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SENEGAL CEREALS PRODUCTION PROJECT

EVALUATION REPORT

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I. SUMMARY

OBJECTIVES

These objectives were to be accomplished by reinforcing an already existing extension service (SO.DE.VA) to provide more personnel, better training of personnel, two expatriate technicians, some construction of office space warehouses and storage, demonstration equipment, added support for operating expenses, and new applied research unit to provide evaluation of the effect of the extension themes, to demonstrate them, and to study how to improve them.

Project implementation started almost immediately after the ProAg was signed on February 26, 1975.

The detailed progress on inputs and outputs is described under an analysis of the log frame (page 10). The extension program conceived with SO.DE.VA laid considerable stress on promoting the adoption of ox traction, with plows and other suitable equipment, and increased applications of fertilizer, based upon the research results of the CNRA (Bambey). Because of an inadequate supply of the necessary equipment and fertilizer and of obtaining much less than the expected results when only parts of the package were used, progress in promotion of this concept has been somewhat slower than was anticipated. The program emphasis was then changed by SO.DE.VA to address the bulk of the farmers in the

These themes are already recognized by the farmers and their promotion is more easily done because the machinery and fertilizer inputs required are in much better supply.

The production goals in terms of peanuts and millet have been met using the extension program for the majority of the farmers. This has increased the net farm income per family, which is largely derived from peanuts. The 1975 crop was also good. However, farm costs, particularly fertilizer costs, have increased each year starting in 1975, without a corresponding increase in crop prices. This clearly has had a depressing effect on farm income and in 1977 will have an even greater effect by also depressing fertilizer use.

Increased production of millet is severely limited by the failure of ONCAD, which has the responsibility for millet marketing, to launch a serious buying program in October, November and December when the farmers wish to sell millet (page 38). There is no reason to hope that this problem will be overcome by intervention from SO.DE.VA in the near future. This is doubly necessary because a new millet selection, with seed multiplied under a SO.DE.VA. program, will be available in sufficient supply to cover the whole project area in 1978.

Compared with the performance of the other 9 medium term projects in the Sahel designed at the same time as this one, the Senegal Cereals Production Project was outstanding in the

speed with which it got started, and in terms of output is certainly among the leaders if not the best.

For further information the reader is directed to the evaluation using the log frame page 10 and to the detailed parts of the report to which the log frame leads.

Knowing that there is a line for a second phase of the Senegal Cereals Project in the 1978 ABS, the evaluation team has presented some ideas for a possible second phase, including some steps that might be taken to prepare for it.

Because the expenses have been less than projected, the evaluation team, among its recommendations, suggests that the project be prolonged and extend current funds to March 31, 1978 and possibly to December 31, 1978, or thereabouts.

II. OPERATIONAL PROGRAM ELEMENTS

The GOS requested AID assistance to increase the production of millet in Central Senegal, in the Thiès-Diourbel area. This region generally accounts for 14% of the area and 10% of the millet/sorghum production of Senegal. It accounts for 11% of the area and 14% of the production of peanuts. These two crops cover about 90% of the area cultivated in the Thiès-Diourbel area.

The principal objectives of the AID-financed project are as follows: The operational program is to promote diversification and intensification. That is to move somewhat away from the traditional emphasis on peanuts, with millet also being grown by the head of the household. Intensification is at three levels:

1. TL with horse and/or donkey traction, light mechanization and use of fertilizer.
2. TB with ox drawn equipment of a heavier type, with fertilizer, animal manure and plowing.
3. TBFF or AF with ox drawn equipment of an even heavier type, with some areas in intensive cultivation using a higher level of fertilizer, in rotation and with plowing at the end of the season. Manure is produced and stored in a special storage, forage production is introduced for the cattle and a supply is conserved. These techniques are stated in the PROP (page 12) to "have been proven by research to have significant socio-economic values".

The program elements, developed in 1974 with SO.DE.VA. include:

1. An expanded farm intensification program in the Departments of Thiès, Bambey, and Diourbel.

2. Additional field personnel at the department or "operation" level, and in the field.
3. An expatriate agronomist and an extension specialist. The agronomist is "to work closely with the Senegalese agronomist assigned to the project and to assist in the training of Senegalese agriculturalists (Ingénieur de Travaux Agricoles)". The extension specialist is "responsible for the organization at the field level of the required training program for the field personnel as well as for the demonstration training program for farmers in the three departments". The two expatriates are supplied by SAFEC (Paris).
4. An enlarged CETAD (Training Unit) (Center financed by IDA; A-V Center and equipment by Iran) for upgrading the extension staff from the level of "vulgarisateur général" to "encadreur de base". Some new staff are to be trained. The expenses of training are paid by the project.
5. Construction of office space and warehouses at the level of delegations (Thiès and Diourbel) and warehouses in 5 districts. Provision of some office equipment.
6. Equipment and some buildings at departmental training centers (ZER).
7. Provision of ox training centers in each district.
8. Provision of the demonstration center at MBodiène on "heavy" soils.
9. Provision of agricultural and personnel training centers (CFA) at district level (eight).
10. Provision of demonstration farm level storages in each of 8 districts using a revolving fund.

11. Provision of a truck.
12. Provision of small tools, equipment and veterinary supply kits for each of 8 districts.
13. A revolving credit fund.
14. Provision of tractors and millet threshers for demonstration purposes.
15. Applied research and liaison between CNRA (Bambey) and SO.DE.VA. unit.
16. Applied research on deck and dior soils at NDiamane when a sufficient supply of water is available from the new well. This is to reinforce The existing experimental unit (PAPEM).

It is proposed to build offices for a staff of 2 expatriate agronomists, 2 Senegalese agronomists (Ingénieur Agronome), and 5-6 technical assistants as well as a secretary and other administrative staff. This includes the liaison group from Bambey.

III. THE INTENSIVE FARMING PACKAGE

The project envisioned extension work at three different levels;

- a) the full technical package;
- b) intermediate package, and
- c) more basic preliminary improvements.

In the first category inputs call for more draft oxen to be trained, more farmers to use high rates of fertilizer (TBFF) and this is expected to lead to an increase in output. The original concept proposed by CNRA Bambey and accepted by SODEVA was proposed to the design team and reported to be technically and economically feasible. This was to be one of the major sources of the increase in production. For reasons stated below, although production has probably increased by a few thousand tons, more emphasis has been given to the basic package with encouraging results. Each farmer in the intensified program (TBFF) has about 1/4 of his land "intensified" but it has not been plowed and probably has only a medium dose of mixed fertilizer and often no oxen. What was not recognised was that farms that had oxen were using them only with horse equipment. With little plowing the results of the fertilizer applied were less than with plowing. So the TBFF theme was really not being applied.

The limited supply of inputs (see page 38) particularly plows, double hitches, and tools frames for oxen and carts for oxen and horses, together with limited supplies of fertilizer, make it difficult or impossible for a farmer wanting to adopt the whole package to do so. However, the farmers profited from having the oxen by finishing them and selling them for butchery. In the

last 2-3 years this has been very profitable. The inability to get the inputs for the ox traction program lead to an inability to get the outputs and a lack of adoption of the themes. A study in the Bambey department in 1975 indicated that 6% of the farmers had oxen. There was less than 1 cart per 6 pairs of oxen, one pair in 12 were on a farm with a plow, one pair in 10 with a double hitch to pull 2 or 3 seeder units instead of one like a horse. About one pair of oxen in 13 was on a farm with a multipurpose tool frame and so on.

The liaison group showed that farmers with oxen used in this way did not get a higher income from crop production on a per ha. or per worker basis than farmers without oxen. The liaison group also launched a study to see the results of application of a package of intensifying themes and to demonstrate it in the 3 study villages.

The same survey indicated that there was an average of almost 1 horse and 0.5 donkey per farm in the Bambe department and that one farm in four had a horse cart. The liaison group showed that about 70% of the people involved in farming used fertilizer. Those who did not were not likely to be the head of the compound or of the household but an unmarried son or a wife.

SODEVA recognizing the error in the concept that production could be substantially increased in the medium term by intensification, decided in 1975/76 to emphasize service to the bulk of the farmers who had horse and/or donkey traction and used light doses of fertilizer. This program change is believed to have played a considerable role, together with the weather, in the production increases in 1975 and 1976.

Unfortunately, this program has received another check by the GOS raising the price of fertilizer 3 years in succession. After feeling the "squeeze" of higher input prices without increased cash crop prices in 1967/77, farmers have responded to the third price increase in 1977/78 by reducing their orders for fertilizer. The 10% increase in fertilizer use in 1976 over 1975, could have been responsible for 2-3% of the increase in millet and peanut production. A decline in orders by about 1/3 if followed by a decline in delivery and consumption (which is likely) could in itself lead to a decline of 6-8000 tons of millet and slightly less of peanuts.

There is nothing that SODEVA can do about this. If the GOS pushes the matter to the limit and eliminates^s the subsidy on fertilizer without changing product prices they are liable to reduce fertilizer use on peanuts and millet to almost zero in the Thiès-Diourbel area with a consequent loss in production and probably involving a steady decline in soil fertility over time, with a consequent decline in yield.

Mercier (SODEVA) has already suggested that between 1960 and 1975 peanut yields have declined an average of 45 kg a year in Thiès and 35 kg a year in Diourbel.

In a major way the future of the project in the Thiès-Diourbel area is threatened if the GOS removes the fertilizer subsidy without increasing prices.

IV. LOG FRAME ANALYSIS

The Senegal Cereals Production Project was conceived as a farm intensification program similar to that in the Sine-Saloum. The general conception was proposed by SO.DE.VA. The principal objectives of the AID-financed program are as follows:

1. Encourage the production of cereals in rotation with existing cash crops (groundnuts) to provide farmers with their basic food requirements.

2. Gradually increase farmer income by the introduction of more rational production methods which will improve productivity and lead to the commercialization of the increased millet crop.

3. Assist in expansion and strengthening of the Senegalese Agricultural Extension Service (SO.DE.VA.).

4. Expand the current program of applied research to village from cooperatives and intensified farms to serve as models for more generalised agricultural development throughout the groundnut basin.

5. Develop the necessary rural infrastructure to assure the continued overall agricultural development of the area.

The project is located in the Thiès department of the Thiès region and in the Bambey and Diourbel departments of the Diourbel region. It is in the central part of the groundnut basin, with a rainfall of about 650 mm. in an average year. The soils are mostly sandy and are intensively cropped with millet and peanuts in succession, with little fallow and a little continuous millet.

The structure of the project and its inputs and outputs are summarized in the log frame. For simplicity the progress of the project, and its problems are laid out in an expanded log frame (Annex) , with commentaries by the evaluation team.

Program goal (log frame Section A). The program goal "to contribute to the economic development of agricultural productivity, particularly in cereals, in an important area of the groundnut basin" is to be assessed by two indicators:

- Increased yields per hectare on participating farms, through the introduction of intensification methods of from 25 to 50% over the life of the project.

- Increased number of farmers participating in various stages from semi-intensified farming to full-scale use of techniques (with ox traction, improved soil management and heavy fertilization).

The evaluation of these measures of achievement requires systematic surveys of the numbers of farmers adopting the techniques and evaluation of the yields obtained by sampling and weighing, or by knowing the area of a plot and its production. This is by no means simple to accomplish and the problems encountered by SO.DE.VA. trying to do this in an IBRD project in the Sine Saloum are discussed at length in Elizabeth Hopkin's report of her consultation with SO.DE.VA. in evaluation in November 1976 (copy in project file). The major gap is lack of data on the yield obtained by the adoption of the different components of the technical package.

In the three villages studied by the project's liaison group at CNRA (Bambey) farmers with ox traction are shown to have similar income per hectare and per worker as farmers without ox traction. This is due to the inability of farmers to obtain the inputs required (see Project Outputs page 18) and Project inputs, review of technical analysis and feasibility, (p.30) the intensive farming package (p.31) and the Supply of Inputs (p.38).

What has in fact happened is that SO.DE.VA. and the Liaison Unit (CNRA) recognizing the problem, initiated research into how the intensive technical package could be made to work in the area. As a result and SO.DE.VA. has re-directed its extension program to the largest group of farmers in the region - those with horse traction using machinery and moderate doses of fertilizer.

The best estimates of production available indicate general increases in yields, except where rainfall is seriously deficient, producing the proposed increases in production by involving the mass of the farmers, rather than a few thousand of the larger and perhaps more innovative ones. Time will show whether this trend is maintained but it certainly looks to be a well founded trend.

Project Purpose (log frame Section B)

To assist the GOS achieve a higher and self sustaining level of productivity in the agricultural sector and also support the efforts of SO.DE.VA. to diversify and intensify productivity in the West Central region of the Groundnut Basin. The conditions indicating achievement are:

1. Increased groundnut and cereals output per farm. There has been an increase in groundnut plus cereal output. However, without a serious attempt by ONCAD to provide a market for millet in November and December (see Cereals Marketing page 41) it is natural that as cereal yields increase the area planted declines. A major part of this land is diverted to peanuts for which there is a ready market organised by ONCAD.

2. Increased government revenues due to increase in sales of groundnut. Government revenue on peanut exports, through the Caisse de

Perequation is the result of the volume exported and the net margin per ton. In 1975, there was a record crop but a very low world market price, so the government revenue was very low indeed (almost zero). However, the 1976 crop, which was good but not a record, will perhaps produce a margin of 20,000 f/ton, or rather over \$11.6 million for the project region.

One cannot assume that there will automatically be an increase in government revenues from an increase in peanut production without making an assumption on the peanut prices on the world market and whether West African peanuts will continue to be of an acceptable quality.

3. Stabilization of cereals market price as a result of increased cereals output. Unless ONCAD changes its cereal purchasing program there will be no major increase in cereals output, beyond what is needed for subsistence. Real stabilization of cereal prices is probably not feasible^x but a good buying program in surplus areas, redistributing the grain to areas in short supply would reduce the fluctuation in cereals prices. The production of mechanical threshing without an improvement in cereals marketing may in fact reduce the stability of cereals prices.

4. Reduced demand for rice in the rural environment as a substitute for cereals. No observations have been made that would provide an estimate of this "condition". Rice is eaten as a choice for feasts and celebrations and is sometimes eaten for choice during the dry season, when the family or the compound chief does not have the obligation to provide the cereal. Rice costs 80 f/kg about twice the price of threshed millet, but part of this difference is absorbed by the value added in decorticating

(x) If required the reasons can be explained.

and grinding the millet (perhaps 20 f/kg) and perhaps in making couscous which is sold at about the same price as the "small" (broken) rice.

As the income of farmers increases one might expect the per capita rice and wheat consumption to increase. Rice is a superior food compared with millet and both rice and bread are convenience foods, requiring little or no preparation compared with millet.

There will be an attempt by the liaison group to evaluate the sales and purchases of cereals in the 1977/78 farming season. This should indicate when rice is consumed by the rural population and in which direction the consumption is likely to change.

5. Increased in farmers' incomes producing greater self-sufficiency and stability in the rural environment. This assumes that as farmers' incomes rise they become more self-sufficient and more stable. Farmers incomes are largely derived during the rainy season. The division of the income between family members, the sons, the wives and perhaps the daughters, suggests that increase in cereal production accrues to the household head and that the other produce part of peanuts for sale. Thus it is probable that increased family income will lead to increased consumption and to increased dependency on outside trade. It is not clear how the increased income will affect the rural-urban migration (instability) of the sons and daughters in the dry season and even in the rainy season. The intensified package (TBFF) only affects the household head. However, machinery and fertilizer may be available for use on plots of other members of the household. At the moment, the terms of this use are not known (see Intensive Farming Package, page 30 and also Hopkins consultation with SO.DE.VA. November 1976).

6. The purpose includes diversification, which is a part of the SO.DE.VA. program both in terms of crops other than millet and peanuts, out of season crops, and livestock production. Effective diversification is a further condition, which may be estimated by seed inputs distributed or by increase in output of diversifying crops and by increase in output of livestock and livestock products. It requires an assumption that suitable crops can be found and that there is a profitable market for them.

Project Outputs (Log Frame Section C)

1. Recruitment and upgrading of extension personnel by SO.DE.VA. in the project area. This assumes that a higher level of training will improve the performance of extension agents. If the higher level of training tends to change the quality of the recruits, the outcome will be uncertain. The VG (lower level) tended to be middle aged or older men in the village, skilled in farming, and leaders but poor in filling out forms; the EB (higher level) recruits are occasionally VG but more often younger men, with less farming skills, and better at filling out forms.

The original output proposal was found in the 1976 evaluation to have been too high and has been reduced. The reduced output target has been met.

2. Establishment of required SO.DE.VA. infrastructure including training and farm demonstration facilities in project area. See the Engineers' report,

The infrastructure is either well under way or in place (except the 8 centres de Formation Agricole) These lower level staff training centers were not scheduled on the 14/1/75 SO.DE.VA. construction infrastructure

tables. Subsequent de-emphasis of the VG position in the staffing apparently rendered them less necessary. The additional utilization of ZER's for staff training (observed by evaluation team) has been an adequate supplement to the main training center (Pout CETAD) so that there is no projected plan to establish these CFA's. This seems an acceptable modification to the original plan.

3. Setting up of an applied research unit to assure coordination between research and agricultural extension activities. The unit has been set up and is functioning as a means of evaluating the adoption of the themes and their economic effect. If the theme does not have the anticipated effect, the reason is studied. The unit also tests and demonstrates new varieties, new interventions and crop and livestock diversification program (see p.46).

4. It will be necessary to obtain an added output in the form of an improved and steady supply of farm equipment for use with oxen and fertilizer. Current levels seriously reduce the profitability of the themes of ox traction and heavy fertilisation and prevent accomplishing the target figures for farms and area of land intensified (see Input Supply, page 38, and the Intensive Farming Package, page 7).

5. To fulfill the project purpose (B1) which includes diversification, outputs will be required in crop production other than millet and sorghum. The liaison group are actively working on this with (a) success in one village in improving the cultivation of a bas-fond and an ox drawn water supply in two others to permit vegetable production out of season, (b) trying new varieties of manioc, and also maize, sorghum, cowpeas, okra, orange of Guinea, (c) trials of forage crops and (d) trials of finishing sheep and cattle (see page 46).

SO.DE.VA. also distributes seeds of diversifying crops (p46) and has a program of livestock intervention (p.46).

6. If cereal production is to be increased an organised market is required at harvest time offering the official price. SO.DE.VA. purchased over 100 tons of seed millet in the name of ONCAD in 1976/77. SO.DE.VA is interested in negotiating with ONCAD to help to ensure the credit is in place in the cooperatives at the time of cereal harvest and that an orderly market is organised.

V. RESULTS

1. Training Elements

The construction of the project financed building at Pout for re-location of the CETAD (Centre d'Entraînement aux Techniques Agricoles et de Développement) was completed on schedule and the CETAD was transferred from Notto to this new location and became functional at Pout at the end of the first year of the project. The CETAD programs of on-the-job training for SO.DE.VA. staff members in the Cascade system continued throughout the two years without interruption. This contributed substantially to the ability of SO.DE.VA. to upgrade existing staff in and transferred to the project area to launch the project as well as they did after a late start.

At the new location in 1976 a total of 19 short courses varying from 2 days to 2 months were conducted for 233 staff members. This is a typical program year for CETAD and it leaves time for the center staff to carry out the important field follow-up of those trained. As planned, this center serves the entire SO.DE.VA. area, not just the AID project area. In this respect, other donors have also participated in its establishment so it is a multi-lateral effort. The former CETAD location at Pout was rapidly converted to a functioning ZER (Zone d'Entraînement et de Référence) for the Thiès department and has provided a center for periodic training for farmers, EB's and VGs throughout the second year.

One and one-half hectare of land was designated at NDoulo for the ZER in Diourbel department and the warehouse was constructed and equipment delivered. However, this did not start functioning until the second year due to a contractor default. The results of the second year were satisfactory and in addition this ZER is used for on-the-job staff training.

It is questionable whether 1 1/2 ha. is of adequate size for a ZER. The idea of the project establishing CFA's (Centre de Formation Agricole) considered in the PROP was dropped by mutual consent of SO.DE.VA. and RDO. It was considered that existing and planned training facilities along with the use of ZER's would suffice for the term of the project.

Draft cattle training centers were at times considered to be established as more or less permanent facilities. However, since the centers do not need to be elaborate and are best located after it is possible to select a village centrally located among the owners of the animals to be trained, all such centers have been of a temporary nature. That is they are little more than pole stalls made of local wood. They serve very well the needs and some material is salvaged for relocation and reestablishment the following year. A total of 1011 pairs of work cattle were trained in 1975-76. During the evaluation in April 1976, it was agreed that project goals for training work cattle were beyond the ability to supply. 1976-77 goals were reduced to 1971 pairs. A total of 1860 pairs of work cattle were trained at 3 of these centers during the 1976-77 in the project area of which 886 pairs were females, 202 pairs work cattle were trained by farmers themselves outside the training centers.^x

x This trend is one which should be encouraged in the future so that SODEVA may eventually shed this responsibility to the private sector.

New training centers for the 1977/78 campaign are already in operation and were seen by evaluation team.

2. Training Aspects

Participants training planned for the project consisted of two short courses in the U.S. for two Senegalese. One course was TC 104-3

"Agricultural Development and Implementation" and the participant (Agne) is now the Delege of Thiès region, a position in which he effectively uses his training. The other course was intended to train the Trainer in Management but when the course was cancelled, TD 104-4 "Development Skills for Agriculture Managers" was substituted. The participant (Khoundour) is a coordinator at Thiès between Promotion Humaine and SO.DE.VA. activities. This is a useful position to the overall objectives of the project and the PH add-on, however, Khoundour is not able to use his training to any great degree in this position. An understudy should be provided for his present position and in due time he be transferred to a position in which he can more fully utilize his training.

One Super 8 film (Thiebo) was produced during the first year and 4 others are in progress for the second year. This output is less than intended and much emphasis in the third year must go into resolving the problems encountered so that the need for training films can be met. To improve the quality of the films to be made the second year the project supported a contract with a film making specialist. Delays in the office censoring films when copies are returned from overseas processing have been too long. It is possible that processing in the U.S. and diplomatic reimportation of the copies may help rectify this and should be tried. Financing savings could also result.

Considerable effort went into the development and printing of simple educational tracts and these have been useful to project efforts at the village level. ADO has considered with SO.DE.VA. a means to reprint several titles of the CRET technical publications to use in staff training.

However, these are now to be reprinted in Washington and the project has ordered needed supplies of these for SO.DE.VA. use.

The expatriate training specialist, working with SO.DE.VA. staff in audio-visuals, has developed four slide sets on subjects useful at village level as well as staff training. This effort is a start but must be greatly accelerated in the remaining year of the project and during any proposed project prolongation.

Radio programs are difficult for outsiders to evaluate, however, in SO.DE.VA.'s general evaluation (Journée de Synthèse March 22-23, 1977) they ranked educational radio programs at about the same level of progress and effectiveness as the tracts. In this same document slide sets, movies and posters were said to be not very effective as developed and used in the campaign. SO.DE.VA. recognizes the need to concentrate more serious effort on audio-visual production and use.

The question of focusing staffing and training on EB's vs. VGs was, at the start of the project, favoring a concentration on EB's and eliminating VGs, by the processes of upgrading where possible and of normal attrition.

In general this policy has been supportable by the results but new considerations should be brought in to making a definitive decision on this matter for the future.

The VG was typically recruited from the rural area. He had little formal education but could write, though he may not speak good French. He was not very good at filling out forms but he knows farming and farming practices and being usually middle-aged had obtained some

respect in the village. He is paid about 20,000 F/Mo. If he loses his job with SO.DE.VA. an attempt is made to help him become a demonstration farmer. A few VG's have been trained up to the EB level which is a good practice where possible. The EB as a recruit has had more formal education and is younger. He can fill out forms more easily than the VG but he has usually had little experience farming. His youth and inexperience makes it more difficult for him to be well accepted in the village and he may be a long time in establishing the required rapport with farmers. He is paid about 28,000 F/Mo.

A new grade has appeared, an enquêteur, He has had more formal education and is skilled in filling out forms. This is his major role. He is paid about 30-35,000 F/Mo. Each of these grades represents a promotion and it may be necessary for morale to maintain such a possibility and promote some though care should be given to upgrading their skills and abilities in doing so.

Recruitment, which at first was done by an interview followed by a written exam, permitted a careful selection of new recruits. Currently, recruitment, because of the number of applicants, tends to be only by competitive examination. An interview should be added, in spite of any political pressure against it, to ensure that only the best are employed. Once employed it is difficult to discharge anyone for incompetence so a reasonable attempt must be made to weed these out at recruitment time. Alternatively, a probational period might be incorporated into the recruitment system.

Ultimately, as SO.DE.VA. continues to evolve as an extension service and agriculture in general becomes more progressive, agent qualifications and training will have to keep pace. In particular the scope of work of an agent will have to become more general and less specialized than it is now. The luxury of having agents responsible for surveys, agents responsible for livestock, agents responsible for crops, etc., cannot be afforded.

Administrative Elements

(a) Office and Warehouse Space

SO.DE.VA. experienced problems in getting design approvals and in contracting the construction of offices and certain warehouses. Although these problems put construction about 10 months behind schedule and disrupted the original budget for construction, the net affect on the project has been negligible. The completion of this construction was not really a critical factor in the program. SO.DE.VA. delegation and operation office have had no problems maintaining themselves in the rented facilities they have long occupied. In addition, a budget review in June of 1976 resulted in budgetary adjustments which covered the increased costs of the approved designs which had resulted from interim inflation. It is quite evident that no other phase of the project suffered from these upward budget adjustments for construction.

SO.DE.VA. anticipates that all remaining project construction will be completed by the end of June 1977 and all facilities will be occupied a month or so later. A review of this by the REDSO engineer

confirms that this is possible. Phase of the construction which have been completed, accepted by SO.DE.VA. and a REDSO engineer are satisfactory and have been put to the intended use of the project. This constitutes structures at CETAD, MBodiène and 3 warehouses at ZER's.

(b) Technicians

The project was authorized to employ 2 expatriate technicians which the cooperating agency could obtain on contract under Code 935 waiver. As a result a French Ingénieur Agronome with 5 years overseas experience in Africa and Cambodia and a French Training Specialist with 9 years in Africa (6 in Senegal) were contracted by SO.DE.VA. They were on the job within 2 1/2 months after the start of the project. (A 3rd expatriate was used temporarily at the Extension Research Liaison Unit, see CNRA).

The technicians have functioned with complete satisfaction in Thiès where they are officed. However, both have experienced great difficulty in establishing a working relationship with the delegation in Diourbel department. The problem is rooted largely in the Delegeue's contention that his training and experience is equal to that of the expatriates so that they can offer little to the program of his region. The Delegeue is an outstanding person, well in control of his area and respected by the farmers. However, he recognizes that his staff is in need of on-the-job training but feels the project should provide it by means other than these two expatriates.

The expatriate positions are intentionally outside of the normal staffing on the SO.DE.VA. organigram because they are advisory positions and not permanent. They are contracted by SO.DE.VA./Dakar and there may not have been adequate consultations with the two Delegates as to the persons selected and the description of their duties. The first would be difficult to reopen for consultation but the description of duties of the expatriates, the provision of counterparts for them to train and a projected date when the training is completed could be re-examined with the delegates and a way found to resolve the present unsatisfactory situation using, if at all possible, the on board technicians supplemented, if necessary, by other short term specialists.

(c) Finances

The SO.DE.VA. project account is under IBM computer service. The system of advancing funds to a project account, and ADO receiving periodically vouchers of project expenditures on which reimbursements are made to the account is working well. The principal problem has arisen from the fact that when vouchers are submitted they are often as much as 6 months behind the fact and it is difficult for AID management to be as current as it ought to be on project finances.

In addition SO.DE.VA. has done adequate annual reviewing of its project financial picture and from this has made wise and necessary budgetary adjustments. However, the current picture reveals that half of the project funds allocated for SO.DE.VA. spending remains for the 1977-78 year and the future.

This lower than anticipated rate of spending has not seriously affected the overall effectiveness and progress of the project in any identifiable way. Essential spending has taken place and wastage has been kept at a minimum. It does raise the question whether the cooperating agencies are capable of efficiently spending these remaining funds if budgeted for one year and if an expanded program and plan of work commensurate with that budget would remain within the scope of the PROP and ProAg as well as within the physical capability of the cooperating agencies to carry out. (See the recommendations for the third year of the project).

The PH cooperating agency in the 1976 project add-on has only been functional for one year so that a financial review by that agency is due. It is suspected that a similar situation of under-spending of the budget may be revealed by such a review.

The project was audited by AAG/Accra in May and June 1976 and the resulting 5 recommendations made in the report dated August 25, 1976 were cleared by December 8, 1976. Records and financial documentation of CNRA and SO.DE.VA. were acknowledged by the auditors to be adequate. The evaluation team did not look into these matters presuming that AAG/Accra will periodically audit the project on its own schedule.

V-A. EXTENSION AND ADMINISTRATIVE

1. Both cooperating agencies (SO.DE.VA. and CNRA) have underspent their budgets for the first two years of the project. More than half of the project funds allotted to each remain as of March 31, 1977. However, since project goals have been essentially met (after certain adjustments during the first year's evaluation) this is not serious. In no way can it be identified that spending at the rate budgeted would have accelerated progress or achieved more. To have done so would more likely have resulted in waste.

SO.DE.VA. was required by the ProAg to maintain its previous level of spending and staffing in the project area. The evaluation team depended upon the observation of the AAG audit team in June 1976 that this requirement was fulfilled up to that time. A response to an RDO letter dated March 3, 1977 requesting current data must be received before an up-to-date evaluation can be made on GOS salaries and SO.DE.VA. funding to project. However, it was noted in their reports that SO.DE.VA. has dropped below the level of staffing paid by the BN which was set in the ProAg.

The slippage in spending opens up the possibility that current funding (along with \$457,000 reserve in the PROP) can finance continuation of project activity even with some phased expansion into new department(s), through 1977-78 and 1978-79. This possibility was introduced briefly to each cooperating agency to prevent them from feeling that there must be a cash program to finish using existing project funds in the 1977-78 campaign. This can provide a transitional year should new project funding be authorized for project prolongation and expansion.

2. Staffing of SO.DE.VA. as of March 31, 1977 is very near the level set as a revised project goal during the 1975-76 evaluation. BN is paying a few less than was agreed in the ProAg and the project a few more than was set. No significant increases are under consideration. Those which might be entertained by RDO if and when they are officially proposed should be (a) replacements where needed should either CNRA or SO.DE.VA. staff be transferred into other departments of Thiès and Diourbel regions for the expresse purpose of gathering data to evaluate the need for eventual project expansion into one or more of these departments and to sensitize the rural people to be receptive to the project program if introduced; (b) staff additions to assure Senegalese counterparts to be trained by expatriate specialists during their remaining service to the project; (c) an understudy for Khoundour

In general, however, a limit should be set and observed to project paid staffing and operating costs from which there can be a progressive reduction to zero and full absorption by the BN at the end of any prolongation of the project.

Supporting payment of staff salaries and operating costs has been an important part of the project. Project goals are reachable only if people are functioning in the field bringing the program to farmers. In any new project, tapering off of support to Senegalese staff salaries and operating costs will be an important element.

3. Construction phase of the project met certain difficulties but momentum was recovered. Delays were not critical and all phases should be completed and the units in use before the end of the third year of the

project. Construction at Pout permitted a relocation of the CETAD from the former site at Notto. This resolved certain problems of the old site and was accomplished without interruption of the training program. Other warehouses at MBodiène, NDoulo, NDindy have been in use for some time and those at Notto, Baba Garage and NDindy are ready for use in the third campaign. Office structures have suffered the major delay but SO.DE.VA. rented facilities continued to be available and completion of the remaining structures highly probable in June 1977.

4. Planned participant training was achieved. One of the two participants is in a position to use his training effectively. The other is for the present shunted off to a position useful to the project but not an especially good one for using his training.

5. Efforts in producing and using audio-visuals have lagged and thus have limited to some extent reaching of the full potential of some training programs. This must be accelerated and expanded in the future.

6. The most serious situation is with the utilization of the two expatriates technical services staff. Relationships between them and the Delege at Diourbel have prevented them being fully effective in Bambej and Diourbel departments. They have, however, adequately fulfilled their functions in Thiès department. The situation is known at the Direction level in Dakar but traditional tendencies to permit Delegations certain autonomies has limited the initiative and effectiveness of attempts to resolve it from Dakar. Obviously, outside technical assistance should not be terminated until Senegalese are adequately trained to carry on. Therefore, efforts to resolve this situation must include naming and training the Senegalese while the expatriates are on board with the project.

The Production Intensification Program

The intensification program consists of a series of themes which have an interactive effect on the crop yield. The basis is:

- clearing the land of stumps,
- marking out fields of 1 ha. (to assure better control of fertilizer and manure application rates and to improve accuracy in yield measuring),
- plowing down 400 kg. of phosphate and organic matter applying manure,
- putting the field into a millet,
- peanut rotation,
- use of improved millet seed,
- planting millet by hand in hills before the rain,
- thinning between 10 and 25 days after emergence,
- applying 100 kg. of 10-21-21 at time of thinning,
- apply 50 kg. of urea,
- hoe/weed at least 2 and better 3 times mechanically,
- use of selected peanut seed,
- plant the peanuts as near as possible on the days of the first useful rain, use a pair of oxen with 3 seeder units and a double hitch. The ground should have been harrowed and have been plowed the previous year,
- apply 150 kg. of peanut fertilizer 8-18-27,
- hoe/weed 4 times, including at least one handweeding.

From the outset, because of its complexity, high rate of inputs, and its philosophy, this has been a difficult package to get adopted. Farmers do not like to remove the stumps because they use the leaves for cattle feed and the twigs to make grain storages. It is hard work and takes a lot of

time. If the field is not the farmer's property he will not clear it for the owner. The problem of the supply of plows and of getting the plowing done, preferably towards the end of the rainy season, retards adoption.

Farmers like to sow millet in rows using the mechanical seeder, rather than in hills, which have to be marked out by hand. Should they quit intensification (particularly plowing) this land is more susceptible to environ. Thinning, pulling out and throwing away good plants, is hard for the farmer to do.

The supply of the fertilizer mixtures and especially of urea is inadequate for present needs.

It is hard work to get the required number of cultivation completed and well done. The package requires a peanut-millet rotation and it is the millet that responds most spectacularly, but millet is harder to sell for a good price and less profitable than peanuts.

At best, a farmer may have 1/4 of his farm in "intensive" cultivation using as many of the themes as he can manage in his work calendar and in his input supply. Other members of the household will use different levels of technology.

Problems in reaching the target have been (a) psychological

on the part of the farmer, (b) failure to deliver inputs of fertilizer and machinery, (c) farmer's difficulties in scheduling the work, (d) yields less than anticipated probably due to use of an incomplete set of themes.

SODEVA has backed off from the major emphasis on this theme both in the AID project area and in the Sine-Saloum in favor of emphasis on a program of themes more useful to the mass of the farmers. SODEVA, partly due to the Hopkins consultation on evaluation (see bibliography), is trying

to rethink the classification of farmers, bearing in mind that no compounds have an all TB or TBFF agriculture. Because of the shortage of inputs in Diourbel TBFF farmers do not have to use the complete set of themes. So full adoption is impossible to estimate.

The increase in fertilizer price (except for urea) without an increase in product price is also a serious disincentive to adoption of heavy fertilization. At current prices it is theoretically still profitable. The Liaison Unit has instituted a research and demonstration program on the execution of the package in the three study villages. Results in only one of the three came up to expectation in the first year. This is expected to lead to identification of the causes of failure to obtain the expected yield and to demonstrate the steps to take to go from oxen traction to TBFF.

The importance of the theme in the long run is that with little additional land available in the region, it will require intensification to enable farmers to increase their productivity and so their income and also intensification will be necessary to support the growth in population. The level of fertilizer recommended are those required to replace the minerals removed by the grains and the straw, assuming the straw is removed for cattle feeding and manure is used elsewhere. However, to obtain the expected increase in yield it is necessary to plow, to turn under organic matter, to apply the phosphate and to use the recommended amounts of fertilizer. Partial adoption will not usually give the expected returns.

The Intermediate Program (TB)

The intermediate program has been regarded as an intermediate step to the intensive program. It requires the farmer to use bovine (cow or ox) traction with appropriate machinery - plow, tool framee, multiple hitch for seeders, etc. It encourages plowing during the latter part of the rainy season and the use of all the TBFF themes except land clearing, marking out of the fields, application of the 400 kg/ha of phosphate, and application of urea.

The major problem with the adoption of the TB themes has been an inability to supply and to get adopted the ox drawn equipment. Farmers have used the oxen to replace horses, using the horse drawn equipment but going at a slower pace. Farmers have profited by selling their oxen finished at a good time of year and the liaison group has shown that farmers with oxen do not get higher yields or incomes from crops per hectare and per worker than farmers using horses. The substitution of cows from oxen has

changed the resale situation, and now farmers are starting small herds of cattle. This situation rekindles the old argument on whether oxen are superior to horses on Senegalese farms. Tradition prevents the use of two mares working together and also prevents castrating the stallions; two stallions working together are hard to control.

It is not clear that there is a profitable intermediate phase between horse drawn equipment with intermediate level of fertilization and ox drawn equipment, with the limited amount of plowing that is done, and the same level of fertilization. It is the plowing, preferably incorporating organic matter, that should increase the response to fertilizer.

As with the intensified system, all of the farming done by component members is not at a homogenous level of technology.

This theme is important as a transition between the average level of production practices and the intensified system. The intermediate level of fertilizer is significant because it represents the amount of fertilizer that has to be added to replace the minerals removed by the grains (millet and peanuts) removed. Anything less will lead to a gradual depletion of the soil phosphate and potash.

The Light Theme Package (II)

The Light theme package can be divided up by the use or the absence of animal traction and by the use of fertilizer. In effect there can be:

$T_0 F_0$ no traction, no fertilizer

$T_0 F_1$ no traction, with intermediate fertilizer use

$T_1 F_0$ horse and/or donkey traction without fertilizer

$T_1 F_1$ horse and/or donkey traction with intermediate fertilizer use.

The majority of the farmers (70% or more) have some form of traction and use some fertilizer.

Extension to these farmers includes the promotion of better seed bed preparation, sowing millet in hills and thinning it at the right time, using enough cultivation to adequately control the weeds, planting peanuts mechanically immediately after the first useful rain, using the correct stand of peanuts, use of moderate amounts of mixed fertilizer (to replace the minerals removed by the crop sold).

There are not even estimates of yields of these farmers except from the work of the liaison group. This shows that their fertilizer use, yields, and incomes from crops per hectare and per worker are the same as for farmers using oxen. Considering that the oxen are used just to replace horses with little replacement of the machinery used, this is not surprising.

This group of farmers is responsible for the major part of the production and for the major part of the increase in production.

	<u>1975</u>	<u>1976</u>
	Target Realized	Target Realized

Area of peanuts
Production of peanuts
Area of millet
Production of millet
Fertilizer used.

The inputs for the TL program are in better supply than for the TB and TBFF.

In the long run the fertilizer application rates will need to be increased to cover the mineral depletion by the removal of the grains from the field.

VI. COMMODITY PROCUREMENT

Although SO.DE.VA. required some time to get geared up for launching the commodity procurement phase of the project, it has moved along well since. With the exception of some demonstration equipment and office furniture, planned procurement has been essentially completed.

Specifically the larger items bought are 1 flatbed truck, 2 tractors two millet threshers, 2 plows, 2 trailers, one disc, one pump, the veterinary equipment, one corn sheller, one millet grinder and one millet decorticator. Considerable animal draft equipment was bought for use at the ZER's and MBodiène but these are mixed in the records with Location-Vente items at present and until that phase is properly sorted out, and an inventory made of demonstration equipment which is for SO.DE.VA., a listing of these would be impossible. SO.DE.VA. has been instructed to sort these out in the accounting records.

Demonstration granaries built by the project are in use. The evaluation team saw two of these and the millet keeps well in them.

Due to the season of the evaluation only the millet thresher with tractor and trailer and the decorticator and grinder were observed. Land which had been plowed by the tractor plows and by oxen drawn plows was seen, however, one ox drawn demonstration plow was seen in use. The general conclusion of the team without an item by item check was that equipment is being effectively used in the project. The millet thresher demonstration has had a real impact on the farmers. Should the charge being made for mechanical threshing of millet prove to be adequate to cover the cost of the operation as well as to amortize the equipment then it will prove cheaper than the hand method. (See other discussions on Post harvest in the evaluation).

Some additional demonstration equipment can be procured for the project as the budget review indicates funds would be available over the next two years. ADO and the cooperating Agencies will have to work out specific items to be added each year. There should be some caution not to include too much demonstration equipment so that SO.DE.VA. becomes a service beyond the demonstration function.

VII. SUPPLY AND INPUTS

(Aside from Project Commodities)

The extension program is in a large part based upon purchased inputs, which are ordered by the farmers through the local cooperatives. It is the responsibility of ONCAD to consolidate the orders and to deal with the manufacturers or importers. This applies to mechanical hoes, seeders, peanut lifter, plows, polycultivators, carts, phosphate, mixed fertilizer, urea, chemicals and seeds. ONCAD is also responsible to the BNDS for the credit. Work oxen are not supplied through ONCAD.

The performance should be judged by two criteria: the fraction of the order delivered and the timeliness of the delivery.

The inadequacy of this situation, particularly with regard to plows and polycultivators, carts, and urea are so great that they render SO.DE.VA. incapable of promoting several of the regular themes of the project:

Agronomic intensification with seeds of new varieties, plowing, manure management, forage conservation (both requiring carts) and nitrogen fertilizer (urea) on cereals.

Farmers try two or three times to get the equipment through the cooperatives and then give up in disgust and are discouraged. In this way the extension agents lose credibility when the themes cannot be followed.

There are annual meetings between the senior staff of ONCAD and SO.DE.VA. but the situation has remained more or less unchanged. Added to this are the problems of credit delivery to the cooperatives by ONCAD.

	DIOURBEL			THIES			TOTAL		
	Ordered	Delivered	%	Ordered	Delivered	%	Ordered	Delivered	%
Fertilizer									
Millet mixture t.									
1974/75	3655	3793	103	7017	5887	84	10672	9686	91
1975/76	7702	7758	100	9667	8156	84	17369	15914	92
1976/77									
Peanut mixture t.									
1974/75	5805	6341	109	4644	4188	90	10449	10529	101
1975/76	14429	7071	49	8333	8111	97	22762	15182	67
Phosphate									
1974/75	-	-		-	-		-	-	
1975/76		306			461			767	
Urea t.									
1974/75		10.5			0			10.5	
1975/76		42			3			45	
Light Equipment									
Seeder									
1974	1592	1291	82	3376	3133	92	4968	4424	89
	6461	6582	102	6138	5497	89	12599	12079	96
Peanut Lifters									
Heavy Equipment									
Plows									
	8	0		12	3		20	3	15
				7	6		7	6	86
Ariana poly-cultivator									
	6	3	50	15	8	53	21	11	52
				12	14	117	12	14	117
Horse carts									
	775	385	49	1717	19	1.1	2492	404	16
	4841	47	0.9	5341	570	10.6	10182	617	6
Ox carts									
	941	0		147	0		1088	0	0
				379	0		379	0	0

SO.DE.VA. has recently proposed^x that ONCAD equipment and supplies be provided to SO.DE.VA. storages (in each arrondissement) on consignment for purchase by those prepared to pay cash. The supply should be in place before the peanut marketing campaign for farmers who wish to convert some of their peanut earnings into inputs right away. This is especially common after a good peanut year.

SO.DE.VA. also proposes that they and other extension societies be permitted to place orders directly with the machinery manufacturer SISCOMA. The orders would be based upon the General Assembly of the Cooperatives. This system has been accepted for the supply of work oxen.

(x) SO.DE.VA., Dakar, Journées de Synthèses, CETAD, Pout, 22-23 March 1977 p.8 para.241 a & b.

VII. POST HARVEST TREATMENT OF CEREALS

A. Grain Storage

The grain storages originally proposed were of the the Carera type, a concrete cylindrical silo. However, before the project got started the design recommended by CNRA (Bambey) was changed to a rectangular bin-type storage with 4 bins in a small shed. This was developed by Dr. G. Yaciuk of CIDR.

It was also found that although the losses were not great in the traditional storage on the year, losses in the bins, if correctly treated, were almost zero. However, the traditional system does not require threshing before storage. There seems to be a problem in expecting the women to thresh a bin holding 30 m³ full of grain.

The new bin is really designed to go with the new mechanical thresher. Indeed with the thresher a substantial storage is needed either for sacks or for bulk grain. As the threshers become more widely used so will the storage bins.

There are currently 2 sets of 4 bins in each of the three study villages, about 60 m³ of storage in each village. A test bin was also built by the project at MBodiène. This compares with the target of no Carera silos for 1976/77. However, the Carera silo is now obsolete. This item is out of phase; it is important to demonstrate the new storages along with millet threshing and this is being done successfully at the expense of reaching the original grain storage goal. There seems to be the need to have a single bin in a compound and not to have a group of 4 bins in a separate structure which has to be paid for. The relationship between the size of the family and the size of the bin needs to be worked out.

The whole situation of post-harvest mechanisation is under study in 1977/78 by both the Liaison Group and Mr. Lalonde (CIDR). So far 1978/79 there should be more information as a basis for retargeting this intervention.

B. Post Harvest Mechanisation

(1) Since the design of the project SO.DE.VA. proposed to test and demonstrate the SISCOMA millet thresher, which is based on a CNRA design. Early in 1977, a second thresher using the same principles, was introduced by the French AFCO. There are no other threshers designed for millet known to be on the market. In India, the country with the largest production of millet, the threshing is believed to be done by hand.

Two threshers with tractors are being used on a custom basis charging 6 f/kg. The estimated annual output is about 600 tons. This seems to be attractive to the head of the household, who produces most of the millet and has to pay about 10% of the grain threshed (worth about 4 1/2 f/kg) (or 5-6 f. to a woman^x other than his family). The women of the family seem to be reluctant to thresh large amounts of millet for sale even at this price. It is certainly very tedious and a woman threshes about 20 kg a day using a mortar.

Use of the thresher at harvest time further reduces the cost by avoiding putting the grain on the ears into storage and taking it out.

The farmers in the region are very interested in buying threshers and one village has already contracted to buy an AFCO machine if it is found to work satisfactorily. However, it is not known just how this is being organised. In a group of 20 families each putting in 25,000 CFA to raise

(x)certain women do this work as a means of augmenting their income.

the half million down or is it being done predominantly by one clan, with a few families playing the major role.

The Liaison Group and Mr. Lalonde (CIRD) both at CNRA, Bambe, are to study the economics of the thresher, its true costs for threshing, the costs and requirements of storage and so on (Liaison Group p.55). So in a year's time there will be more information available.

The tractors purchased to drive the threshers and to move them around are being equipped with plows and the délégués, particularly Mr. Kane, are interested in doing full plowing on a custom basis before the millet is ready to thresh.

This also needs to be observed especially since the real cost may be up to twice what is being charged.

(2) Mechanical decortication and milling is also of interest to the villagers. These tasks are normally done by the women and are considered to be part of the work of preparing the meals and they are not paid. Suitable machinery is being demonstrated and will be on trial in at least one of the villages. The costs and the social effects will be studied in 1977/78 (Liaison Group p.55 ,

There is no doubt of the technical feasibility of the process. Some women have carried decorticated grain to the town in order to avoid grinding it in a mortar. However, the question that arises is how is the custom work to be paid for. It may, in the short term, pay the farmer to pay 6 f/kg to get grain threshed, because he has to pay for it anyway; the effect of paying the wife on the family's welfare is not known. It is the women's duty to do the grinding of the grain or to pay for it to be done. This is a quite different situation.

The average household is expected to use 200 kg of grain per head residing in the compound year round. About half of these are equivalent to 1 worker (i.e. woman = 0.5 man equivalent = 0.2 child, etc.) . The cost of custom threshing, decorticating and milling is about 26 f/kg. This could absorb 20% of the net value of production of the household. There are several ways in which income could be increased by 20% in order to meet this cost. It particularly involves a different use of the women's labor saved in such activities as feeding small ruminants (the profit on Tabaski rams might equal the custom costs for a family), raising poultry, or doing dry season irrigated vegetable production. All of these income diversifying activities are being studied in the program of the Liaison Group (p.55).

(a) Crop Diversification

Diversification reduces the current almost complete reliance on peanuts as a cash crop. Livestock have served in the past as a form of investment but not much as a source of income; they could be sold to realise cash in time of adversity. Diversification should not only broaden the income base but also provide an opportunity for the profitable use of out of season labor. Four types of diversification are being tried: additional food crops, forage crops, dry season irrigated vegetable production (already practiced near major towns such as Thiès and Diourbel), and finishing of cattle and sheep (also known in the area).

(1) Crop diversification includes sorghum (variety CE90), maize (JOS and BDS) , okra (P12), bissap (guinea osage) which used to be a cash and export crop, cowpeas, and manioc.

Results from the Liaison Group (page 55) with sorghum are erratic and new varieties will be sought. Maize is successful, particularly since the ears are sold for roasting at 5-25 f. each and then what is left is stored as grain. Okra, which is normally only grown around the edge of plots, has been grown successfully in solid stand; however, the market price is volatile and may vary from over 100 f/kg to 35 f within a month. It can be dried and kept for domestic use or sale at a later time. Bissap, grows well but the market is now limited to Ramadan when it is used in a drink; the export seems to have stopped. Manioc is a traditional crop in the region and the innovation consists in using new varieties, plowing and fertilizing, yields of about 8 tons/ha are obtained. Part of the labor is outside the cropping season and it does not conflict with labor for other crops. Cowpeas are traditional but their production mixed with millet has been discouraged. Now the CNRA, after discussions with ICRISAT is interested in studying the association of cowpeas and millet.

Sorghum, maize, cowpeas and manioc have also been part of the diversification program of SO.DE.VA. and seed has been supplied (cuttings in the case of manioc).

Area Planted in Diversifying Food Crops
(hectares)

	1974	1975		1976		1977
		Target	Realized	Target	Realized	
Sorghum	8	56	55	146	32.25	
Cowpeas (niébé)					27.5	216
Manioc			1.6		7.5	
Other					85	

The progress in diversification according to the data seems to be relatively slow. However, these data are believed only to include TBFF farmers. There is a significant percentage^x of the land that appears to be cropped but is in neither peanuts nor millet and is presumed to be in other crops. There is also an unknown amount of mixed cropping (association). This ranges from transplanting the millet thinnings in the peanuts to sowing cowpeas in the millet fields.

There might be some new crops that could be introduced. Davis recommends trying *Curcubita foetidissima*, a perennial that grows wild in the desert of Mexico and SW USA reportedly producing 2.5 tons/ha of seeds which contains 30-35% protein and 34% oil; the enormous roots may also be eaten as a starchy food. Davis suggest this might be useful in Tivaouane. The IITA/CIAT/CIDR manioc program might have some useful semi-arid region manioes. In Upper Volta under somewhat similar conditions farmers are rapidly adopting soybean production spontaneously. Davis recommends also trying *Simmondsia chinensis* (the Jojoba shrub) which grown in SW Mexico and SW USA in desert temperatures and with under 200 mm rainfall, partly as a windbreak but also as a producer of a liquid wax (50% of the weight of the beans) which may soon become commercially marketable as a replacement of sperm oil. This Davis suggests might be suitable for Tivaouane.

To date there have been no data published by the Liaison Group which give more than an idea of the possibilities of increased income from

(x) Bamby operation about 1% according to the SO.DE.VA. Bureau.

diversification. The modelling process which has been started should be expanded to indicate the potential increases in income from different crops, in order to see which crops fit best into the calendar of work for millet and peanut production. This is also raised in the matter of the women's use of time saved by mechanisation of post harvest processes and perhaps also by oxen drawing water.

(b) Livestock (not directly included in the original project)

Livestock have traditionally been kept as a "bank account", a means of investing disposable income in a profitable way. Finishing of sheep (often for Tabaski) and of cattle was traditional. The manure produced in the compound was used on the land and the livestock were fed on the by-products of the crops, peanut vines, peanut cake from artisanal expressing of the peanut oil, millet straw, and millet bran.

The project has through veterinary assistants seconded to SO.DE.VA. greatly improved the care of the animals kept in the villages, which is a basis for development of livestock production. However, better coordination is needed with the area veterinary service to maintain a sanitary cordon by treatment of all ruminants in the region, not only against rinderpest and CBPP but also against the other contagious diseases. The veterinary service will not permit staff seconded to SO.DE.VA. to treat the herds of the agro-pasteurs (farmers with cattle herds); a better arrangement is needed on this.

The project has also built a few manure stables, a lot of cattle shades and some manure ditches.

Table Ruminant Feeding

	<u>1974</u>		<u>1975</u>		<u>1976</u>	
	Target	Realized	T	R	T	R
<u>Number of farmers</u>						
TBFF		50		98	193	146
TB		100		181	382	227
TL		<u>500</u>		<u>915</u>	<u>1440</u>	<u>197</u>
		650		1194	2015	570
<u>Number of Animals</u>						
TBFF		850		1399	2296	173
TB		675		1253	1698	259
TL		<u>1525</u>		<u>1000</u>	<u>3994</u>	<u>230</u>
				3652		662
Total (sheep)		750		1773	4230	
<u>Construction</u>						
Stables		14		5	12	165
Shades		484		512	2182	307

This greater numbers of animals fed in 1975 and 1976 represents more disposable income from good peanut crops and not just the effect of the project.

It is clear that since 1974 the profits in cattle finishing have been unusually high because, added to the normal dry season increase in prices (enabling the farmer to sell at a higher price than he paid for the animal), there has been a general upward trend in cattle prices. Cattle prices are now expected to remain fairly stable but if the

Mauritanians resume exports on the former scale or if the Malians deflect a substantial number of cattle from the Ivorian to the Senegalese markets, the price of cattle could fall.

The economics of cattle and sheep feeding is being studied by the Liaison Group. In 1977-78 more definitive studies will be made. This should provide a guide for SO.DE.VA. in this area of program.

Much of the cattle feeding in the past has been done by farmers feeding out and selling work oxen, after only a short period of use, these were often bought on credit. The use of work oxen was marginally profitable in crop production (see Liaison Group, page 55, and Hopkins dissertation) but farmers obtained their profit from cattle finishing. SO.DE.VA. responded to this by the introduction of heifers for work to the extent in 1976 of 30% of all work cattle supplied. Cows do not have the draft power of a well fed pair of oxen, but under the circumstances in which most of the draft cattle are being used, can do just as well as a pair of oxen.

In the time the cows, which are less likely to be "turned-over" and sold than work oxen, will of course produce more work oxen and cows.

The real integration of livestock and farming requires:

- veterinary service delivery,
- supply of inputs such as drugs, salt-mineral, mixes and concentrate feeds,
- better conservation of peanut vines and millet straw and their more efficient use,
- production of crops (either forages or combined forage (grain, eg. cowpeas) to provide more and better forage which must be well conserved,

- good management of the livestock,
- conservation of the manure and if possible the urine for use on the land,
- credit available for the purchase, at least initially of the feeders.

SO.DE.VA. is attempting to introduce these elements in the program with mixed success. In view of the potential importance of the livestock element as a factor in diversifying and increasing farm income, an "Ingénieur de Conception" in livestock is needed to give guidance to the ITE's in the delegations. Such a man could probably serve the whole organisation and not just Thiès and Diourbel. There is already an expatriate livestock technician in the Sine-Saloum who could train a Senegalese in this role.

Meanwhile, further development is needed of the technical packages particularly in forage production and conservation (including perhaps seeing if the spineless cactus grown at MBodiène is effective as feed for milk production in other parts of the project area). The work in forage harvesting and conservation must be fitted into the working calendar in a way that conflicts less with food crop and peanut production. The economics need to be better understood and incorporated in the package. The credit funds available in the project do not appear to be fully used and could greatly help the feeding program.

In the case of small ruminants, demonstrations of improved management practices and their economic benefits are needed to encourage farmers to change from the "no management, gathering system" to a real production activity.

The poultry program seems to be at a rather low level, and with prices of poultry meat could undoubtedly be stimulated. Pig production, observed in the MBodiène and Bambey areas, is handicapped by, what is believed to be African Swine Fever (peste porcine africaine) and technical assistance should be sought to overcome this.

IX. LOCATION-VENTE AND CREDIT FOR STORAGE OF GRAIN
AND FOR WORK ANIMALS

The phase of the program, wherein certain equipment is bought, demonstrated (sometimes on a rental basis), and sold to a farmer when he is convinced it will serve his needs, was started in the first year. This was a revolving type of fund which had an original budget of \$13,000. Although undoubtedly useful in the operation of the extension program, there has not been adequate reporting to ADO on this phase. This could be because SO.DE.VA. accounting has not accurately reflected the actions taken in this phase and all items bought for this purpose were apparently reported under demonstration equipment. The current financial status report under demonstration equipment. The current financial status report (March 31, 1977) shows no activity, that is no expenditures, no rental income and no sale returns against that line item in the budget.

ADO/Dakar has asked for a complete report on this phase in a letter dated February 1, 1977. The evaluation team was told that this report is being prepared but was not available for the team.

The revolving credit fund was not used during the first year. In March 1976 ADO/Dakar responded favorably to a SO.DE.VA. proposal to enlarge this fund (originally 3,081,000 CFA) adding 8,000,000 CFA when the budget was reviewed in June 1976. Part of the proposal approved was to extend credit also to farmers to buy work animals and equipment.

In October 1976, ADO/Dakar agreed to a SO.DE.VA. proposal also to launch the grain storage credit. To date no reports have been provided to ADO on either of these credit program. Though it is said that credit has been extended, a hurried review of the accounting during the evaluation

shows no entries against this credit line in the account but entries were made for work animals believed to have been bought and loaned against the demonstration account. Obviously this too must be carefully reviewed by SO.DE.VA. controller and the adjustments made before anyone can determine the exact situation with regard to credit. (See recommendation for third year of project).

X. FORESTRY

Assisting farmers to produce, or obtain from nurseries, seedling trees of varieties adapted to the project area has been a useful though not originally emphasized phase of the Cereal Project. These trees will in the future contribute to wind erosion control, to crop protection and to compound shade for people and livestock. Neem is the most popular variety followed by eucalyptus. In 1975-76, 20 760 neems, 2 980 eucalyptus and 1 570 other species were planted in the project area. Acacia albida is not grown in nurseries but farmers are assisted to protect seedlings coming up naturally to assure that they will survive. 4,045 seedlings of this species were protected. Although statistics for 1976-77 are not yet compiled, this program is so well accepted by farmers that it is fully expected, these statistics will be exceeded when the new statistics are reported.

With such an endeavor, the number of seedlings planted or protected is one thing. How many survive to 2 or 3 years is the more important thing. Therefore, starting in 1977-78 SODEVA should begin to report this as well to give the true value of this phase of the project. Should it be possible to identify costs specifically for this phase, then a cost per tree surviving to 3rd year would be valuable to the proper evaluation of this phase.

XI. THE CELLULE DE LIAISON

The ProAg calls for the project "to accomplish an effective tie between research (CNRA) and extension (SO.DE.VA.) through the establishment of a liaison group so as to assure two-way flow of information between the two services and the farmers".

The PROP calls for the liaison unit being responsible for the "preparation of documents and brochures in a form consistent with research results and usable by the extension service. The liaison unit would also be charged with the conduct of applied research trials throughout the project area and for socio-economic surveys to measure the effects realized by the project at the farm level".

The liaison unit has been lead first by Mr. Ramond (an expatriate) and then by Mr. Fall, a Senegalese trained in agricultural economics in Belgium. Although the employment of Mr. Ramond exceeded the PROP provision for 2 expatriates, he was an excellent choice to launch this phase of the program having had long experience in Africa in both extension and research activities. Furthermore, Mr. Fall was the best choice of a Senegalese to head this unit so the wait for him to complete his studies in Belgium was justified. The unit has 2 Ingenieurs de travaux agricoles (from the Bambey School) plus the field personnel. Some students from the Bambey school do a "stage" in the liaison unit, doing a piece of field research in the Terroir villages.

The work of the liaison unit has been

- to describe the demographic situation in the 3 villages which were selected for study, one in each department.
- to inventory the farm machinery and equipment in the three villages and to relate this to the area cultivated.

- to select a sample of 25 compounds for deeper study
 - . of farm operation by the different family members,
 - . of the farm practices used by the different family members,
 - . of the output of the fields in relation to the farm practices used and the family member involved,
 - . of the economic of farming in the 25 compounds.
- to survey the farm animals kept by the families in the 3 villages,
- to conduct trials of new varieties, farming practices and other innovations,
- to propose and elaborate more intensive systems of production - presumably with the idea that these might be more profitable.

To accomplish this the liaison group has done the following types of work:

1. Applied agronomic research using small and large plot techniques,
2. Trials of new crops to diversify the farming,
3. Irrigated vegetable crop production studies,
4. Grain storage ,
5. Livestock production studies,
6. Socio-demographic studies , and
7. Economic studie

The experiments have included:

1. Peanuts 3 varieties (2 per site) X date of planting (5 in 1975 and 2 in 1976). X fungicides for seed treatment in 1976.

The new variety, 73-33, proved to be superior, Early planting, immediately after the first rain, as was expected was superior. The new fungicide was more effective on the old variety, 57-422, but not on the new, 73-33.

This trial seems to have been well conducted. One site in 1975 failed due to poor germination and rat damage.

This experiment could lead to multiplying and using the new peanut variety in the project area during the prolongation period of the project. It demonstrates to farmers the value of early planting. It might lead to supplying the improved fungicide if or until a new variety is widely adopted. The results have been handed to SO.DE.VA. but ONCAD is involved in the supply of peanut seed and of fungicides. Therefore, a coordinating agreement should be worked out between these services, if the new inputs are to be used.

2. Preplant herbicide on peanuts. 2 herbicide treatments (trifluralin spray and dinitramine granules) plus control in 1975. In 1976 the plots were on farmers land (1/2 or 1 ha.) with Trifluralin and Stomp as the herbicides, and granules vs low volume spray vs ultra low volume spray. In the first year, the liquid gave good control and the granules, due to uneven spreading, were on average not so good. There was an attempt to measure the time saved as well as the yield increase.

In the second year, the on-farm trials gave less uniform results and some of the plots are not accounted for in the report. There was no significant difference in the mode of application. The two herbicides were not used in the same village and so cannot be compared.

The cost of the material is 5000 f/ha, with an equipment use cost of 1,400 f/ha, and an operating cost estimates at 1,000 f/ha. The returns come from two sources: (1) an increase in yield, which is not always of more value than the cost of the herbicide; in one village in 1976, of 16 plots 57% produced enough more to pay for the cost of applications. (2) There is an important benefit from using a treatment applied before the rainy season to save a weeding which normally comes at a time of peak activity. Some attempts have been made to measure the time saved. However, with only a small part of the crop treated, it is hard to estimate what added production could or should come from the time saved in hand or mechanical weeding.

Herbicides are now being used in pre-extension trials in the Thiès department and have been offered on a trial basis, to the Délégué at Diourbel; however, he considers that his farmers are not ready for herbicides . There is widespread farmer interest in the use of herbicides, (but the pace of introduction and promotion of its use may be best controlled by those who know and understand the farmers best.)

A third experiment is a study of the AF or FP themes on the yield of the improved Souna III millet. The themes include:

- clearing the land of stumps
- plowing , preferably at the end of the rainy season
- apply 400 kg of tricalcium phosphate (available free under certain circumstances)
- hand sow in hills and thin to 3 plants per hill within 10-25 day of emergence.

- apply 150 kg of 10-21-21 at time of thinning and later 2 applications of urea, 50 kg each.
- after harvest plow down the stalks.

With some exceptions, the results of this group of themes, gave substantial increases in yield. Four large plots in one village averaging over 2 tons/ha., nearly double the yield of the controls. However, in the two other villages the differences were not of the same order - in some cases the increases being of the order of only 33%.

There remain many problems to be solved in the application of this package of themes but the experiment has high-lighted some of them:

Farmers do not like to remove all the shrubs from the land, because they need the shrubs for the cattle to feed on the leaves when there is no other browse, and the twigs are used to make traditional millet storage bins. Clearing also is heavy work and unless one "owns" the plot of land one is not inclined to do it for the benefit of another.

If improved practices are not maintained, the cleared land becomes susceptible to wind erosion in the dry season.

The farmers generally do not have plows to use with the oxen. Plows have been difficult to buy, due to certain bottlenecks in the supply system of ONCAD. Plowing also takes a heavy pair of oxen and needs care and hard work to do it deep enough. Attempts to promote "fall" plowing before the land becomes too dry have met with little success because of the conflict with the labor for harvesting peanuts. After the millet crop, only very little plowing was done before the soil dried out. After it is dry, plowing is possible but much more difficult.

Farmers prefer to plant the millet in rows with a mechanical seeder, rather than by hand in hills.

Farmers buy the fertilizer on credit and repay it when peanuts are sold. Fertilizer has gone up in price in each of the last three years from 12 f/kg in 1974, to 16 f in 1975, 20 f in 1976 and 25 f in 1977. In 1975 there was a record peanut crop and farmers did not feel the increase in fertilizer price as a decline in their cash receipts for peanuts. In 1976, the cash from the average peanut crop, after paying for fertilizer at 20 f., was noticeably smaller. The result is that in 1977 fertilizer orders are being cut and this can result in lower millet yields in 1977 even with normal rainfall.

Even with a substantial increase in yield demonstrated as possible from the application of a package of improved practices, millet does not provide the net income per hectare or per worker that can be obtained from growing peanuts. This is true for the present. Fixed prices of 35 CFA for millet and 41.5 CFA/kg for peanuts.

This experiment is thus very important in showing both the elements of the package needed to intensify production and yield, and the problems that farmers face in trying to adopt the package. The economics of this package for intensification (i.e. the original TBFF) will also be important to establish in the project area.

The second type of activity of the liaison group is testing of new crops to diversify the cropping and thereby increase farmer income. These crops have included:

Sorghum CE90 and 74-2

Bissap (*Hibiscus sabdariffa*)

Maize BDS and in 1977 JDS

Manioc, traditional, M53-250 and M65-1

Okra P12

Niébé forage 58-74 and 66-35

Millet forage

Pennisetum pedicellatum

The sorghum has not done very well although there have been a few (one?) case of a yield of over 2 tons/ha. In 1977 a new variety will be tried.

The Bissap is a traditional crop but the market (for making a drink at Ramadan) is seasonal and the dealers do not seem to be buying any more for export.

Maize has done well, not particularly in terms of the actual yield of grain per hectare, but because it is sold by the ear for "roasting ears". This brings a good price (5-35 f./an ear). But this market is thin in the project area.

Manioc is a traditional crop in the region. Its introduction into the rotation gives a possibility to plow during the rainy season. Manioc responds well to plowing and manure. The yields are about 8 tons/ha.

There are problems of limited supply and high costs of the cuttings. In addition there is a danger of disease introduction if the cuttings originate from certain areas. Most of the manioc was either consumed by the family or given as gifts although it can command a very good price in the markets or urban areas.

Okra does well, it is traditionally grown around the edges of the fields but not in a plot. The results of the plots were satisfactory. However, the market for green okra is highly seasonal, with prices changing within a month from 125 f. to 25 f./kg. The okra can be dried and kept in slices or as a powder.

The forage production is believed to be valuable not only as feed for ruminants but also in the rotation for soil improvement. With certain crops, such as forage cowpeas, the field is released early for fall plowing.

Forage cowpeas (niébé) and forage millet (souna) both give satisfactory yields. The cowpeas are favored because a crop of grain can also be obtained. Yields of the millet are erratic (ranging from 11.6 to 26 tons/ha of green material with about 20% dry matter.). The real problem lies in harvesting the forage at the correct time and, preferably, mechanically. There is a gap in the labor calendar before the millet grain harvest begins but farmers have not used this time to harvest forage but have delayed, running into conflict with millet and peanut harvest. Cutting the forage may take 100 hours/ha and the ox-drawn mowers, with the typical light oxen encountered in the field, do not work well. With a pair of oxen weighing a ton or more, the mowers work reasonably well. Loading and transporting the forage may take another 40 hours a ha.

The forage is either dried and stored as hay or ensiled. The ensilage process, especially in unlined trench silos is not sufficiently reliable partly because of the difficulty of cutting the material finely enough so that there is sufficient compaction the green material to reduce air pockets. Excessive spoilage results. With concrete lined silos, better results may be obtained but at added expense.

The *Pennisetum pedicellatum* did not germinate, probably due to the seed being too old. So the qualities of this grass in farmers' hands remains to be seen.

The forage supply situation remains to be resolved. For a true integration of livestock and crop production it will be essential. Meanwhile the millet straw and peanut vines are widely utilized

They are gathered, stored in piles or sheds and fed. It should be pointed out that to get farmers to grow forage particularly for feeding livestock (as is done in this project with marked success) is already an accomplishment not seen in most Sahelian countries and is a real credit to SO.DE.VA.

A third element of the program of the liaison group is irrigated vegetable production. This has been done in liaison with the CDH (Horticultural Development Center) near Dakar. Advice and assistance to overcome problems is given by the liaison group. In two of the three villages the irrigated gardens were abandoned because the wells are too deep to be worth the effort of irrigating due to pumping costs. To overcome this it is proposed in 1977 to install an ox powered pump, like that being used on the demonstration farm at Bambey for water supply and irrigation of vegetables. A light pair of oxen can draw a good stream of water which will be welcome not only for irrigation, but to save time in providing the domestic and animal supply.

Meanwhile, in the third village where there is a tradition of irrigation in a low lying valley (bas fond) a new onion variety, Galmi, has been introduced; this onion stores well and so can be marketed over a longer period and at a better price. An improved variety of cabbage is being sought for 1977.

Insecticides and raticides have also been provided for the vegetable production.

In late 1977, it is planned to start a vegetable production study near Diourbel, at the request of the Délégué, Mr. Kane.

Another activity, called for by the project is the provision of improved grain storages. About 20 m³ of grain storage has been supplied in each of the 3 Terroirs villages, using the concrete bins designed at CNRA by Dr. Yaciuk of CIDR. These are filled with grain, often mechanically threshed by the SODEVA demonstration threshing unit, with bromophos mixed in it. With occasional surface treatment with bromophos the grain keeps perfectly. The original concept of sale-rent of the bins did not work and it is not clear what will be done about this.

The advent of the mechanical threshers in the project has had a profound effect. First it costs roughly the same price (in millet or in money) to get the threshing done by women with mortars, as with the machine. The machines will put more threshed grain on the market early in the year, when it can be sold to produce needed cash before the peanut buying campaign. Attempts are being made by SODEVA to ensure that there is a market at this time at the official price (35f/kg). The farmer will gladly sell the millet for less threshed out of the field than millet of which the heads have been chopped and stored and then taken out of storage and threshed. The farmer is also not interested in selling millet at a time when he is busy with threshing and selling of peanuts. But he often finds it is difficult to get enough millet threshed by hand for sale before the peanut harvesting, threshing and sacking begins.

There are also millet decorticators and grinders on demonstration in the field by SO.DE.VA. A complete set of post harvest machinery will be installed in one of the villages in 1977 by the CIDR post-harvest research project. A second village is buying a thresher cooperatively. The liaison group will participate in studying the socio-economic effect of this development, which on the one hand, relieves the women of a tremendous amount of work and, on the other hand, substitutes machinery for women's work. Payment for the services, 6 f/kg for threshing, 10 f. for decorticating and 10 f. for grinding will represent a large drain of money (perhaps 20% of the net income). Will the women find other more profitable activity to replace this income? It might come from irrigated vegetable production, livestock production or processing of millet flour into couscous for sale; it might come from a combination of all three. In any case, it will be very important to understand the socio-economic implications of this change which the villagers are very interested in adopting. (Furthermore, the results of this study will be valuable in guiding the future project program with this type of equipment.)

The fifth set of activities is concerned with integration of livestock into crop farming. This involves cattle and sheep finishing, including studies of the cattle market to see the best time to buy and sell and the prices of animals of different "weights".

Animals are deparasitised; farmers are instructed in making rations and helped to obtain the necessary ingredients. Protein supplement is available in the form of locally pressed peanut cake. Stables, which include manure storage, silage trenches and forage production are all available to the farmers in the 3 villages. Live-weight gains and cost and returns are being calculated for 1976/77.

The last major activity of the liaison group is collecting data on the demography, the agricultural and livestock production, farm machinery and the economics. This gives information on the adoption of themes proposed by extension and their economic impact. It provides the only reliable yield data of farmers in the project area. It also provides an estimate of the cereal supply produced per head.

Economic analysis is made to try to associate the effect of various themes on yields and returns. The results are then used to try to improve output.

The 1975 results showed that farmers with oxen did not earn more per ha or per worker from crops than farmers without oxen. This led to some rethinking of the ox traction program and starting of the AF, plowing and fertilization research in 1976.

The logical next step has been proposed in March 1977, to develop a model of the farms in the study villages so the results of changes (such as saving in labor by use of herbicide) can be budgeted. In this way, the program can be guided along the lines that will be most profitable for the farmers.

Net Income on Farms in 3 Villages 1975 and 1976

1975	G	N. Francs CFA	L
Net income + No. of ha.	25,675	22,685	22,215
Net income + No. of worker	50,519	42,317	56,322
Net income for head of compound	118,166	86,025	178,572
1976			
Net income + No. of ha.	16,525*	33,581	33,542
Net income + No. of worker	38,268	65,608	89,837

* About 250 francs CFA = \$1.

** In 1976 this village has a low rainfall, badly distributed.

Millet and Peanut Yields in 3 villages 1976

	G	N Kg/ha	L
Millet	437.5	883	432
Peanuts	753	1,030	1,429

The relation between the Liaison Group and SODEVA personnel is surprisingly good. There is goodwill on both sides but some misunderstanding. For example an internal memo at CNRA, requesting CNRA staff not to visit the study villages without a representative of the Liaison Group present, was taken to be a restriction on visits by SODEVA staff. In fact, the farmers were getting confused by conflicting instructions from enthusiastic research workers from Bambey.

A member of the evaluation team was present at the meeting between the Liaison Group and SODEVA for discussion of the 1976 results and 1977/78 research proposals. There was a good discussion and SODEVA staff had a definite input on the research program. For example, a second village in Thiès was included to cover mixed livestock-crop farming, at the suggestion of the Délégué.

After only two years, this development seems to be fulfilling its purpose admirably, and with increase in time, increase in discussion and increase in mutual trust this could provide the future pattern of

two way collaboration between research and extension, with a feed back to research on constraints in the adoption of the thèmes recommended.

The problem being addressed are, in general, the major problems faced by farmers in the region. The Liaison Group has a tendency, as would be expected from the history of farming systems research at Bambey, to emphasize research on themes lourds, based on plowing and heavy use of fertilizer. Work on new varieties, seed treatment (fungicide) and diversification crops can help the farmers using the thèmes légers. SO.DE.VA. has changed its major thrust to work more broadly with thèmes légers, horse drawn equipment and light doses of fertilizer. Research on and demonstration of thèmes lourds is, of course, important in the long run and should be continued. But, some work should be done on thèmes légers, on transition thèmes (how a farmer can best get from light to heavy thèmes) and how to overcome the universally recognised problems of getting from the one to the other.

XII. M'BODIENE

A small survey of local farmers has been made to find out the social and economic situation of the population.

The basic program of the ZER has been to develop a diversified system of mixed farming with higher yielding crops and vegetable crops, fertilizer, plowing and other intensifying themes, and producing and conserving forage in the place of fallows on a calcimorphic (Rend-zine) soil. Spineless cactus has been introduced and grown for 3 years. Cattle and sheep have been finished.

The ZER staff is interested in irrigation but the well water is unsuitable for irrigation although potable for humans and livestock. There have been problems with bird damage on new crops with different season length. Problems with high losses of silage and with markets for vegetables.

A group of 15 farmers are followed by the station to see what can be done in practice in intensification and diversification. Most of the farmers already own cattle and so ox traction is quite feasible. Local pig production

with improved breeds is crippled with African swine fever (peste porcine), which is only controlled by slaughter and starting with "clean" stock.

Because the cooperative sells no peanuts, none being produced in this particular area, ONCAD provides no credit for the purchase of farm, machinery and carts. If he purchases it for cash, the farmer does not get the subsidy.

Future Program

SO.DE.VA. (Dakar) believes that the IBRD will support the M'Bour Operation. In this case the ZER will be included.

The technical package for use on these calcimorphic soils has not yet been adequately developed. A more thorough socio-economic analysis would be useful for a start to see just what activities should be addressed. For example, a major group of the population is engaged in fishing and works part time in the production of a food grain; another group, or perhaps some of the same group, has major cattle and sheep enterprises. Some people are fulltime farmers. What are the restraints of the different groups involved and what are the solution for releasing them ? This could give the ZER three or four well defined lines of work.

It must be remembered that the situation at M'Bodiene does not represent that of the Department of M'Bour and that a basic program for M'Bour is still needed.

XIII. NDIAMANE

The applied research unit at NDiamane has not yet been started because, although there is a bored well about 300m deep with water from the Maestrichtian aquifer at 11m a capacity of 50m³/hour, there is no pump on it and the GOS has not decided on the plans for developing the 30 à 40,00 ha. of the productive deck soil that can be settled when there is an adequate supply of water.

The quality of the water of C₃S₄ indicates that, although potable, it is too saline for use for irrigation on the deck soils. The water contains 378.0mg per liter of sodium and 282.6 mg of chlorine. It also contains 1.4mg per liter of luorine.

ISRA has a group of 6 families of settlers near the well and proposes to go further with the development and introducing more settlers, including putting a survey worker in place for 1977/78. However, no one is anxious to see a permanent installation of a high capacity pump in operation until the area has been surveyed and laid out for settlement. This would just invite an anarchic settlement pattern on the basis of first come - first served.

The 1977 program presented to the RDO in April to be launched July 1977 includes putting the applied research and demonstrations in place and starting the first phase of extension (prevulgarisation) to a group of 8-10 farm families expected to be in place. An aerial survey will be made in October 1977 with a land survey in order to establish land use and land use rights. This will be followed by a land allocation program.

The area represents a very important resource that if properly developed could help a large number of families around the periphery who are short of land to use the deck soil better and also provide land to settle 2-3,000 families on the interior of the zone.

*Worthing file
M. Sill*

PROJET ANTEENNE EXPERIMENTALE POUR LA MISE EN VALEUR
DES TERRES DOK DE LA ZONE DE NDIEMANE

(BAMBY-FISSELA)

Dans le cadre du projet Moyen terme Sahel financé par l'E.S.A.I.D., en plus du financement de la cellule de liaison recherche développement, il avait été prévu de créer une antenne expérimentale dès 1977 ; un crédit de 12.000.000 F. CFA avait été prévu à cet effet.

L'objet de l'étude à mener est d'établir une carte des droits d'appartenance et d'usage du terroir afin de proposer dans une deuxième phase un plan de lotissement.

Il faut donc prévoir une photo aérienne au 1/20.000 agrandie au 1/10.000 qui sera à effectuer en Octobre 1977 et l'établissement d'un cadastre qui sera achevé fin 1978.

Parallèlement il convient de poursuivre l'expérimentation multilatérale implantée au PATM de NDIEMANE sous la responsabilité d'un agent technique, M. KEBE, ayant à sa disposition deux bouviers permanents et faisant appel à la main d'oeuvre temporaire.

Des modifications des bâtiments de ferme sont prévues pour une meilleure collecte des eaux de pluie (gouttières et citerne à construire).

Des actions de pré vulgarisation et des enquêtes seront conduites au niveau des exploitants pionniers (8 à 10 en 1977-78).

DEVIS PREVISIONNEL POUR LA PERIODE DU 1er JUILLET 1977AU 31 MARS 1976

(Milliers F.CFA)

<u>Personnel permanent</u>		<u>Total par rubrique</u>
1 ITA (6 mois) x 60 000	360	
1 ATA (9 mois) x 40 000	360	
1 chauffeur (6 mois) x 40 000	240	
1 Topographe (6 mois) x 90 000	540	
2 encadrateurs (9 mois) x 40 000	360	
2 Bouviers (9 mois) x 2 x 30 000	540	
	<u>2.400</u>	<u>2.400</u>
<u>Fonctionnement</u>		
Main d'oeuvre temporaire PAFEM	800	
5 " " leve topo	400	
Transport (manionnettes) 15 000 Km x 65 F. CFA	1.170	
Fournitures bureau	300	
Fournitures PAFEM	500	
	<u>2.400</u>	
Frais gestion 10 % personnel	240	
10 % fonctionnement	317	
	<u>2.717</u>	
<u>Total frais gestion</u>		
<u>Total fonctionnement</u>	<u>3.827</u>	<u>3.727</u>
<u>Infrastructure</u>		
Construction 2 cases bureau	500	
Amenagement bñiments ferme	500	
	<u>1.000</u>	<u>1.000</u>
<u>Equipement</u>		
Matériel topo	800	
Matériel bureau	500	
Vélocoteurs 3x150 000	450	
Photo aérienne (15 km long x 8 km large) 12 000 ha	3.000	
Divers	123	
	<u>4.873</u>	<u>4.873</u>
		<u>12.000</u>

SO.DE.VA. 1977/78 PROGRAM^x

A. <u>TL</u>	Activity	Themes	Action
	1. Cereal Production:	Prepare seedbed in dry season Mineral and organic fertilisation Improved millet seed Thinning to 3 plants per hill Cultivation for weed control	Requires overcoming constraints in supply. Management of manure Conservation of organic wastes for application to soil.
	2. Diversification of Crops: cowpeas, sorghum, maize manioc, onions, potatoes egg plant, okra, tomatoes cabbage, green beans, etc. Some are out of season crops.	Themes as for 1 adapted	Village meetings
	3. Livestock Production:	Keep a heifer or cow Feeding cattle or sheep Small stock, including poultry with improved cocks	Audio-visual materials Rural radio Pamphlets Supply of feed supplements Credit program
	4. Integration of Livestock in Farming:	Gather and stored forage supplies Sensitise towards animal traction Manure conservation and storage	Meetings and demonstrations Forage harvesting methods New inputs (forage seed)
	5. Environmental Improvement:	Tree nurseries for neem and eucalyptus Planting wind breaks Planting trees for wood supply Protection of young cadd (Acacia) trees	Eucalyptus seedlings Demonstrations (Perhaps competition on saving cadd trees)
	6. Organisation of the Farm	Maintenance of Equipment Storage of cereals and various crops	Spare part supply Storages for grain

(x) Buresi, CETAD Pout, 22-23 March 1977.

B. <u>TB.</u>	Activity	Themes	Action
	1. Cereal Production:	as for TL	
	2. Diversification of Crops:	as for TL	
	3. Livestock Production:	as for TL plus Animal Health Animal feeding Calf salvage program	Use of ox training centers to demonstrate equipment, animal feeding and traction. Work with groups of TB farmers rather than individuals. Audio-visuals-slides and Super 8 for the appropriate themes Agro-industrial by-products.
	4. Integration of Livestock and Farming:	as for TL plus Forage production	Forage seed supply
	5. Environmental Improvement:	as for TL plus Plowing Burying of organic matter in soil	
	6. Organisation of the Farm:	as for TL plus Rational use of oxen with correct machinery Manure ditches or covered stables	Demonstrations AV materials Supply of correct machinery
C. <u>TBAF</u>			
	1. Cereal Production:	as for TB plus Intensification Rotation Heavier application of fertilizer including urea	Timely delivery of sufficient fertilizer.
	2. Diversification:	as for TB plus Tobacco, beref and bissap	Drying, storing, and marketing

Activity	Themes	Action
C. TBAF (cont'd)		
3. Livestock Production:	as for TB plus Introduction of improved bulls	Supply of improved bulls and rotate them.
4. Integration of Livestock and Farming:	as for TB	
5. Environmental Improvement:	as for TB plus Rotations Heavy application of phosphate Land clearing	Phosphates supply delivered on time.
6. Organisation of the Farm:	as for TB plus Improvement of farm infrastructure storages, etc.	Materials Credit.

An attempt will be made to get at least one farmer per cellule and then as quickly as possible one per village who does all the themes together in order to demonstrate the effect of the synergism on the yields. The ATCR will have a special role to play in accomplishing this.

In Thiès there will be a 2-3 day reunion of the TBAF farmers run by an AT including simple management training.

Rural Organisations or Institutions

SO.DE.VA will work towards developing the cooperative structure to cover marketing, supply for the rural community, machinery and consumption needs.

Management problems will have to be taken care of.

Some form of village association is needed to start with and to pass from an emphasis on production to one development; it will also, of course, help with extension work. It might start with group activities, by the TB and TBAF farmers (grain storages, buying machinery, equipment for drawing water).

An important area will be cereal marketing that will develop with increased production and with post harvest motorisation. SO.DE.VA. expects to play a substantial role in this.

A marketing intervention is also important if vegetable production is developed. Here a contract might be obtained with a national organisation or a processing plant.

An action along these lines, seeking how to get a cohesive and effective village organisation will be pursued. The Délégué at Thiès already started this type of action in a number of villages in the 1975 program and could then organise his extension program on a less diffuse way.

This will also involve setting up the cooperatives with an autonomous management and not leave them to rely solely on a commission on service. This is being tried in trial zones by ONCAD. SO.DE.VA. expects to work with one cooperative per department.

Action in the Council of the Rural Community

The ATCR are expected to start a program with the community councils. The situation is unclear whether the ATCR should be a member of the council or an advisor when invited. Some have requested help; should these be the first with which we work? Will the political aspects of the council hinder our agents in their work with the farmers? A definitive document will be provided from Dakar before September 1977 providing information and defining our action.

The ATCR will be given training before this time so that they can approach the President and members of the councils on the program of SO.DE.VA. and its results. In this way it should be possible to draw attention to the support which we can give to their rural development program and, at the same time, receiving help to advance our program.

XIV. RECOMMENDATIONS FOR THIRD YEAR OF PROJECT

1. SODEVA and CNRA have reviewed their spending to date and compared it to budgeted funds to March 31, 1977. This comparison shows the extent to which the respective programs are "off course" in the rate of spending. Based upon this review, a new budget and program for the 1977-78 year should be laid out by each agency and these reviewed with RDO/Dakar. Where costs have risen for items in the program and work plan, these adjustments should be made. Should it become clear that certain project funds are not needed for planned program items, by mutual agreement, RDO and the cooperating agencies may arrive at additional useful program endeavors within the revised budget and the scope of the PROP. Once these are clearly agreed, a new or revised plan of work should be developed by each cooperating agency which is filed with ADO/Dakar preferably by June 15, 1977.

This exercise is an essential one in order to clearly identify the budget picture at this stage of the project and to determine whether all project goals are possible within the budget and whether any new and worthwhile endeavors may be programmed. It should also help identify ways in which the reserve \$457,000 in the PROP may be used as transitional to new funding under a prolongation of the original project.

In this respect, the project manager working with the Regional Controller and the SODEVA and CNRA comptables should analyse the situation carefully to determine whether or not the following projected spending might be possible and more feasible than attempting to expend remaining project funds in one year.

This would mean that if the project is to be extended, so far as SODEVA and CNRA are concerned, new funding would not be required until mid to late 1978-1979 unless costs of expanding into new departments would necessitate a larger budget than anticipated above.

2. (a) Fill the Director of Formation position at Dakar with a full time, qualified Senegalese in place of the temporary assignment of the Director Technique to that position.

(b) Direct that this person interview the two expatriate and the two Delegates to try to find a common ground for a solution to the situation.

(c) Direct that the two Delegates name (where not already done so) a Senegalese counterpart in each Delegation for each expatriate. Alternatively, if the availability of qualified Senegalese dictates conserving personnel, SODEVA/Dakar might name a counterpart for each expatriate and these Senegalese given authority and responsibility to function in both delegations.

(d) The Dakar Director de Formation should hold meetings one in each Delegation, planning with the Delegate, the two expatriates and their respective counterparts a program wherein specific training is laid out which when completed will enable the Senegalese counterparts in a reasonable length of time to take over the function of the expatriates.

(e) Present these plans to ADO/Dakar for review and adjustment if needed to arrive at mutual agreement on when and how the training will be completed and when the service of each expatriate to the project may be ended. SODEVA may, if necessary to complete the training of Senegalese, carry this plan into the period of prolongation of the original project.

(f) Provide special reports on the progress of this important phase until it is completed.

(g) Should SODEVA, in consultation with the Delegates, require any short-term, special, additional outside assistance to supplement the work of the expatriates in completing the training of the Senegalese Counterparts this should be proposed in writing to RDO and a budget developed for this added service. The proposal will be considered for funding, using current project funds if available or by calling into action the necessary part of the \$457,000 reserve designated in the PROP for the Project in FY 78.

3. In relation to item 2, a Senegalese should be designated as soon as possible as a Dakar-based, SODEVA project correspondent and counterpart to the ADO/Dakar AID Project Manager. This is essential considering that it would in due time be necessary to have a Senegalese in this capacity as the project training plan will in due time eliminate the need for the expatriate now serving as the project correspondent.

4. SODEVA should review its own budget with regard to BN funds and discuss with ADO/Dakar what new use it proposes to make of the funds now being spent for office and warehouse rental in the project area where the completed project construction replaces the rented facilities. In this regard it should be seriously considered that the funds thus saved be applied to one or more of the following:

(a) Continued construction where needed to replace other SODEVA facilities, now rented.

(b) An amortization and/or maintenance fund for the buildings the project has constructed.

(c) Reducing the percentages of project support to operating costs.

(d) Reducing the number of SODEVA staff on project salary payments.

5. Plan and carry out the making of at least 12 new educational slide sets such as those shown to the evaluation team at CETAD and use these in village and staff training work. If other funds for audio-visuals are not available to do so, use project funds to equip the mobile units with day light screens so that in the off season mobile units may hold showings in day time as well as nights.

6. Accelerate the production of Super 8 training films and work closely with ADO/Dakar to accomplish making of copies and reimportation of them without extreme delays in censor review, etc. and possibly at some savings to the project. Slide sets may also be duplicated to some advantage in the U.S. and accelerate the production of these.

7. All cooperating agencies should be encouraged to submit their requests for reimbursements to project accounts quarterly and within 3 weeks of the end of a given quarter. This is essential for two urgent reasons:

(a) The Regional Controller is now required to report quarterly, to AID/Washington, on level of project expenditures and must have reasonably accurate figures from the cooperating agencies for this reporting.

(b) The AID project manager must be kept more current than has been the case in the past on specific project expenditures.

8. SODEVA should hold joint meetings with the Delegations with a view to standardizing the format of monthly reports originating in the arrondissements and reporting to the department offices (Bureau d'Opérations). The project manager should review these reports monthly at the operation offices and contribute his own suggestions at this meeting to the standardization of the report form. Standardization should make it easier

to compile data from the reports and assure that all required data is reported from the arrondissements on important aspects of project activity.

9. The situation in which SODEVA/Dakar has required extensive time to print and deliver required project reports to ADO/Dakar on the project should be corrected. During this last year the time between when the draft report was submitted by the project correspondent and when the printed report reached ADO has at times approached 2 months. A similar problem has existed for the other two cooperating agencies and ways to improve the timeliness of reporting should be worked out with them.

10. SODEVA should report no less than every 6 months on the location/vente (rent/sale) and credit phases of the project. All transactions under this phase must first be brought current in the report now under request to SODEVA (letter dated February 1, 1977). One way that all items and transactions under location-vente can be traced and checked accurately is for SODEVA to assign a number to each item of demonstration equipment the project buys and trace it through rental stages (listing income and to what use the income was put) to the point where is eventually sold to a farmer. The sale price and the application of this income toward new procurement of demonstration equipment is recorded to close out a given item.

Although there is no evidence that anything untoward is happening in this phase, there is a recognized potential for misuse of this fund. Good records and reports reviewed by AID can assure that this phase is going well.

11. The RDO should arrange with SODEVA the use of project funds (if other funding is not available) to bring in (October-November 1977) a credit

specialist to evaluate and recommend for this phase of the project.

12. Staff payments from project and BN funds should be brought back in line with the requirements of the ProAg. This is important in order to have a starting point for future phased reduction of project support to staff.

XV. LIAISON GROUP 1977/78 PROGRAM

(a) The research program will be continued much as before but with some additions in 1977. Agronomic research will continue on soil improvement (AF), peanut varieties, fungicide (dropping date of planting), and peanut herbicides (with an emphasis on evaluating the potential value of the labor saved). It is hoped that SODEVA-ONCAD will respond to the peanut variety fungicide research by:

- changing first to the recommended variety 57-422 with the new fungicide;
- pre-extension trials and multiplication of the new variety 73-33.

(b) Herbicides for peanuts are already in the pre-extension phase. If they appear to be consistently profitable, a herbicide and means of application plus the necessary adjustment in the farming system to use the labor saved, will be proposed.

(c) The crop and variety behavioral trials will be continued and in 1977 observation will be made on the adoption of the diversification crops by the farmers in the villages.

(d) The vegetable crop production program will be intensified. In the village which has the bas-fond (depression land) a new variety of cabbage is being sought. The ox powered water drawing system should permit a better start to be made in the other two villages. A fourth site, near Diourbel, will be included in studies in the 1977-78 dry season.

(e) The livestock inventory should be completed and data from the market study should be available. The Liaison Group would like to use some AID funds in a revolving credit to buy steers for finishing in order to

observe the inputs and outputs and the economics. This is comparable to the purchase of demonstration equipment. It was suggested that some of the SODESP (Society for the Development of the Sylvo-pastoral area) steers be purchased and the profitability of feeding them compared with the profitability of feeding steers bought on the market.

Sheep finishing will continue to be studied. An attempt will be made to estimate the costs of husbandry.

A fourth village will be selected with SO.DE.VA. (Thiès) to provide a better opportunity to study the association of livestock and agriculture.

(f) The basic demographic data gathering will be continued, with a special study on the number of people who are absent in the dry season (working in the towns etc.) in order to make a better estimate of the relationship between annual food needs and food grain production.

(g) The machinery survey will be continued to see if the farmers are responding to the program by purchasing more machinery and changing their source of animal power to oxen. It is particularly important to see if owners of work oxen are changing to the heavier equipment actually designed for oxen, rather than using the oxen with machinery designed for horse traction. This may change the economic picture for traction bovine when compared to no traction bovine.

(h) Three of the heaviest tool frames (polyculteur du grand rendement) are to be introduced. Experience elsewhere has shown that their use is labor saving, whereas the regular ox drawn equipment tends only to improve the timeliness and quality of work. These machines will be used by the Liaison Group and by farmers and the results observed.

(i) The economic studies will be continued with more emphasis on the labor input and labor constraints. This is important because labor is a major constraint in agricultural production. In 1977/78, in collaboration with the CIDR post harvest mechanisation study, observations will be made in at least 2 of the 3 villages on the effect of the mechanisation on the work of the women and on their income. Alternative profitable uses of women's labor will be proposed, such as irrigated gardening in these two villages using the ox drawn water supply.

Surveys on non-farm income will also be made along with an effort to study sale of cereal (which is a "black market" activity) and food purchases.

- (j) The Liaison Group will continue to work closely with SO.DE.VA. and respond to the needs expressed by SO.DE.VA. staff. As noted elsewhere in this evaluation, the Liaison Unit must review its budget carefully and propose a new budget for 1977-78 to ADO/Dakar. It appears that in doing so, adequate funds will be available for carrying out this proposed program.
- (k) In preparation for the second project (to start in 1978), the Liaison Group needs a second agricultural economist trained, preferably in the U.S. A candidate is available in July when he is due to finish the 2nd cycle (4th year) at the National Agricultural School at Abidjan.
- (l) The Liaison Group could start studies in villages in other departments to be included in the "new" project, but it seems unlikely that a decision will be made in time to do this in 1977/78. This, if the current budget review does not yield adequate funding from funds allocated, it should be considered to release and authorize funds from the \$457,000 reserve in the PROI.

(m) The Liaison Unit and ADO should study the transport needs of the unit staff in serving the Terroir programs. Consideration should be given to continued mileage payments for staff use of personal vehicles for official use U.S. project provided transport vehicles. Should the latter prove best, the necessary vehicle(s) should be foreseen in budgeting for the project prolongation. There is no provision of the current PROP which could authorize use of original project funds for these vehicles.

XVI. CONCEPTS FOR A NEW PROJECT

Since the evaluation team was aware of the inclusion of a second phase in Senegal Cereals in the ABS, it considered that the following observations might be helpful if a design for a new project is required.

(a) Goals

The goals of a new project should relate to a more meaningful end than intensifying the practices on a certain number of farms. They might relate to certain production objectives, bearing in mind:

(1) That in the long run, unless the marketing system for cereals changes and without free prices (which is unlikely) farmers will probably find it more profitable to produce peanuts as their major cash crop.

(2) SODEVA is (correctly) trying to encourage diversification by farmers into other crops and livestock. So that production objectives should include cereals, peanuts, other crops and livestock in some form where one can compensate for lack of another. This, in fact, leads to a monetary objective.

It is, of course, impossible to estimate the net income of farm families in the project area. A gross value of production and the value of inputs, purchased through the project, could be estimated, together with the value of seed retained to estimate a sort of value added per family or per worker. This could be checked against estimates of the Liaison group of income, which is obtained in a similar way but knowing yields and expressed as value of output minus value of variable inputs, and in another form minus debt amortisation to give the net income.

Even if this is taken as one objective measure there should be a broader concept introduced in a second phase, also corresponding to SO.DE.VA.'s current policy, that of community development. Measurable objectives in this area, which could include health, water supply and similar programs, are harder to define without considerable study and discussion with village groups. Some of them, such as time saved in drawing water (often 30-40 m. deep in the project area), may appear in the form of increased income but also may contribute to increased leisure or to other "non productive" activities on which (African) societies place a value, for example religious activities.

(b) Scope

The existing project as directed towards agricultural production and storage of cereals. During the course of the project horticulture, livestock and post-harvest mechanisation of cereals were introduced. Today post-harvest mechanization of peanuts is a matter of political importance in Senegal. The post-harvest mechanization and livestock elements may also require an improvement in supply of animal drawn transport in some areas.

If the project is to be directed more towards development, health (perhaps associated with the Sine-Saloum AID project), village water supply and other village developmental needs should be considered.

(c) Geographic Area

The delegation of Thiès includes the departments of Mbour to the South, Thiès and Tivaouane to the North. Mbour has a coastal area and in land it is much like the department of Thiès but as a whole Mbour has a less

dense population. There is a region of about 5,000 ha. of calcimorphic soils near MBodiene in the South; these soils are fertile but difficult to till because of their relatively high clay content. There is some possibility that SODEVA will propose a MBour project to the IBRD.

Tivaouane has a northwestern half which has many bas-fonds, divided by the road and railway from a south eastern half which is somewhat like the Department of Thiès. The area has considerable non-farm employment and is scheduled for an urban development. This department has considerable development opportunities.

In the delegation of Diourbel, the departments of Bambe and Diourbel are already in the project area and MBacké, to the east, remains outside. In MBacké there are a number (about 12) of large (200-2,000 ha) farms belonging to the marabouts of the Mouride sect, headquartered in the Department at Touba. The marabouts exercise considerable political influence and some of them are asking for agricultural extension services and there is a discussion on whether the marabouts should pay for the service. There is no question about their ability to pay for machinery. The marabouts run schools for young men, to give spiritual training and also training in work including farming. In theory, it would be useful for the marabouts to give a sound agricultural training and instruct their believers to follow this pattern. The marabouts are active now in farming, probably putting too much emphasis on continuous peanut production because they receive substantial amounts of millet as a tithe from the believers. This leads to over-cropping and soil erosion.

Without support from the marabout the program in MBacké will not get far.

The question is can SODEVA really work with the marabouts ?

Mbacké is similar in character to the department of Diourbel with peanuts and millet the major crops. It also has some good livestock feeding.

(d). Potential agricultural and livestock program elements

New crop varieties seed of the Souma III selection will be in sufficient supply for the whole project area in 1978/79. However, for this to produce an increase in millet sold, or in the long run, in millet produced there may need to be changes in the hand threshing system, moving to mechanical threshing. There will have to be change in the marketing, probably with SODEVA having more responsibility and acting in the name of ONCAD.

In 1981, it may be possible to field test the long promised GAM millet, which gives a higher yield, is less critical in the stand required and so on. Currently, the original GAM, which had problems of incomplete filling of the ears and susceptibility to pests and diseases, is being crossed with millets from India.

A new peanut 73-33 could be multiplied for production in the region. It has undergone pre-extension tests.

Other inputs. Data will be available to see whether herbicides should be extended generally and how the labor saved can be used. Herbicides may add appreciably to the effectiveness of fertilizers by ensuring better weed control.

Integrated crop and livestock farming with the use of agro-industrial by-products such as cotton seed hulls and meal and peanut meal will be found a useful means of maintenance of soil fertility and of increasing and

diversifying income. This will involve overcoming the problems of forage production and conservation.

The results of the soil management research (Amélioration foncière) should show the way for a more sound adoption of draft cattle and mechanisation.

The studies on post harvest mechanization for millet will indicate the potential advantages and disadvantages from its introduction. It will be important to see what effect the substituting of machinery will have on the well being of the women.

(e) Training Needs

The Senegalese have made it clear that they wish to supply their own technicians for the continuation of the project. This would require each delegue to have an "Ingénieur de Conception" at least an ingénieur agronome (i.e. completed a 4-year course at a higher agricultural school), to take care of the agricultural program. There should also be an animal husbandry graduate of the same level available. Because of the way in which the SO.DE.VA. program is organised this man would have to be on the Dakar staff and would be responsible for the conception of the livestock phase of the integration with farming. He should be stationed in Thiès or in Diourbel because in that way he will be close to the problem.

The difficulty will be to find suitable candidates for these traineeships. If candidates cannot be selected with adequate English to study in the U.S. then the students could go to the Abidjan Agricultural School for both agronomy and animal husbandry. Eventually such students will be able to go to the Institut Agronomique in Senegal.

The Liaison Group in a second project requires at least one and probably two people trained as research/agricultural economists. There

will be enough work for two people in the Liaison Group; a first trainee could be made available from CNRA having completed the 2nd cycle (4th year) at the Abidjan National Agricultural School (Ingénieur Agronome) With some reinforcement at the undergraduate level and, of course, language training, he could take an MS program. He could return to Senegal after, at the most 4 semesters and a summer, to do his research at CNRA in the Liaison Group. It is important that his training start in fall 1977. If he is delayed 4 months he will return too late to do research in the crop season.

The second traineeship is designed to provide a replacement for Mr. Fall. Within 5 years, it seems highly probable that ISRA's program will require Mr. Fall to take the responsibility of head of the agricultural economics section at CNRA, leaving him only a little time to work on the Liaison Group program. Before the end of the new project it is clear that a second agricultural economist will be needed to ensure the continuation of the Liaison Group, perhaps with increased scope.

The project has taken on a credit phase. There is interest and need for expansion of this and including credit for animal feeding programs. University level training for a SO.DE.VA. staff member on agricultural credit to head up this phase would be required.

It is recommended that in so far as it is possible the new project fund this participant training. This should be possible when the \$457,000 reserve in the PROP is brought into use.

(f) Administrative Considerations

(1) That the suggested frequency for financial reporting by cooperating Agencies be on a quarterly basis and report be to ADO within 3 weeks after end of the quarter. In this respect, advances to the project accounts should be reduced so that this additional pressure be brought on cooperating agencies to submit vouchers quarterly in order to have funds in their respective accounts to continue operating. These things probably should be pinned down in the new ProAg.

(2) The new ProAg could also spell out more clearly not only reporting periods but set a mutually agreed and reasonable time between the end of the reporting period and the due date of the report at ADO. This requirement is essential and should in some way be enforceable to keep the RDO and the project manager current on activities, problems and accomplishments of the project.

(3) A plan should be worked out with SODEVA and cleared with and approved by the Ministry of Rural Development and the Minister of Finance and Plan whereby AID project support to staffing and to operating costs are reduced to zero at the end of any project prolongation. This means that the BN must be increased by an amount to match the annual reduction of AID project support to these two expenses.

(4) Construction phases of the original project were a source of many frustrating problems and basically it may be better to leave construction to SODEVA and use project funds for other phases. However, if any is to be considered for the prolongation phase it should be kept to more minor structures and requiring lesser proportion of the project budget. Suggested things to consider are one or two operations offices

and 3-5 small warehouses, such as those built at Notto, Baba Garage and N'Dindy in the original project, at new ZER locations or locations where agricultural supplies and materials may need to be stored temporarily for distribution . SODEVA should provide to PDO improvements in its method of controlling building standards.

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