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POTENTIAL OF SORGHUM AND MILLET PRODUCTION IN SUDAN

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INTRODUCTION

Sudan is the largest country in Africa, covers an area of 2.5 million sq. kms., equivalent to 250 million hectares. The cultivated area amounts to seven million hectares. However, conservative estimates are that about 35 million hectares is suitable for crop production, 60 million hectares for range land and 30 million hectares for forests. This indicates that only about 20 percent of the country's arable land potential is utilized (3 % of the total area and 8.5 % of the total cultivable land). This indicates that Sudan has vast potential for agricultural development.

Sorghum and pearl millet are staple food for the majority of the inhabitants. Over 50 percent of the entire cropped land in the country is planted to these crops (Table 1). Sudan with an area of about two million hectares under sorghum and one million hectares under millet is one of the major producing countries. Ninety percent of the total sorghum area is rainfed, 9 percent is under irrigation

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Table 1: Area, production and average yield of the seven main crops in 1974/75 and 1975/76.

| Crop | 1974/75 [*] | | | 1975/76 [*] | | |
|-----------------|----------------------|----------------------------------|-----------------------|----------------------|----------------------------------|-----------------------|
| | Area 000 ha. | Production 000 metric tons | Production kg./ha. | Area 000 ha. | Production 000 metric tons | Production kg./ha. |
| Cotton | 512 | 647 | 1264 | 415 | 321 | 774 |
| Sorghum | 2342 | 1701 | 729 | 2677 | 2027 | 757 |
| Millet | 1081 | 401 | 371 | 1055 | 404 | 381 |
| Sesame | 912 | 233 | 255 | 963 | 239 | 248 |
| Ground- nuts | 753 | 230 | 1235 | 868 | 932 | 1074 |
| Corn | 82 | 46 | 550 | 89 | 55 | 614 |
| Wheat | 248 | 269 | 1098 | 300 | 264 | 881 |

^{*} Source: Sudan Year Book of Agricultural Statistics, June 1977.

and 1 percent is under flood with an average yield of 1, 1.5 and 1.2 tons per hectares respectively. Pearl millet is grown on poor land under traditional management conditions, all of it under rainfed conditions with an average grain yield of 500 kgs. per hectare.

Agricultural research in the Sudan:

The first organised agricultural research work in the Sudan was undertaken by Wellcome Tropical Research Laboratories which was established in 1903 and later merged with Shambat Research Station. In 1918, Gezira Research Farm, the head quarter of agricultural research in the Sudan was established at Wad Medani. In the beginning almost the entire attention was placed on cotton production. Need for self sufficiency in food stuffs and other agricultural products was felt in war conditions and diversification of agricultural production was felt necessary. The interaction of a particular crop with the environment and adjustment of environmental conditions by agricultural practices to improve crop production were considered as areas of great importance to investigate.

Research accomplishments-sorghum and pearl millet:

Sorghum breeding program started with the establishment of Central Rain Land Research Station at Tozi in 1952. The experiment station had a plant breeder, agronomist, botanist, agricultural engineer, soil scientist, pathologist and entomologist. Later, in 1963 sorghum breeding activities were shifted to Abunama and in 1973 extended to Wad Medani. At the present time sorghum research has extended to include Wad Medani and Abunama as the main stations, Tozi, Agadi and Samsam as testing locations.

The early objectives of the sorghum breeding program were aimed at producing high yielding varieties suitable for

combine harvesting to be utilized on the mechanised crop production schemes. Crossing program and selection of Sudanese stocks resulted in a number of varieties some of which are suitable for machine harvesting. Some of the varieties released to-date are TUB 7, 11 and 22 and selections of Dabar, Karkatib, TW AKAR 51/3, Fat. Maatug 7, Gadam El-Hamam and Dwarf white milo.

Most of the earlier released varieties did not find wide acceptability as they were considered of low grain quality for bread by farmers and consumers in most parts of the country. Crosses between popular good grain types and high yielding poor grain types did not achieve great progress. American hybrids and exotic sorghum varieties were introduced in early stages of the program and were found low yielding and poorly adapted in comparison to local varieties. However, some later introductions gave yields comparable to the best locals.

Continuous selection in local stocks resulted in high yielding, good grain and combinable variety Dabar 1/1/1/1. This variety has wide acceptability. However, selections from crosses made in late sixties, between indigenous varieties, yielded many progenies superior to Dabar. In trials conducted at five locations during the last two seasons more than 25 have outyielded Dabar in mean grain yield over locations up to a margin of 80 %. Recently, an intensive program for the development of high yielding hybrids has also been undertaken.

Pearl millet received very little attention from research workers inspite of its importance as staple food for 3.5 million people of Western Sudan. Essentially no research work was done on this crop until 1973 when ALAD sent out a small nursery to the Gezira Research Farm at

and Medani. There has been a growing interest in pearl millet since then. Some collection and screening of local material has been done on a limited scale at El-Obied in Kordofan Province.

Sudan development plans:

The Sudan's six year development plan (1977 - 1983) requires an investment of about US\$ 6.5 billion. It is estimated that this investment would produce a growth rate of GNP of 7 % to 8 % annually. The ten year-basic Agricultural Development Program for the Sudan prepared by the Arab Funds for Economic and Social Development (AFSED) would be of great significance for the country in the realization of these investment targets. This program would be part of a 25 year plan to make the Sudan the primary source of food for Arab countries, it estimates that by 1985 the Sudan would provide 42 % of the Arab World's total vegetable oil consumption 58 % of its basic food and 20 % of its sugar needs. Total cost of the basic program over a ten year period would be US\$ 5.7 billion, out of which US\$ 2.0 billion have been earmarked for agriculture and would form the core of agricultural development within the six year plan (1977 - 1983). Twelve Arab governments on November 1, 1976 signed an agreement establishing an autonomous body, the Arab Authority for Agricultural Investment and Development (AAAID), to implement the basic program. The authorized capital of AAAID has been established at US\$ 510 million. Between 1975-85 plans are to double cereal out-put to about 5 million tons.

There are five main land use types in the Sudan:

- a) Perennially irrigated cropland: such as Gezira, and Khashm El-Girba schemes,
- b) land irrigated through flush irrigation such as the schemes in Gash and Tokar deltas,

- c) land rotation and grazing: mixed farming based upon a subsistence economy,
- d) used unimproved grazing which consists of land used by nomadic and semi-nomadic pastoralists; and
- e) land under shifting cultivation which is confined to the southern and central rainfed parts of the country.

One of the potentials for further developments in Sudanese agriculture appears to be on the expansion of the cultivated area of the north of the country particularly on the central clay plains and the greater use of mechanisation in agricultural production. But for any such developments to take place there are two essential prerequisites: adequate finance and a vastly improved transport infrastructure.

With regard to transport several projects are at present underway to improve the existing situation such as the construction of all weather road from Khartoum/Port Sudan and Kosti/Wad Medani on the Blue Nile.

Aside from the horizontal expansion of the cultivated area there is great potential if yields per unit area could be increased vertically. Yield levels of sorghum and millets are quite low and it is assumed that with better management and improved varieties the targets of doubling cereals output could be achieved.

Future out look and research plans:

In 1977 an intensive breeding program was started with the objectives of developing high yielding and drought resistant varieties and/or synthetics which will be adapted to different agroclimatic zones of the country. Large numbers of exotic breeding lines, varieties, synthetics and hybrids were introduced from International Crops Research

Institute for the Semi-Arid Tropics (ICRISAT). Some of the pearl millet lines were tested in a national trial to test their performance in millet growing regions of the country. Based on the results of four locations, it was found that there is scope for direct introductions. Also, improvement in local varieties is possible by crossing and selection programs.

Clearly, the past efforts on sorghum have been aimed at producing varieties satisfactory for large mechanised farms. The requirements of the small farmers have essentially been neglected. This could explain the reason behind neglecting pearl millet since there is no large producing schemes for the later.

Presently the following factors are considered as major constraints limiting the productivity of these two crops:

1. Non-availability of high yielding millet varieties.
2. Lack of drought and heat resistant and early maturing varieties.
3. Management limitations under mechanised farms. For example lack of precision in planting resulting in low plant stand and inadequate or absence of intercultivation allowing profuse weed growth.
4. Striga hermonthica (Witchweed) is a serious problem in most of the sorghum and millet growing regions resulting in poor plant growth and less grain production.
5. Insects, pests and disease problems such as stem borers, head worms, birds, downy mildew, smut and ergot diseases.
6. Lack of trained staff in the fields of breeding, crop physiology and mechanised crop production agronomy.
7. Inefficiency of extension services.

Keeping in view the factors which limit sorghum and millet production, it is felt that applied agricultural research for improved crop production in irrigated and unirrigated areas is the current need of the country. An integrated farming systems program should be developed. A number of studies like plant density, fertilizer usage, seeding depth, cultivation, management of soil and water needs to be tackled immediately. In number of places in the country during the rainy season, a part of the area is flooded, it may be desirable to develop rain water storage facilities by making ponds or water sheds to improve the traditional farming practices. Since there is no well equipped research station for millet research in the millet growing areas of the country, it will be desirable to establish research stations and testing sites in Western Sudan. To tackle the problem of parasitic weed striga which is very serious on traditional farms program to identify and breed striga resistant genotypes is likely to be initiated in 1978 with the financial assistance of International Development Research Centre (IDRS).

In summary it can be said that the Sudan has a wide potential for agricultural development and with the assistance of Arab oil money and expansion of applied research through international cooperation this potential is most likely to be realised, so that the country could become one of the African and Arab World's main food suppliers. But for this to occur the problems of transport and communications, and poor bureaucracy have to be overcome.