. 103. to pay pensions, etc., for military personnel? **Yes.**
 - f. App. Sec. 106. to pay U.N. assessments? **Yes.**
 - g. App. Sec. 107. to carry out provisions of FAA Sections 209(d) and 251(h)? (transfer to multilateral organization for lending). **Yes.**
 - h. App. Sec. 501. to be used for publicity or propaganda purposes within U.S. not authorized by Congress? **Yes.**

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USAID PROJECT N° 625-0928

AMENDMENT N° 5

to the

PROJECT AGREEMENT

between

THE PERMANENT INTERSTATE COMMITTEE FOR DROUGHT CONTROL IN THE SAHEL

and

THE GOVERNMENT OF THE UNITED STATES OF AMERICA

for

REGIONAL CROP PROTECTION

(RESEARCH AND DEVELOPMENT OF INTEGRATED PEST
MANAGEMENT FOR BASIC CROPS IN THE SAHEL)

AMENDEMENT N° 5

à

L'ACCORD DE PROJET

entre

LE COMITE PERMANENT INTER-ETATS DE LUTTE CONTRE
LA SECHEREUSE DANS LE SAHEL (CILSS)

et

LE GOUVERNEMENT DES ETATS-UNIS D'AMERIQUE

pour

LA PROTECTION REGIONALE DE VEGETEAUX

(LA RECHERCHE-DEVELOPPEMENT CONCERNANT LA LUTTE INTEGREE CONTRE
LES ENNEMIS PRINCIPAUX DES CULTURES VIVRIERES DANS LE SAHEL)

FISCAL DATA:

Appropriation: 72-11X1012
Allotment : 812-60-686-00-69-01
Amount : \$ 2,500,000
Reference : State 51535

The Grant Agreement between the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) and the United States of America acting through the Agency for International Development (USAID), dated February 7, 1978, for Research and Development of Integrated Pest Management for Basic Crops in the Sahel and amended as of April 18, 1978, August 30, 1978, December 29, 1978, March 23, 1979, is hereby amended as follows:

Paragraph 1 of Article 3, Section 3.1 is amended to read as follows:

SECTION 3.1: The Grant. To assist the Grantee to meet the costs of carrying out the Project, USAID, pursuant to the Foreign Assistance Act of 1961, as amended, agrees to grant the Grantee under the terms of this agreement, an amount not to exceed eight million nine hundred thousand United States Dollars (U.S. \$ 8,900,000) ("Grant") consisting of six million four hundred thousand dollars (\$ 6,400,000) previously obligated and two million five hundred thousand dollars (\$ 2,500,000) obligated by this Amendment.

Attachment 1 to this Amendment is the revised Project Financial Plan which replaces the Project Financial Plan in the original agreement.

Paragraph 2 of Article 3, Section 3.1 remains the same.

The fifth amendment shall be effective upon execution. Except as specifically modified and amended hereby, the Grant Agreement shall remain in full force and effect. All references in said Agreement to the words "Grant Agreement" or "This Agreement" shall be deemed to mean the "Grant Agreement as amended".

L'Accord de Subvention conclu entre le Comité Inter-Etats de Lutte contre la Sécheresse dans la Sahel (CILSS) et les Etats-Unis d'Amérique, agissant par l'intermédiaire de l'Agence des Etats-Unis pour le Développement International (USAID) daté du 7 février 1978, pour la Recherche et le Développement des moyens de Lutte contre les Ennemis Principaux des Cultures Vivrières et amendé le 18 avril 1978, le 30 août 1978, le 29 décembre 1978 et le 23 mars 1979, est amendé comme suit:

Le Paragraphe 1 de l'Article 3, Section 3.1 est amendé et à lire comme suit:

SECTION 3.1: La Subvention. Afin d'assister le Bénéficiaire à financer les coûts de l'exécution du projet, l'USAID, conformément à la loi de 1961 sur l'Aide Etrangère telle qu'elle a été amendée, accepte d'accorder au bénéficiaire aux termes de cet Accord une somme qui ne dépassera pas huit millions neuf cent mille dollars des Etats-Unis (\$ E.U. 8 900 000) ("Subvention"), comprenant la somme de six millions quatre cent mille dollars (\$ 6 400 000) allouée précédemment et la somme de deux millions cinq cent mille (\$ 2 500 000) accordée par cet Amendement.

L'Annexe 1 de cet Amendement est le Plan Financier du Projet révisé qui remplace le Plan Financier du Projet dans l'accord initial.

Le paragraphe 2 de l'Article 3, Section 3.1 demeure inchangé.

Ce cinquième amendement prendra effet à partir de la date d'exécution. Hormis ces modifications spéciales apportées par cet amendement, l'Accord de Subvention restera inchangé et légalement valide. Toutes les références dans ledit Accord aux expressions "Accord de Subvention" ou "Cet Accord" devront être comprises comme "Accord de Subvention tel qu'amendé".

FINANCEMENT USAID
(\$)

PROJECT INPUTS (DEPENSES POUR LE PROJET)	COPS (PLANS d'OPERATION DES PAYS) TOTAL	FAO TOTAL	TOTAL BUDGET (BUDGET TOTAL)
Project Personnel (Personnel de Projet)	175,411	4,050,000	4,225,411
Official Travel (Voyage Officiel)	130,882		130,882
Contractual Services (Services contractuels)	166,871	250,000	416,871
General Expenses (Dépenses Générales)	168,549	170,000	338,549
Supplies (Fournitures)	57,200		57,200
Material & Equipment (Matériel & Equipement)	1,980,921		1,980,921
Construction Plans (Plans de Construction)	200,000		200,000
Training (Formation)	20,166	130,000	150,166
Other Costs (Autres Frais)		1,400,000	1,400,000
TOTAL	2,900,000	6,000,000	8,900,000

FINANCIAL PLAN (PLAN FINANCIER)
 FINANCEMENT USAID
 PROJECT - 1st OPERATING YEAR
 (PROJET - 1ère ANNEE OPERATIONNELLE)
 (\$)

Operating Entity (Unité de Gestion)	TOTAL to DATE (TOTAL ENGAGE A CE JOUR)	Future Years anticipated (Années futures prévues)	Total all years (Total de toutes les années)
The Gambia (La Gambie)	115,675	327,573	443,248
Upper Volta (Haute-Volta)	544,327	829,378	1,373,705
Mali (Mali)	424,067	816,360	1,234,427
Mauritania (Mauritanie)	148,000	391,066	539,066
Niger (Niger)	203,000	655,000	858,000
Senegal (Sénégal)	601,032	811,575	1,412,607
Chad (Tchad)	337,933	971,867	1,309,800
Cape Verde (Cap Vert)	34,650	429,150	463,800
Sub-Regional	24,475	2,813,195	2,837,670
UCTR	268,841	376,939	663,780
UGR	180,000	691,858	871,858
FAO	6,000,000	6,796,000	12,796,000
Contingency (Frais imprévus)		476,039	476,039
TOTAL	8,900,000	16,380,000	25,280,000

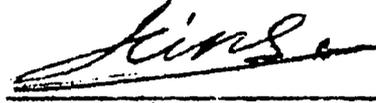
IN WITNESS WHEREOF, the United States of America and CILSS each acting through its duly authorized representative, have caused this fifth amendment to be signed.

EN FOI DE QUOI, les Etats-Unis d'Amérique et le CILSS, chacun agissant par son représentant dûment mandaté, ordonnent que ce cinquième amendement soit signé.

FOR THE GOVERNMENT OF THE UNITED STATES OF AMERICA

POUR LE COMITE PERMANENT INTER-ETATS DE LUTTE CONTRE LA SECHERESSE DANS LE SAHEL

BY : 
Thomas D. Boyatt

PAR : 
Aly Cissé

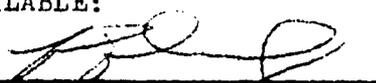
TITLE : Ambassador of the United States of America

TITRE : Secrétaire Exécutif du CILSS

DATE : MAR 25 1980

DATE : MAR 25 1980

FUNDS AVAILABLE:

BY : 
B. Loc Eckersley

TITLE : Mission Controller

USAID PROJECT N° 625-0928

AMENDMENT N° 5

to the

PROJECT AGREEMENT

between

THE PERMANENT INTERSTATE COMMITTEE FOR DROUGHT CONTROL IN THE SAHEL

and

THE GOVERNMENT OF THE UNITED STATES OF AMERICA

for

REGIONAL CROP PROTECTION

(RESEARCH AND DEVELOPMENT OF INTEGRATED PEST
MANAGEMENT FOR BASIC CROPS IN THE SAHEL)

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Attachment 1

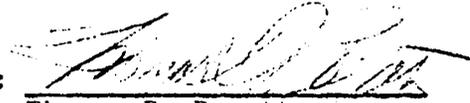
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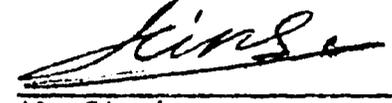
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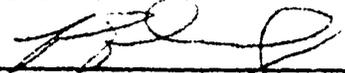
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