

THE ACCOMPLISHMENTS AND CONSTRAINTS OF SUNFLOWER RESEARCH IN UGANDA.

by

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July 1992

1. INTRODUCTION

The exact date of introduction of sunflower (Helianthus annus L) in Uganda is not known though records have it that it is an indigenous N. American crop possibly brought in by missionaries as one of the experimental crops in Uganda in the 1920s and 1930s (Rita Laker-Ojok, 1986). Although by the 1960s it was widely grown in many parts of the country, the National Sunflower Programme was not launched until 1988. Prior to 1991, no improved varieties were widely available and no variety had ever been presented to the release committee for consideration. Previously Ugandan farmers depended on land races and scanty imports of seeds from neighboring countries. In most cases farmers were using seed retained from ornamental or confection varieties of Russian or Kenya origin which had been introduced in Uganda in the 1960's and 70's. Oil content of these seeds varied from 10 to 30%. The white seeded varieties having the lowest oil content, followed by the striped and black varieties respectively. Sunflower varieties with thin seed coats are usually higher in oil content than those with thick coats and are preferred for crushing because they cause less damage to the screw presses. Although seed color is not always an indication of oil content, usually dark colored seed tend to be higher in oil content than light colored seeds (Buker J.R. and Denton G.W., 1991).

A number of private, cooperative and religious organizations have promoted sunflower growing at various times. Currently the biggest private promoter of sunflower growing is Mukwano Industries. Since 1991, Mukwano Industries has contracted farmers in Northern, Western and Eastern Uganda by supplying them with seeds and buying the harvested crop from them at a pre-agreed price. Nyakesi oil mill, under South Bukedi Cooperative Union has also supplied seed to farmers in Tororo District and then bought the harvested crop from them. The Karamoja Seed Scheme, which is sponsored by Church of Uganda, multiplies and sells the striped type of sunflower seed even though the variety has never been tested or released for distribution in Uganda. In general the Karamoja Seed Scheme is primarily interest in crops which are suited to the semi-arid climate of the most northeastern corner of Uganda. The Catholic Church is promoting sunflower growing and oil extraction in Fort Portal, Hoima, Luwero, Arua, Kabale and Gulu. Improved sunflower seed has, at times, been imported and distributed in the vicinity of these mills, but it has been neither evaluated for suitability nor scientifically multiplied to retain purity.

Without careful isolation, sunflower is readily cross-pollinated by the activities of bees and other insects. As a result, most of the sunflower in Uganda is highly mixed. It lacks uniformity in color, maturation period, height, yield, and oil content.

Though northern and north-eastern Uganda are most suitable for sunflower production because of their semi-arid ecology, evidence suggests that it can also be produced in the southern and western regions. It should be noted here that the first trial areas for sunflower were Ankole and Kigezi in western Uganda in 1947 and 51 tons of sunflower were reported sold in Kigezi alone in 1950. Thereafter, the crop was grown on commercial basis not only in this area but also in West Nile, Acholi, Lango, Teso and Karamoja. The table below shows national figures for sunflower exports from 1959-1973.

Table 1 Sunflower Exports 1958-1973

<u>Year</u>	<u>Tons</u>
1958	172
1959	262
1960	292
1961	67
1962	20
1963	87
1964	108
1965	105
1966	66
1967	23
1968	251
1969	262
1970	209
1971	58
1972	-
1973	3
1974-79	-

Source: Rita Laker-Ojok, 'The Edible Oil Industry and Its Relationship to Economic Development in N. Uganda', November 1986

2. SUNFLOWER AGRONOMY

Sunflower grows well in soils ranging in texture from sand to clay. It does not require as high levels of fertility as do maize, wheat, and Irish potatoes in order to produce satisfactory yields. Because it produces a lot of bot protein and oil, however, it extracts a considerable amount of nutrients from the soil, especially nitrogen. Soils should have good drainage for sunflower production, but the crop does not differ greatly from many other field crops in this respect.

Like most field crops, sunflower requires the kind of good seed-bed which results from carrying out a second ploughing if the field is planted on virgin land. By ploughing only once on already cultivatable land, however, a farmer can reduce his variable costs of production. By and large farmers have now adopted improved methods of planting. The crop was initially broadcast done before sunflower gained popularity from various institutions. Line planting, however, is now dominant with recommended spacing of 75cm by 50cm and 2 seeds per hole. An application of P₂O₅ fertilizer before planting and 60kg/ha of Nitrogen at thinning are recommended. Thinning can be done to leave only one or two plants to a hill resulting in an approximate plant

population of 55,000 plants/ha. Lower plant populations are recommended in areas where rainfall is limited (on average 33,000-45,000 plants per acre in semi-arid areas). This compares with a recommendation for 45,000-60,000 plants/ha in areas where there is more moisture.

A wide range of planting dates can be used for sunflower because the growing season, in second rains for instance, is longer than that required by commonly grown varieties. However, the highest yields and oil percentages are obtained by planting early (Robinson 1978). A planting depth of 3cm is excellent in moist soils or if rain is imminent. Seed can be planted to a maximum depth of 10cm if necessary to reach moisture. Sunflower planted 9cm to 15cm deep yields 10-28% less than that planted 7cm deep (Robinson 1978).

Whether the farmer weeds once or twice mostly depends on whether ploughing was done once or twice. If ploughing was done once, then weeding is normally twice and vice versa. This is done to minimize production costs and save labor.

Sunflower yield is influenced by three factors:

- a) Number of heads per hectare
- b) Number of seeds per head
- c) Average weight per seed.

The number of heads per hectare influences yield more than the other two variables. Since under normal circumstances there is only one head per plant, plant population is the major determinant of yield. It should be noted that sunflower adjusts to low populations by increasing weight/seed and seeds/head and to high populations by decreasing weight/seed and seeds/head. Therefore, yield, which is the product of the three components, remains relatively constant through a wide range of populations except that the size of the head may not compensate for loss of space in case of very wide spacing. Variety, weather, soil conditions and sunflower pests, however, can contribute to considerable variability.

3. SOCIO-ECONOMIC HIGHLIGHTS

a) Socio-economic Importance:

The potential socio-economic importance of sunflower can be perceived in light of its ability to satisfy the edible oil needs of Uganda and as a possible source of cash income for the farming population. It has been estimated that sunflower can satisfy approximately 25% of Uganda's edible oil needs. It has been heralded as the only hope for Uganda's edible oil industry in the short-run because of its potentially high oil content (20-50%). It has, also, been observed by Rita Laker-Ojok (1986), that sunflower production and processing offers one of the few rays of hope for revitalizing the local economy in Northern Uganda in the long run. Because oils are high in calorie content and contain certain essential fatty acids, it has been suggested that increased edible oil consumption would improve the overall nutritional status of the country's population. Uganda's need for edible oil was estimated to be 54,740 MT/yr in 1986. If sunflower were to supply 25% of this, there would be a need for 14,000 MT of sunflower oil (Serunjogi, 1988). If expanded, sunflower production would generate agro-based industrial activities and would also create employment.

Before over-estimating the possible contribution of sunflower, however, it is important to note that sunflower will be grown only where the infrastructure can support a cash crop; ie. where there is a mill and an adequate marketing and transportation system (Buker 1989). Sunflower is

not a subsistence food crop. If sustained production for cash sale is to take place the producer must be able to realize an attractive net profit over the full costs of production including family labor. Similarly, the demand for sunflower is a derived demand, depending directly on the demand for edible oil in the economy and the ability of local processors to compete effectively with alternative sources of oils and fats on the international market.

b) Relative Profitability:

While sunflower has relatively fewer labor demands than do other crops grown for cash such as maize, or cotton, there has been reluctance to expand sunflower production due to low prices offered for it in most locations. In the north, sunflower competes with simsim, cotton and groundnuts. Cotton was the traditional cash crop. When the cotton cooperative marketing system fell apart, however, farmers were desperate for an alternative cash source. For a time sunflower appeared to offer an attractive alternative. Recent increases in the price of cotton as well as the high price and ready market for simsim, have greatly eroded interest in sunflower. The price of sunflower has not risen to keep pace with its competitors. At present simsim generally yields a greater net profit per hectare than most competing crops.

c) Market channels:

Sunflower is a relatively new crop to Uganda farmers and its marketing system is very poorly developed. Growing and marketing of sunflower is still a trial and error exercise. Unlike other food crops which can be consumed domestically, sold directly to other consumers, or through traders for processing or export, sunflower has a much more limited range of potential customers. Oil mills are essentially the only market for the crop.

Consequently the price farmers can obtain is directly tied to the potential for profitable oil extraction and not to the cost of production of the farmers. Some of the mills such as Mukwano, Nyakesi, Kagando, Hoima contract with farmers supply them with seed and later buy the harvested crop at a pre-established price. Prices currently range from 110/= a kg of the black seeded (offered by Nyakesi Oil mill in Tororo) to 160/= a kg (offered by Mukwano and Hoima Diocese upon delivery of the crop at the mill). Mukwano, the largest oil processor, has established wholesale depots for his soap and oil in various locations. These centers act as buying agents for sunflower. Transport costs are therefore cut by reducing the number of empty return trips. Even so, the collection centers are few and the quantity of sunflower produced by an individual farmer is generally very small. A serious vacuum exists at the first handler stage. Low cost mechanisms for bulking and transport to the collection centers needs to be found if farmer and processor margins are to be increased.

4. SUMMARY OF RESEARCH ACCOMPLISHMENTS 1988-1991

In 1988 a National Sunflower Programme was launched at Namulonge Research Station. Serere had been the center for sunflower research years before, but germ-plasm collections were largely lost during the long period of turbulence and political instability.

In the first season of 1988, Serunjogi, Anyanga and Gahakwa set up 2 sets of sunflower variety trials with the objective of identifying the most promising of the imported hybrids when grown under Uganda conditions. The first set was composed of 30 entries, 27 of which were hybrids from Cargill UK Ltd including several hybrids already being grown by Ugandan farmers with 3

peredovicks as controls. Trial Centers were Mubuku and Kabanyolo. Another set had 22 hybrids from Inter-State Seed Co. of Fargo, North Dakota. Two local Peredovicks were included in this trial as controls. The trial center was Mubuku. Fertilizer applied was 40kg/ha of P_2O_5 before planting and 60 kg/ha of N at thinning. A spacing of 75cm by 25 cm between rows and hills respectively was used with 4 seeds per hill. Thinning was done when plants were 15 cm high leaving one plant per hill except on the row ends where two plants were left. This resulted in a population of 55,000 plants/ha.

Results from the trials indicated potential in 4 Cargill hybrids which the breeders safely recommended for importation by MOA. These were S400, S430, and SH 3422 whose average seed yields were within the range of 2000 kg/ha but achieved at least 1300 kg/ha at farmer's level of management with an oil content of 50%. Of the seed from Interstate Seed Co., only one entry, IS7000, was promising. IS7000 is placed well for the short season areas because of its short maturity period (56 days to flowering). It is a short variety, resists lodging and has 52% oil content.

In the same season, Serunjogi and Anyanga undertook to test an open pollinated variety with the objective of introducing an open pollinated variety from another sunflower growing country as a short-term solution to shortage of seed in Uganda. Trials were carried out on a Peredovick from Zimbabwe. This involved testing the adaptability of the introduced variety to the Uganda conditions and screening for desirable plant habits, reaction to diseases and pests, seed yield and oil content. If successful they intended to multiply the variety for inclusion in further yield trials and as a possible supply of seed to the Uganda seed project for future released to the farmers.

This Peredovick was found to be extremely heterogenous, 25% of the stand had multiple heads, 25% were male sterile. Large differences in height, rigor, head size and seed color were observed. Although yields were satisfactory with an oil content of 45%, it was found to be a degenerating hybrid rather than a true open-pollinated variety.

This Peredovick was first tested under farmer conditions in 1988. Then, in the first season of 1989, it was decided to exoand on-farm crop production trials at farmer's level of management following the results from on farm trials of both seasons of 1988. Four districts namely Masindi, Mubende, Luwero and Kasese were selected with 28, 75, 55, and 17 sunflower trials respectively. Even though the season was very dry, except for Kasese where the trial fields were completely destroyed by drought, the sunflower performed quite well compared to the maize and soybean, especially in Masindi where several farmers obtained over 3000 kg/ha of sunflower.

Two technology packages were tested against the farmers indigenous technical knowledge. These were line planting with fertilizer at the rate of 45 kg of N a hectare and spacing of 75 cm by 25 cm between rows and plants respectively and just line planting without fertilizer. In most areas there was no local variety to compare with Peredovick so the demonstration was intended to show the farmer the value of line planting and use of fertilizer. The results are shown in Table 2 below.

The results of these trials showed that new technology package was beneficial to the farmer. Sunflower yields of 1600 kg/ha were realized on several farmers' fields compared to less than 800 kg/ha when farmer's indigenous technology package was employed.

The miserable average yields of sunflower both seasons of 1990 were attributed largely to the combined effect of drought and bird destruction. Unfortunately, these trials were carried out in

an area where marketing of sunflower was problematic. The lack of sure market probably reduced the level of farmer commitment to bird scaring.

C). Development of Sunfola and Hybrid Seed

During the first season of 1989 further tests were done on open pollinated varieties with the objective of getting sunflower seed quickly into the hands of farmers and oil millers. Isolated fields of Peredovick of Russian origin and the Australian variety Sunfola introduced in Uganda in the late 1980s and a number of introduced hybrids were planted by the Namulonge Research Staff. While both Peredovick and Sunfola varieties varied in maturity, Sunfola was determined to be more promising as a quick stable variety that could land in the hands of the farmer within two years.

In both seasons of 1990, Buker, Anyanga, Odongo, Adumo and Namakula carried out breeding and agronomy experiments at Namulonge Research Station, Ngetta and Nakabango Variety Trial Centers located respectively in Kampala, Lira and Jinja with the objective of evaluating introduced hybrids and open-pollinated varieties as well as local open-pollinated varieties in order to identify a suitable open-pollinated or hybrid variety that can be recommended to farmers in Uganda.

Agronomy trials were carried out to determine the critical time and number of weedings in sunflower as well as arrive at suitable plant population and spacing recommendations. Hybrids from Pioneer, Northrup-King, Dekalb, and Cargill seed companies and open-pollinated Sunfola, various Peredovicks, Salut, semi-dwarf and local striped varieties were used. Different weeding regimes were used for the weeding experiments and different hill spacings and plant populations for spacing and population experiments.

Yield, disease incidence, uniformity in maturity, average height and average head sizes were the characteristics looked for. On weeding, comparisons were made among different treatments; no weeding at all, weed once at 4 leaf stage, weed once at 12 leaf stage, weed at 4 and 12 leaf stages, weed once at bud stage and weed at 4, 12 and at bud stages. The treatment for spacing included 75cm by 25cm (53,333 plants/ha i.e. 1 plant per hill), 75cm by 25cm with 2 plants per hill (106, 667 plants/ha), 75cm by 50cm (26,667 plants/ha i.e. 1 plant per hill), 75cm by 50cm with 2 plants per hill (53,333 plants/ha), 75cm by 75cm (17,778 plants/ha i.e. 1 plant per hill), 75cm by 75cm with 2 plants per hill (35,555 plants /ha), 90cm by 30cm (37,037 plants/ha i.e. 1 plant per hill), 90cm by 30cm with 2 plants per hill (74,0784 plants/ha) and 90cm by 45cm (24,691 plants/ha i.e. 1 plant per hill). It was determined that plant populations of about 53,333 plants per hectare using 2 seeds a hill at 75cm by 50cm spacing and weeding twice at an early stage would produce an adequate stand.

Yield tests at Namulonge, Jinja (Nakabango) and Lira (Ngetta) indicated that Sunfola was the highest yielding open-pollinated variety tested in Uganda and that it had an oil content of at least 40% although Peredovick 20 and Peredovick 160 also appeared promising. Similarly among the introduced hybrids, P 6510, NK 285, NK 265, S 400, PXF 584, P 6440 and DK 3849 were the most promising in terms of seed yield.

The team strongly recommended more research to be directed into the yield potential and oil content of the fore-mentioned hybrids and open-pollinated sunflower varieties. Testing should also include the local open-pollinated semi-dwarf and the local striped for further comparison with the introduced hybrids and open-pollinated varieties. Also of concern should be intensive

research into diseases because minor diseases today could ultimately become serious to the extent of destroying potential high seed yield and oil content varieties.

In July, 1990 more than 1,000 kgs of reselected sunfola were harvested at Namulonge Research Station and this was distributed by MFAD to its on-farm trial programme, the Uganda Seed Project, CAAS project (which was assisting the South Bukedi Cooperative Union) and EIL (which has a project to distribute a hand operated oil mill suitable for isolated villages). A few tons went to private oil mills for crushing or were sold to NGOs. While the farmer is enthusiastic about the new technology package; new variety, fertilizer application, line planting and early weed control, he is constrained by lack of cash to buy the purchased inputs. Even when both cash and inputs are available, the low and fluctuating demand for his produce makes input procurement risky.

In both seasons of 1991, more On-Station Trials work was done on introduced hybrids and open-pollinated varieties still maintaining the original objective of finding high yield and oil content varieties suitable for Uganda's soils and climate. Hybrids and open-pollinated varieties of various origins and at least 40% oil content were tried.

Of a test that comprised 47 entries of hybrid seed, CS 430 rated both very high in seed yield and less vulnerable to bird damage under conditions at Namulonge in second season, 1991. This hybrid is capable of surpassing CS 400, hitherto used as a check in many tests, by 1% higher in yield and 4% lower in bird damage. This however has been attributed to the age of CS 400 seed whose seedlings are weaker than those of CS 430 whose seeds are new such that tests at Namulonge and Ngetta show that CS 430 outyields CS 400 by 58% and 33% respectively. A measure of seedling vigor therefore is an important determinant of suitability of seed for planting. In fact the ability of hybrids to stand stress is due to hybrid vigor or heterosis, which is acquired by the offspring which results on crossing inbred lines (Annual Report, 1991) and therefore which makes them strong enough to resist diseases. At Ngetta CS 430 ranked second to IN 3130, a variety from interstate seed company against similar characteristics as in Namulonge. At Nakabango, Pioneer XF 584 yielded highest. CS 430 was not planted at this location. In second season hybrid AGC 91521, IN 3107 came out vigorous and very promising.

Of a test that comprised a number of open-pollinated varieties, a part from a breeding line Record 11-1.7 of Tanzanian origin, which realized high yields and about 40% oil content at Nakabango, other locations like Namulonge and Ngetta, semi-dwarf and local striped yielded highest respectively but with oil content less than 30%. Three lots of New Sunfola that were tried; the one grown 1st season 1990, the one grown 2nd season 1990 and one that was grown by Mitchell Cotts in 2nd season 1990 were similar in seed yield. Record however is a promising open-pollinated variety if its variability can be reduced. Its yields on farmer's fields range from 800-1000 kg/ha compared to Sunfola's 700 kg/ha.

The researchers heralded hybrids over their counterparts, the open-pollinated varieties for their superiority in seed yield, ability to stand stress, and uniformity. The open-pollinated cannot produce good yields without bees. The problem is that bee populations are highest in an environment where there are trees and water. Such an environment, however, is a natural habitat for birds which are the single largest enemy of sunflower in Uganda.

D) Breeder Recommendations:

The breeders came up with a number of recommendations (Annual Report, 1991) and some of them are summarized below:

- i). A lot of emphasis should be put on hybrids rather than open-pollinated varieties of sunflower if Uganda's 98% shortage in the edible oil supply is to be replaced by local production in the near future.
- ii). More research should be directed at the yield potential of the hybrids CS 430, CS 400, IN 3107, AGC 91521, and IN 3130 because they are very promising.
- iii). Germination tests should always include a measure of seedling vigor, because weak seedlings will not result in a good crop.
- iv). The variety Record is likely to be the most promising open-pollinated if its variability is reduced.

E) Current and Future Activities:

The current activities include on-going germplasm evaluation of a number of introduced sunflower varieties. Every season the least promising are dropped as the process of narrowing down the recommendations continues. Currently there are ultra-trials comprised of 12 entries at Namulonge, Jinja, and Lira. Other experiments done specifically at Namulonge are on possible intercrops for sunflower, fertilizer application levels especially for Urea and Potassium. Also in progress are Pathology experiments to identify the types of pathogens that cause sunflower diseases. Diseases so far identified are alternaria and erwinia. Recurrent selection of the Record variety is also ongoing in order to ultimately achieve uniform characteristics in terms of yields, maturity period, height, head size, disease resistance, seedling vigor. It is hoped that researchers will be ready to present a uniform variety of Record for release in 4 years' time. The recurrent selection method generally takes at least 6 seasons in order to realize the desired characteristics.

Maintenance of a breeding nursery for hybrid seed is also another activity in place. The heads of sunflower trial plants are wrapped with paper bags to avoid cross pollination. Pollen is then transferred by hand from one flower to another (controlled pollination), to achieve rigorous and intensified production of hybrid seed.

It is hoped that arriving at a reasonable number of high yielding and oil content sunflower varieties which are resistant or tolerant to disease attack may be realized within 1994-1996 research period. It is expected that it will take until about 1997 to determine the correct recommendations for fertilizer application and possible intercrops for sunflower. In contrast, realization of very good promising hybrid seed may be achieved already by 2nd season 1992.

It has been reported that in 1992 6,000 ha of sunflower are/will be under improved varieties and this has been estimated to rise to 25,000 ha by the year 2,000. This compares to about 2,000 ha were under local varieties in 1990, which is expected to have dwindled/diminished to almost zero within the same period. It is anticipated that the local varieties will have been replaced almost completely by improved hybrids and open-pollinated varieties. The biggest part of the

acreage will be expanding on existing virgin land (80%) while much smaller areas will be acreage where sunflower has been substituted for other crops previously grown. While it is difficult to anticipate which crops will be substituted, it is nearly certain that these will not be crops consumed at household level as food, neither will they be crops that will give net returns or profits more than sunflower.

6. CONSTRAINTS TO SUNFLOWER PRODUCTION IN UGANDA

One of the most serious constraints to sunflower production in Uganda is birds. Many species of birds find sunflower extremely palatable. Sunflower seed is a preferred bird food. The seed contains many proteins and fats essential to bird growth, fat storage and weight maintenance processes (Bazaar 1978). Vehement complaints have been raised from farmers planting sunflower adjacent to such favored bird habitats as marshes, tall grass or tree cover. This is especially true at the stage of initial introduction of the crop into an area. Isolated small plots of sunflower have been known to be virtually entirely destroyed. Though bird damage in Uganda is less in the second season, human bird scarers with catapults and loud voices still remain the only immediately available deterrent measure. This then points to the importance of achieving economies of scale in sunflower production. The larger the field, the smaller a proportion of total yield that can be eaten by a given population of birds. In addition while it may be economically profitable to hire bird scarers for a large field, the returns to a similar expenditure on a small field would be prohibitive. The bird problem also points out the importance of achieving uniformity in height, and maturity within the variety. The wider the time span between maturity of the first and last heads the longer the time the crop is subjected to bird predation. This is further compounded if farmers in the district stagger the planting of their fields or plant a range of sunflower varieties with different maturity periods. If the available bird populations is spread out over many fields which are all mature at approximately the same time, the amount of sunflower they can consume before harvest will be much less than if they all converge on the only sunflower field which happened to be mature at that time.

In Uganda, sunflower is commonly harvested by hand. This is a labor intensive and costly exercise. Manual harvest is necessitated by the lack of uniformity in flowering and maturity time manifest by the available seed stock. This non-uniformity also inhibits any possibilities of harvest mechanization at the moment. The recommended practice is to cut off the heads individually and transport them to a drying floor prior to threshing. The stalks should be left standing in the fields to be later ploughed under as green manure. Farmers, however, have complained that because the heads are high off the ground, manual cutting is very tiresome. In addition, the stalks don't rot very quickly and are difficult to be effectively ploughed under with just a hand hoe. In many places, therefore, farmers uproot the entire stalk. This is especially the case in areas facing severe fuel shortages because the stalks can then be used for cooking. This practice increases the danger of soil depletion. Precious top soil is removed together with the roots, while nutrients stored in the stalks and leaves are not returned to the soil. Harvesting and drying is facilitated by dry weather. For this reason most farmers prefer planting sunflower in the second rains which is generally followed by a longer spell of sunshine.

Diseases, especially leaf spot and stalk and headrots, constitute a major production constraint in higher rainfall areas. The existing world wide sunflower germ-plasm has very limited known tolerance to these diseases. Altered planting dates, careful crop rotation and other cultural practices are the most effective preventatives. It is recommended that sunflower not be grown in the same field in consecutive seasons, and while no adequate studies have yet been conducted

on the extent of the problem under Ugandan conditions, it has been found in other places that sunflower could not be returned to the same field for up to five years because of the problem of disease buildup.

The shortage of seed to meet the current demand for high oil content varieties remains a constraint in the short-run.

7. CONCLUSIONS

Though selection, cleaning and breeding of sunflower is still going on at Namulonge Research Station and other Variety Trial Centers on many other imported varieties for suitability under Uganda conditions and On-Farm Trial program is still continuing, some achievement was realized in October 1991 when Sunfola variety was re-named New Sunfola and released by the Variety Release Committee of the Ministry of Agriculture. To-date Uganda Seed Scheme at Masindi is busy multiplying it to reach the hands of farmers as soon as possible. It is reported that 10 tons of New Sunfola seed has been planted by 5000 farmers in Tororo in 1991. EIL grew 2000 acres, Mitchell Cotts 27 acres, Seventh Day Adventists 60 acres and in addition some unquantified acres were planted by NRA farms, Catholic Church, Church of Uganda and many others (MFAD/MOA/MUFAF, Research Proposals, ID MOA 12, 1992).

There is need for adequate and reliable up-to-date economic evaluation of the improved technology package for sunflower as well as a better assessment of the potential markets for the crop. Continued marketing problems are evidenced by the fact that low oil content sunflower varieties are still being produced which do not command a profitable price and that most oil mills operate at irregular intervals and very much under-capacity due to the lack of seed to crush. Sustained sunflower production depends on the one hand on farmers adopting improved production technologies (high oil yielding varieties, recommended spacing etc.) and on the other hand on the capacity of the existing oil mills to utilize the sunflower at an economically profitable level so as to offer a reasonable price to the farmer.

An expanded program for sunflower research and extension linkages will establish in the long-run the required confidence for a strong supply response. The supply of newly released varieties to small farmers and the technology adoption transfer are believed to be major problems.

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