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INFORMATION NOTE ON SUNFLOWER IN NEW PRODUCING COUNTRIES IN THE DEVELOPING WORLD

To most countries in the developing world, sunflower is still a minor source of vegetable oil and protein compared to other traditional annual and perennial oil crops. In the last five years, only India appeared to have joined the ranks of the world's major producers. The total area under sunflower in the developing world is estimated at 2.2 million ha (see Annex), i.e. less than 25% of the world's total. Of this, nearly 2.1 million ha are concentrated in Argentina, Turkey, India, Uruguay and Iran, in that order of importance. Some 70,000 ha are distributed over Morocco, Tanzania and Mozambique, while an additional twelve countries account for the remaining 50,000 ha. Thus, excluding Australia and South Africa, there are currently about twenty sunflower producing countries in Asia, Africa and Latin America, for which statistical information is available. To this should be added some 15 countries which are marginal producers or which at one time or another indicated an interest in this crop. Except for Turkey, Mozambique, Israel and Chile which have average annual seed yields of 1000-1100 kg/ha, and Argentina, India and Syria with seed yields of about 800 kg/ha, the majority of the other producing countries register annual averages as low as 400-800 kg/ha. These low yields are the result of inadapted varieties, improper cultural practices, temperature extremes and often moisture stress, and incidence of pests and diseases. All this in turn is reflected in a lower oil content than is normally achieved in established sunflower producing countries in temperate zones.

Sunflower introduction

Its adaptability to a fairly wide range of environmental conditions, and above all the promise of high oil yield per hectare in addition to the suitability of utilizing the seed cake for animal and eventually human food, have greatly aroused interest in sunflower. Many developing countries which depend for their vegetable oil supplies on such perennial crops as coconut, oil palm, olive, and such annual oil crops as cotton seed, groundnuts, soyabeans, sesame, safflower, have taken interest in sunflower. Reasons for this interest are declining yields with crops such as olive trees which are often overaged, or because further measures towards yield improvements with other annual oil crops with the existing cultivars do not offer much scope. In some instances, where no domestic source of vegetable oil supplies exist, sunflower is introduced together with other annual oil crops in trial and evaluation programmes to determine the most promising and suitable oil crops for further investigation. In others, sunflower is tried out as an intercrop between young sugarcane following the example of paddy as intercrop to sugarcane. In still others, it is introduced following a rice crop or a small grain crop, making use of available soil moisture at the end of the rainy season.

Agronomic practices

In most new sunflower growing countries, the emphasis has invariably been on agronomic research and on determining the comparative advantage of the crop. Besides fertilizer trials and weed control, considerable time and effort are devoted to determining appropriate sowing dates for various cultivars to coincide with available soil moisture following a main crop, and to avoid excessively high temperatures during the generative cycle which leads to re-

duced fruit setting and lower oil content. In most cases, sunflower is grown as a rainfed crop and efforts are directed towards reducing evaporation loss with a reduced canopy from a lower crop density. It appears that the initial objective is to establish a reasonable crop rather than to aim at high seed yields, high oil and high protein content. Most of the factors that affect yields are "site specific" and will have to be solved locally, e.g. often a good crop is related to the presence of insects helping the fertilization, like bees and other useful pollinators. However, considerable information has in recent years been gathered on plant nutrition, plant-water relationships, weed and disease control, and harvesting practices, which could help solve many of the local problems. As agronomic research is intensified to obtain higher yields, efforts are being directed towards obtaining superior plant material.

Breeding material

Because of their adaptability to a fairly wide range of ecological conditions as well as their relatively low seed cost, most introduction work starts with open-pollinated varieties generally from the USSR and Romania. Since, however, these varieties tend to be bred towards an increasingly narrow range of environmental conditions, their introduction to a new environment often seems to be accompanied by a large variability because of genotype-environment interaction. The supply of suitable plant material becomes more difficult as the advanced producers increasingly replace open-pollinated varieties by hybrids, which may have a narrower range of adaptability and show a much lower performance in a different environment.

Sooner or later countries need to start their own breeding programmes. In view of the environmental limitations mentioned earlier, breeding programmes might initially aim at adap-

tability to local ecological conditions, diseases resistance, good overall seed yield, early maturity and simultaneous ripening, and short stature with small leaves. Recurrent mass selection and the building up of synthetics can produce low cost and satisfactory varieties and composites. With the accumulation of skills and as improved breeding material becomes available from advanced producing countries, increased emphasis will be on hybridization towards precocious seed yield and high oil and protein content, resistance towards local fungal diseases, attractiveness towards pollinating bees and other desirable agronomic characters.

Imported hybrids are often a useful source to develop locally suitable cytoplasmic and genic male sterile lines as well as restorer lines. Some countries have reportedly incurred important losses of lines through self-incompatibility, while the more advanced countries fear the danger of their CMS lines containing the same cytoplasm. Progress in breeding could, however, be much faster if inbred lines of proven combining ability with known resistance to diseases, possessing good oil and protein content could be made available to interested countries.

Processing and utilization

The principal aim of producing sunflower remains the vegetable oil, to which must be added the high protein seedcake for hogs and poultry feed, as well as seed hulls for starter diets for calves. Considerable work is being done on developing efficient decorticating equipment in Europe and America, which should further reduce the hull content in the cake and make the latter more suitable for direct human consumption. In most developing countries where smallholder agriculture is predominent, the development of small capacity

decorticators and oil expellers should help stimulate interest in sunflower. It is to be noted in this connection that advances in small scale processing machines are being made for use in coconut and palm oil extraction.

Assistance to new producing countries

One of the objectives of FAO's endeavour is to further agricultural research and development, among others through international cooperation. Late last year FAO had the opportunity of assisting a number of sunflower growing countries in Europe in establishing a cooperative network on applied research. Since then, other major producing countries and some smaller ones have joined the network. FAO now looks forward to other producing countries to participate in this cooperative effort, to give to it the benefit of their research facilities and expertise, and in turn to benefit from cooperation.

Small and new producing countries may, however, hesitate to join as they often lack sufficient facilities and expertise to participate in the network's main activities which comprise experimentation of sunflower hybrids in comparative trials, sunflower diseases mapping, chemical weed control, and study on variability of fatty acids and tocopherols in sunflower oil. Small and new producers are, however, encouraged to join the network in one or two or more of its sub-programmes, and benefit from new experimentation techniques and research methodologies to help accelerate the solution of some of their local problems. Also, by participating in comparative trials, they might be able to obtain greater access to breeding material and broaden their genetic base.

At present FAO has undertaken sunflower and other oil crop development in Zambia, Iraq

and Nepal. The progress of these projects indicates the feasibility of expanding this crop in suitable areas of the respective countries.

A number of trainees from developing countries have been sent to important sunflower research centres on fellowships to acquaint themselves with modern techniques of sunflower breeding and crop management.

The FAO Seed Exchange Unit has been responsible for the despatch of many varieties and selections of sunflower to breeders and scientists in research institutes and agricultural departments of developed and developing countries.

FAO would further welcome countries which are in a position to assist governments requesting training of sunflower researchers, field and laboratory technicians. These training programmes are extremely useful and FAO could help stimulate interest in them.

ANNEX

SUNFLOWER ACREAGES IN DEVELOPING COUNTRIES IN ASIA, AFRICA AND LATIN AMERICA (seed yields in kg/ha between brackets)

	1971	1974
	000 ha	
Asia		
Afghanistan	...	2 (488)
Bangladesh	...	(500)
Burma	...	2 (388)
India	...	250 (800)
Indonesia	...	...
Iran	56 (890)	70 (625)
Iraq	...	4 (722)
Israel	5 (1137)	5 (1111)
Lebanon	6 (470)	6 (455)
Nepal	...	...
Pakistan	...	...
Philippines	...	...
Syria	2 (1625)	2 (818)
Turkey	396 (1174)	470 (1106)
Africa		
Angola	...	...
Algeria	4 (450)	4 (488)
Botswana	...	...
Egypt	...	...
Ethiopia	...	...
Kenya	4 (636)	4 (750)

Mauritius	...	...
Malawi	4 (845)	4 (750)
Morocco	15 (814)	30 (830)
Mozambique	9 (667)	10 (1000)
Rhodesia	5 (551)	5 (580)
Tanzania	21 (242)	30 (400)
Tunisia	...	...
Zambia	...	7 ...
Latin America		
Argentina	1313 (632)	1190 (815)
Chile	15 (1331)	9 (1052)
Cuba	...	...
Mexico	...	...
Peru	...	...
Uruguay	72 (682)	91 (532)
Venezuela	...	...
Total	1927	2195
% of world total	23	24