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TRIP REPORT

SUDAN HYBRID SORGHUM SEED WORKSHOP
WAD MEDANI, SUDAN

NOVEMBER 5-8, 1983

BY

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CONTRACT NO.: AID/DSAN/XII-G-0149

☆ International Sorghum/Millet

☆ Collaborative Research Support Program (CRSP)

A Research Development Program of the Agency for International Development, Participating Land-Grant Universities, Host County Research Agencies and Private Donors.

Institute of Agriculture and Natural Resources
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INTRODUCTION

This is Dr. Gebisa Ejeta's report on the Hybrid Sorghum Seed Workshop held in Wad Medani, Sudan, November 5-8, 1983. INTSORMIL funded the workshop. Dr. Gebisa served on the workshop steering committee and served as coordinator of the workshop. The workshop proceedings are in process and will be made available at a later date.

Dr. Gebisa's input with the workshop is appreciated as is the efforts and cooperation of the other members of the steering committee, those who participated in the program, the participants, the Agricultural Research Corporation of the Sudan and ICRISAT.

Glen J. Vollmar
Interim Director
INTSORMIL

Hybrid Sorghum Seed Workshop
5-8 November, 1983
Wad Medani, Sudan.

INTRODUCTION

Several years of collaborative research at the Agricultural Research Corporation (ARC) initially with the Arid Lands Agricultural Development Program (ALAD) and subsequently with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) led to the release, in january 1983, of the first commercial sorghum hybrid, Hageen Dura-1. The seed parent, Tx 623A, was obtained from Texas A&M University, U.S.A.; whereas the pllinator parent, Karper 1597, was selected from an accession of the world collection (GRU, ICRISAT) originally received from Texas A&M. The release of this hybrid provides an opportunity for the initiation of a hybrid seed industry in the Sudan.

Extensive yield testing in the Central Clay Plains indicated over 50% yield increase of Hageen Dura-1 compared to an open pollinated local variety. In addition, grain quality tests at the Food Research Centre in Shambat, indicated that Hageen Dura-1 possesses acceptable food quality and milling characteristics. Furthermore a prerelease experimental seed production testing of Hageen Dura-1 conducted at the Gezira Research Station farm in 1982 indicated that the Hybrid was easily produceable. In the 1983 crop season a 30-acre seed production pilot test was effectively undertaken by the Sudan Gezira Board (SGB). Additionally, 5 acres of commercial seed was also produced by the Mechanized Farm Corporation (MFC) and both foundation and commercial seed production were also undertaken by the Plant Propagation Administration (PPA). These production activities have clearly demonstrated that the released hybrid can be successfully produced, raising further enthusiasm for developing a seed industry.

The National Seed Administration (NSA) even under its revised structure caters only for a seed program based on open pollinated varieties of cereals and vegetable crops, and has no provision for hybrid seed. It is recorgnized that the production and marketing of hybrid seed is different from that of varieties; hence this workshop was organized to initiate the consideration of various aspects of establishing a viable hybrid sorghum seed industry.

II. The Workshop: As can be appreciated from the appended program of the workshop, individuals from several countries and with different experiences and responsibilities gathered to join with concerned and involved individuals from the Sudan, to discuss a broad range of topics relevant to hybrid seeds. The following listing of session titles and field trips indicates the breadth of topics covered at the workshop - a proceedings will be available in due course.

1. Setting the Scene
2. Seed Production and Quality Control outside Sudan
3. Status of Seed Production and Quality Control in Sudan.
4. Marketing and Policy Considerations
5. Study Groups
   a) Production and Processing
   b) Quality Control
   c) Marketing, Government Policy and Extension.

Additionally, several field visits were organized :

1. The research plots on the Gezira Research Station were visited where the participants could appreciate the strength of the research program to help support the seed industry.

2. A 20-acre seed production field of Hageen Dura-1 on the seed farm of the Sudan Gezira Board (SGB) was observed. The production was well done raising confidence in the aspirations of the participants. A seed processing facility of the SGB was also visited.

3. At Sennar, 5-acre production fields each of TX 623A X TX 623B and of Hageen Dura-1 were observed as well as the seed processing facility of PPA.

The field trips were of great interest to all participants and the workshop discussions led to lively interactions. The Pilot Hybrid Project proposal was fully discussed, evaluated and modified (revised copy appended Resolutions arising from the workshop are also appended. The usefulness of the workshop can be appreciated from these resolutions.

III. Additional Observations:

a- Plans are for the active involvement of a private seed industry. It was appreciated at the workshop that there is now a real growing interest by some entrepreneurs to become involved in the hybrid seed business. The deliberations of the workshop were directed to the identification of basic considerations required to encourage private investment in the hybrid seed business.

b- Conceptually, the ramifications of a viable seed industry; ie, production, processing, marketing, quality control, extension, and research, were better understood and integrated. The participants felt that the workshop resulted in a solid step forward- the evolution of a hybrid seed industry is underway.

c- Financial problems are of concern. The pilot hybrid seed production project is expected to ensure forward momentum in production of seed and to involve different agencies in the various aspects of production, quality control, marketing, research, extension etc. as relevant. Funding of this project is felt to be necessary.

It is gratifying that the Sudan Gezira Board used its own resources to undertake production of 30 acres of Hageen Dura-1. It is likely that SGB, MFC, NSA and others will continue to produce, and participate in extension type activities using their own resources. This is also an important financial component to the developing seed industry that deserves the formation of policies that encourage this investment.

Hybrid Sorghum Seed Workshop
5-8 November, 1983
Wad Medani, Sudan.

RECOMMENDATIONS

Production & Processing

1. The Pilot Project for hybrid sorghum seed production, distribution, and utilization was discussed and modified.

2. The interest expressed during the meeting for involvement of private individuals in the production of seed was good. It is recommended that a meeting of interested individuals be called in the next few weeks so that they can learn from the production on the Gezira this season. Foundation seed to plant 2-15 feddans should be made available to interested individuals to enable them to gain experience in seed production.

3. The sorghum breeder(s) of the Agricultural Research Corporation (ARC) in addition to the maintenance of breeders seeds, should be associated with the production of foundation seed. If possible, arrangements should be made with the Sudan Gezira Board (SGB), NSA, MFC or others to produce foundation seed in close liaison with ARC staff.

4. It is suggested that a Sudanese study team be organized to visit various aspects of the seed industry in other countries in August - September of 1984 when their crops are in the field. Members of this team should include individuals from the Ministry of Agriculture National Seed Administration (NSA), Plant Propagation Administration (PPA), Seed Certification Administration (SCA), Agricultural Research Corporation (ARC), Extension Services, and seed producers to a limit of 10 people. The team might travel to India and the U.S.A. to visit seed companies, quality control laboratories, certification and seed law enforcement agencies, public and private research programs, extension services, training activities, and seed trade associations.

5. It is recommended that the hybrid be used as a vehicle to encourag better management practices.

Quality Control

6. It is recommended that use of certified seed of all classes involved in hybrid seed production be encouraged to insure purity, trueness-to-type, and high quality. In time, farmers will purchase seed from producers in whom they have confidence.

7. It is recommended that the "Texas Seed Certification Standards" be adopted as a functional guide in establishing standards in the Sudan for the production of each class of seed (breeder, fonndation, and certified) related to the production of hybrid seed.

8. Isolation requirements need to be arranged with neighbouring farmers so that the specified standards are maintained. Fallow land (where weed sorghum may be growing) around the production field must be handled as crop land for isolation purposes. Where possible, isolation in time can be achieved by sowing so that the crops in the seed field and in surrounding farmers fields flower at different times.

9. Weedy-wild sorghum, known as "Adar", is a serious problem and difficult to control. It is recommended that crop rotation herbicide application and other agronomic practices be specified in the certification standards.

10. We recommend the acceptance of the Tatwawadi (1979) report on seed labelling that permits 0.2 percent weed seed; however, it is urged that 0.01 percent or less seed of "Adar" be permitted in certified seed of hybrid sorghum.

11. It is highly recommended that 'grow-out'tests' of each lot of breeder, foundation, and certified seed, should be made to check quality prior to sale.

12. We recommend that samples of the 1983 production of each lot of seed from each 5 feddan production field of AXR, AXB, R and B lines should be grown out in the 'Off season' to test purity and to demonstrate the results of contamination even as an educational activity.

13. We recommend that all 'planting seed' of sorghum be treated/dressed with appropriate fungicides and or insecticides at least as recommended by competent authority.

14. We recommend that due to the urgency of next year's production that an outside consultant in hybrid sorghum seed production be hired to come to the Sudan to train production technicians in the science and technology of hybrid seed production, i.e. planting, roguing, nicking, harvesting, schedule of roguing etc.

Government Policy

15. We recommend that the National Seed Law, presently under consideration by the Central Government, should be finalized, enacted, and put into effect promptly.

16. Suitable regulations and guidelines for developing an effective seed industry should then be promulgated by the Ministry of Agriculture and Irrigation.

17. The difference between seed and grain must be recognized allowing for unrestricted movement of seed in the country.

18. At present there are no laws or no official government policy which either encourage or discourage seed industry development. It would be useful to have an official policy which encourages such development, giving due regard to protecting the interests of both farmer/consumers and a legitimate seed industry.

19. This seed policy should cater for operation within Sudan of seed enterprises based outside the country on a competitive basis.

20. Quality control should be organizationally separate from production/ marketing activities.

Extension

21. It is most important that an effective and widespread demonstration campaign be carried out in 1984 and following years. This campaign needs to be supported by adequate financing and staff. Leadership of this campaign should involve among others, research workers who are thoroughly familiar with characteristics and requirements of the new hybrid.

22. Special efforts need to be made to involve the Extension Services and Farmer's Unions in the demonstration activities.

23. An extension officer, with responsibility on hybrid seed production, should be associated with the existing extension office at the Gezira Research Station.

24. The ARC should assist with the training of key extension personnel.

Marketing

25. We recommend that immediate decision be made on the organization and policy for distributing seed of Hageen-Dura-1 produced in 1983.

26. Distribution of this seed should insure that a wide cross-section of the farming community is exposed to effective demonstrations.

27. The pricing policy should set the hybrid seed price initially at at least 6 times the prevailing grain price. This is estimated to permit recorvery of 1983 production, processing and marketing costs and provide some profit.

28. The extent of seed produced on the Gezira and its general availability and pricing should be determined to be in support of the growing interest in private seed production. It is suggested that they sell seed at a price which allows a fair return on the investment with adequate profit margin.

Financing of Pilot Project

29. It is recommedned that a brief description of this meeting be quickly written up and coupled with the participants' recommendations, the Pilot Project proposal, and a copy of the workshop program and be sent to donor agencies such as the following for their consideration of support.

1. Arab Funding Agencies
2. FAO (Food & Agriculture Organization)
3. GTZ (German Agency for Technical Cooperation)
4. IDRC (International Development Research Centre, Canada)
5. ODA (Overseas Development Agency, UK)
6. SIDA (Swedish International Development Agency)
7. The Swiss Development Agency
8. The Rockfeller Foundation
9. UNDP (United Nations Development Program)
10. USAID (United States Agency for International Development)

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Comments

The Conference noted with appreciation that the Sudan Gezira Board undertook the production of 30 feddans of hybrid seed this year using their own resources; and, that they are interested to greatly expand production next year. The Conference also appreciated that interested individuals are coming forward to produce the hybrid using their own resources.

Those at the Conference wish to express a deep sense of gratitude to the ARC for hosting the Workshop and to INTSORMIL for supporting it. They also wish to express thanks to the NSA and the SGB for the field visits.

Democratic Republic of the Sudan

Ministry of Agriculture & Irrigation

PILOT PROJECT FOR HYBRID SORGHU SEED PRODUCTION, DISTRIBUTION AND UTILIZATION

A PROPOSAL

November, 1983.

PILOT PROJECT FOR HYBRID SORGHUM
SEED PRODUCTION, DISTRIBUTION &
UTILIZATION

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I. BACKGROUND & JUSTIFICATION

A. INTRODUCTION

Sorghum (Sorghum bicolor) is the most important grain crop in the Sudanese economy and diet. It ranks first both in total tonnage of grain produced and total area cultivated, with over 1/3 of the total crop land in the country devoted to sorghum. Every year some 75% of the total cereal production in the Sudan is generated from sorghum. Currently, the total area under sorghum is over 3 million hectares and over 2.5 million metric tons of sorghum grain is produced; whereas the total production from all other cereals (millet, wheat, rice and maize) is less than one million tons.

Sorghum is produced in all provinces of the country, from the arid region of the North to the high rainfall climate of Southern region. However, the bulk of the crop is grown mainly in the Central Clay Plains which include the provinces of Kassala, Gezira, Blue Nile and Southern Kordofan accounting for over 65% of the total sorghum production in the country. Over 90% of the total sorghum acreage is under rains and about half of that is mechanized.

B. STATUS OF SORGHUM RESEARCH IN THE SUDAN

Sorghum improvement program in the Sudan is many years old. The Gezira Research Farm at Wad Medani was established in 1918 and although very little effort was spent on crops other than cotton, some attention was given to sorghum research owing to its role in the rotation of the cotton growing schemes in the nation. Most of the sorghum research activities in those early days included collection and evaluation of local sorghum germplasm and by the 1930's, some introduction of exotic sorghums had started.

A full fledged sorghum improvement program came into existence in 1952 with the establishment of the Central Rainland Research Station at Tozi. The national responsibility to undertake research on all aspects of sorghum improvement was delegated to this station and later on moved to Kenana Research Station at Abu Naama. Today a good multidisciplinary sorghum improvement program has developed at the Gezira Research Station in Wad Medani.

One thing that appeared to have been very evident through the work of several scientists at Tozi and Abu Naama was that the traditional local varieties were too late, too tall, physiologically inefficient and unadaptable to the ever increasing mechanized farming. It was also reported that exotic introduction brought in at that time were not immediately adaptable. Hence selection within local types for dwarf, early maturing, combine types was initiated by Walton and pursued by Tahir and then by M.A. Mahmoud.

The series of selection efforts in local sorghum types resulted in the isolation of such popular name varieties as Tozi Umbenins, Feterita Maatuk, Mugbash, Bahana, Dwarf White Milo, Gadam El Hamam, Dabar, and Karkatib. A number of these elite varieties from the sorghum research are now in farmers' hands in the Central Clay Plains. It was soon realized, however, that most of these improved local types, while physiologically efficient, and well adapted to conditions intended for, possessed poor grain quality. This prompted change in orientation of the sorghum improvement program and emphasis was put instead on hybridization mainly among local selections.

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At about the same time in the 1960's, some activity on hybrid sorghum program was also initiated. Nevertheless only a limited success was possible from both the diversification and the planned hybrid program as this demanded more of the scarce resources - more attention of senior staff whose responsibilities included several other crops, technical personnel who were totally lacking, funds and facilities.

Breeding program on sorghum hybrids was later reinitiated in the early 1970's initially with AID and received the full attention and the continuity it needed with the advent of the ICRISAT/Sudan Cooperative Program for Sorghum and Millet improvement in 1977.

Today the hybrid sorghum improvement activity at the Gezira Research Station is a full-fledged program. In the last four seasons (1979 - 1982) over 3000 experimental hybrids have been synthesized, evaluated both under irrigated and rainfed conditions. This has led to the identification of three elite hybrids with a combined mean average of 50% over open pollinated local varieties in a total of 21 yield trials over four crop seasons. Experimental seed production on these three elite hybrids conducted, each on a one acre area, during the 1982 crop season indicated that two of the experimental hybrids were easily produceable. These results from four years of yield trials data and the experimental seed production testing were presented to the Sudan Plant Propagation and Variety Release Committee earlier this year. On the basis of this document, the Committee at its 24 January 1983 meeting officially released one experimental hybrid (EEH-3) as the first commercial sorghum hybrid in the Sudan and renamed it in Arabic "Hageen-Durra-1" (Sorghum Hybrid No.1). The released hybrid is high yielding, early maturing, easily produceable and possesses bold yellow grains. It gave an average yield of 5189 Kg/ha or 158% of the local under irrigation and 2968 Kg/ha or 152% of the local under rainfed conditions.

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C. POTENTIAL OF COMMERCIAL HYBRID SORGHUM IN THE SUDAN

The potential for commercial sorghum hybrid production in the Sudan is very good and will perhaps be a natural development. For several years now, the national sorghum improvement program undertook intensive selection for short combine types within the otherwise good local varieties to meet the demands of the rapidly expanding large mechanized farms. These large mechanized farms are owned by farmers who are profit oriented and who understand the economics of the farm business fairly well. Such farmers could easily be convinced to pay more for good quality hybrid seed. In the Central Clay Plains which essentially constitute the sorghum belt of the Sudan, sorghum production has been mechanized and the farm size very big that short combinable types have been on good demand. Even in the irrigated sector particularly in the Gezira, where optimum conditions could be provided, the current yield levels of sorghum are woefully low. The use of good quality seed will substantially increase yields and also promote the use of a package of cultural practices. In much of the rain lands seasonal precipitation is usually unpredictable and unreliable that in some years yield reductions and even total crop failures do occur. It is believed that, superior hybrids identified under local conditions will have a rapid influence in increasing and stabilizing yield levels in the rain lands. In general F1 sorghum hybrids, with their vigorous early growth, fast rate of growth, and ability to efficiently utilize limited moisture, produce higher yield under stress conditions than do varieties. In most of the major sorghum producing countries, introduction of hybrids has revolutionized agriculture. Judging from the performance of the released hybrid, it holds similar promise in Sudan.

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D. SUDAN SEED PROJECT

Currently a reorganized National Seed Administration (NSA) exists under the Under Secretary for Agricultural Services within the Ministry of Agriculture and Irrigation. The new project is financed by the African Development Bank (ADB) and African Development Fund (ADF) and includes a technical assistance component executed by FAO.

Under its present structure the NSA comprises of Plant Propagation Administration (PPA) and Seed Certification Administration (SCA). The PPA is the unit that is given the responsibility of producing all basic varietal seed and of certified seed required by private farmers. The SCA with its field inspectorate and a seed testing laboratory at Sennar is charged with the responsibility of preserving identity and ensuring good quality seed.

The Sudan Seed Project, however, does not include hybrid seed production and distribution and in its present form at least does not have provision for a hybrid seed industry composed of independent growers, producers, processors and distributors including the private sector. With the recent release of the first commercial sorghum hybrid in the country, however, it is highly imperative that a systematic arrangement be developed soon for the production and marketing of hybrid sorghum in the Sudan. It is anticipated that this first commercial sorghum hybrid will help generate a concept of seed as different from grain and thus preclude the necessity of any kind of subsidy on seed. In addition, the production and marketing of hybrid seed has different requirements than for varieties; as farmers must purchase seed on an annual basis; the volume of seed required increases so that private commercial interests are encouraged.

II. THE PROJECT

A- Title: Pilot Project for Hybrid Sorghum Seed Production, Distribution and Utilization.

B- Objectives:

1- To organize scheduled production of different categories of seed (breeder, foundation and certified) by both the public and private sectors.

2- To undertake an aggressive extension and demonstration program on the use of sorghum hybrids.

3- To capitalize on the concept of hybrid sorghum seed in promoting the use of improved seeds in general.

4- To utilize the hybrid seed program as a vehicle for promoting better management practices for sorghum production.

5- To train technical staff from both the public and private sectors in various aspects of the seed program (production, processing, certification and distribution).

6- To arrange a study tour of the seed industry , for a relevant team of Sudanese representing the Ministry of Agriculture, the NSA, (PPA and SCA), the Agricultural Research Corporation (ARC) and seed producers, in countries where it is now functional.

7- To develop plans, based on experience gained during the Pilot Project, for the establishment of a Sudan Hybrid Sorghum Industry involving both the public and private sectors.

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C- PROJECT ORGANIZATION

1. Participating Organizations.

The government units participating in the project are:

(a) The National Seed Administration (NSA). NSA will provide leadership to the project. NSA will also be responsible for production of foundation seed, seed testing, processing and certification and would provide technical assistance to SGB, MFC and private companies in seed production. The principle of the separation of production and quality control should be clearly implemented resulting in an autonomous independent quality control organization.

(b) Agricultural Research Corporation (ARC). ARC will provide NSA and other foundation seed producers with breeder's seed and will assist in technical matters related to production and certification.

(c) Sudan Gezira Board (SGB). SGB will assume the responsibility of producing certified seed to be marketed within, and if possible, outside of the Gezira. SGB will also plan and execute an extension programme to promote utilization of the hybrid particularly by their tenants.

(d) Mechanized Farming Corporation (MFC). MFC will take the responsibilities of producing certified seed and promoting hybrid seed utilization by sorghum growers in the rainfed mechanized areas.

(e) Private Seed Industry. The seed industry should be encouraged in all aspects of seed production, processing, and marketing which also will promote utilization of hybrid seed.

2. The Project Leader.

A senior member of the NSA has been designated to be the leader of the Pilot Project and participate on the Advisory Committee. He will be stationed at Wad Medani to work in close association with ARC, SGB, and other interested parties.

3. Project Advisory Committee.

To coordinate activities and facilitate communication between the different units and to assist the project leader in handling technical and administrative matters, an advisory committee of representatives from the participating administrations has been formed as follows :

1. Director General (NSA) - Committee Chairman
2. Project Leader
3. Counterpart Project Leader
4. Agricultural Manager, Sudan Gezira Board
5. Agronomist, Mechanized Farming Corporation
6. Head, Plant Breeding Section, Gezira Research Station
7. Sorghum Breeder, Gezira Research Station
8. Seed Project Coordinator.
9. One or two private entrepreneurs (yet to be appointed)

4. Counterpart project leader, and short term consultants.

Although national specialists in individual pertinent fields of knowledge are available, expertise in planning, executing and evaluating comprehensive programmes for production, quality control, and marketing of seed of hybrid varieties is lacking. The services of an expatriate counterpart, for the life of the project, with experience and knowledge from a country with an established seed industry, as a participant in this project, could valuably interact as questions and problems arise. He could also assist in providing a continuity of activity and in the identification of consultants making their contribution more effective.

- HYBRID SORGHUM SEED PRODUCTION, PROCESSING, CERTIFICATION AND DISTRIBUTION.

A provisional schedule of seed production for the various categories is depicted in Table 2.

1. Production.

(a) Breeder seed.

The responsibility of continually providing nucleus seed of parental lines (A, B & R) for released hybrids is generally the responsibility of plant breeders of the developing agency - in this instance the Gezira Research Station (GRS), Agricultural Research Corporation. Enough breeder seed should be made available to supply the needs of all foundation seed producers approved by the advisory committee of the Pilot Project. Adequate quantities of seed should be produced for two or more years and held in good storage conditions. This will protect the availability of breeders seed in the event of crop failure.

(b) Foundation seed:

The availability of adequate amounts of good quality foundation seed must be insured in support of commercial production. The production of foundation seed is initially the responsibility of the National Seed Administration but private producers should also be encouraged to produce as required.

2. Processing:

Under the new investment project (Sudan Seed Project) credit will be extended to seed producing agencies for the procurement of seed processing equipment. Therefore, all seed produced by the agencies including the PPA will be processed directly by the producers. In addition the NSA will assist private growers with processing of their seed during the project period on an equal opportunity basis. The establishment of processing plants for the private sector including the importation of equipment should be encouraged.

3. Quality Control:

The Seed Certification Administration has the responsibility of operating a certification program and seed quality laboratory to encourage the production of good quality seed by the corporations as well as the PPA and private producers.

4. Marketing and Distribution:

Breeder seed will be supplied by the ARC to the Plant Propagation Administration on a continual basis. Foundation seed will be made available to all growers of certified seed at a premium price. There should not be any subsidy element for foundation seed marketing and distribution. Certified

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hybrid seed produced by the corporations will be marketed to their respective tenants and others according to a pricing policy covering production, processing, and marketing costs and including a margin of profit. It is anticipated that the NSA will concentrate its efforts on the production, processing, and marketing of foundation seed. Private producers will be encouraged to develop their brand names and sell certified seed grown on their farm or farms organized by them at the price of hybrid sorghum seed competitive in the market.

E- EXTENSION AND DEMONSTRATION

Although production of good quality seed will be a major activity, yet success of the project will basically depend on farmer's acceptance of the hybrid. Prospective growers need to be educated and informed about the hybrid. A carefully organized program employing appropriate and effective information and educational techniques to positively influence farmers perceptions about the attributes of the new hybrid, will be launched. In addition to seed, recommended and sound management practices will be promoted. Well-managed, well-distributed demonstration plots will be the primary extension tool.

F- TRAINING

It is planned to have short-term training opportunities available for technical assistants from the participating agencies both locally and abroad. A total of 7 technicians will be sent abroad, each for a period of 6 months, to obtain training in the areas of seed production and processing (6), and certification (1). In addition internal courses will be arranged at Wad Medani or Sennar on aspects of seed production, processing and certification.

III- BUDGET

A- ESTIMATION

While establishing this pilot project a projection was developed for the production of breeder, foundation, and commercial seed (Table 2). The various public and private inputs into these projection have been estimated. This level of production is considered adequate to enable the pilot project to contribute toward the various organizations taking up defined activities. It also provides resources for study tour and training. Already, hybrid sorghum seed is being produced using the producers resources, a development that is expected to expand and that should be encouraged during the project period. Money provided by the donor(s) of this project should be kept separately identified by the various participating agencies only in support of this project.

B- PERSONNEL

A counterpart project leader knowledgeable and experienced in seed industry development is to be hired. The services of a consultant during each year of the life of the Pilot Project for a period of about 13 man months is to be sought. In addition allowance has been made for overtime of support staff and per diem expenses for all members involved in the Pilot Project.

C- TRAINING

Budget has been allocated for training of a total of 7 technicians abroad, as well as organizing local training programs for about 60 other technicians in the areas of hybrid seed production, processing, quality control and certification.

D- EQUIPMENT

Provision has been made for the purchase of 3 vehicles for use by NSA, SGB, MFC and ARC staff involved in the Pilot Project.

E- OPERATIONAL INPUTS

Budget estimation for labour includes support for MFC, SGB, NSA, and ARC according to size of area of production tentatively scheduled. Provision has also been made for fuel (600 gallons per vehicle per year), oil, lubricants and spare parts for project vehicles. The use of nitrogen fertilizer at the rate 2N (80 kgN/ha) as well as recommended herbicide (sorghoprim) has been advised and budgeted. Allowance has also been made for purchase of materials for effective extension support as well as packaging materials. Provision has also been made for the transport and processing of all categories of seed from the production sites to the processing plants and stores, including the cost of labor and seed dressing material required. Contingencies to cater for insecticides, hand tools, stationary, etc. were also budgeted for in this proposal.

Table 1:- Budget Proposal

Particulars	Cost Estimates (Dollars) Year 1	Year 2	Year 3	Total
A- Personnel				
1) Counterpart Project Leader	84,000	90,000	96,000	270,000
2) Consultant(s)	36,000	18,000	24,000	78,000
3) Overtime (skilled Labour & drivers)	3,680	8,180	16,480	28,340
4) Per diem (including drivers)	5,050	6,700	9,100	20,850
5) Advisory Committee	1,200	1,200	1,200	3,600
B- Training				
Abroad (Technical Assistants)	71,400	186,000	-	257,400
Internal (20 per year)	16,200	6,000	6,000	28,200
Study Tour (10 people)	66,000	-	-	66,000
C- Equipment				
3 Pick-ups (2 NSA + 1 SGB)	60,000	-	-	60,000
D- Operational Inputs				
1) Labour	16,050	31,200	73,650	120,900
2) Fuel (600 gallons per vehicle per year)	5,400	6,750	8,500	20,650
3) Lubricants & Oil	600	750	950	2,300
4) Spare parts for vehicles	-	3,000	6,000	9,000
5) Fertilizer (Urea)	9,720	15,720	29.[illegible],920	55,360
6) Herbicides	4,025	7,400	13,625	25,050
7) Packaging material	1,865	4,010	8,311	14,186
8) Extension material	3,000	3,000	3,000	9,000
9) Transport & Processing	2,390	5,165	10,730	18,285
Sub-Total	386,580	393,075	307,466	1,087,121
Inflation (10-12-15%)	38,658	47,169	46,120	131,947
				1,219,068
				158,478

Table 2 :- Provisional Target of Seed Production

Year	ARC	SGB	NSA	MFC	Private	Total
	(Breeder's seeds:KGF:M (Female 3kg/fed.; Male 1kg/fed)					
1982	10F: 2M					10F: 2M
1983	100F: 5M					100F: 5M
1984	100F: 5M					100F: 5M
1985	100F: 5M					100F: 5M
1986	100F: 5M					100F: 5M
	Foundation Seed: KGF: M (Female 3Kg/fed.: Male 1Kg/fed)					
1982	120F: 40M					120F: 40M
1983			540F: 180M			540F: 180M
1984			1365F: 455M			1365F: 455M
1985			3000F:1000M			3000F:1000M
1986			6000F:2000M			6000F:2000M
	Commercial (Hybrid) Seed: area in fed.					
1982	1					1
1983		30	5	5	-	40
1984		90	50	25	15	180
1985		180	100	100	75	455
1986		540	75	160	225	1000

Female parent seed rate : 3 Kg per feddan

Male parent seed rate : 1 Kg per feddan

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List of Donor Agencies

1) Arab Fund for Economic & Social Development
P. O. Box 21923
SAFAT, KUWAIT.

2) FAO Representative in the Sudan
Khartoum.

3) The German Agency for Technical Co-operation
GTZ
Ministry of Economic Co-operation BMZ
Karl Marx Strasse 4 - 6
5300 BONN 12, Federal Republic of Germany.

4) Canadian International Development Agency
200 Promenade du Portage
Hull, Quebec
Canada - KIA - OG4

5) Overseas Development Administration
Eland House, Stag Place
London, SW1 E 5DH, United Kingdom.

6) Swedish International Development Authority
S.10525 Stockholm, Sweden.

7) Swiss Development Co-operation
Eigerstrasse 73
3003 Berne, Switzerland.

8) The Rockfeller Foundation
1133 Avenue of the Americas
New York - N.Y. 10036, U.S.A.

9) Resident Representative
U.N.D.P.
Khartoum.

10) U.S.A.I.D.
Street 51
New Extension, Khartoum.
(Attention: Mr. Eric Witt).

11 Director General
ICRISAT (For information)
Hyderabad, India.

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