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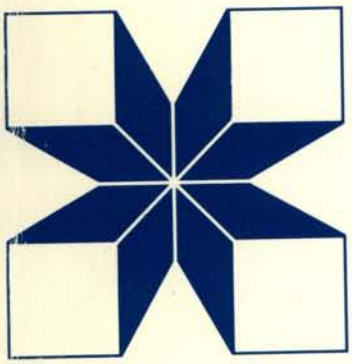

CANADA

OIL CROPS:
PROCEEDINGS OF THE THREE MEETINGS HELD AT PANTNAGAR AND HYDERABAD, INDIA, 4 – 17 JANUARY 1989

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This series includes meeting documents, internal reports, and preliminary technical documents that may later form the basis of a formal publication. A Manuscript Report is given a small distribution to a highly specialized audience.

La présente série est réservée aux documents issus de colloques, aux rapports internes et aux documents techniques susceptibles d'être publiés plus tard dans une série de publications plus soignées. D'un tirage restreint, le rapport manuscrit est destiné à un public très spécialisé.

Esta serie incluye ponencias de reuniones, informes internos y documentos técnicos que pueden posteriormente conformar la base de una publicación formal. El informe recibe distribución limitada entre una audiencia altamente especializada.

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1. The Brassica Subnetwork-II
2. The Other Oil Crops Subnetwork-I
3. The Oil Crops Network Steering Committee-I

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SUMMARY AND WRAP-UP FOR OTHER OILCROPS SUB-NETWORK

Hugh Doggett

Dr. M. V. Rao: in his opening address emphasized that the oilseeds mission directorate has a special interest in the minor oilseed crops being considered by this workshop; linseed, niger, and safflower. These are crops which are adapted to particular niches in Indian agriculture.

India has 45% of the World area of linseed, mainly in Central India. Linseed oil is still used as an edible oil in some places, but it is grown mainly for industrial uses. Good progress has been made in developing dual purpose types, for fibre as well as for oil. Such types have been released, but now need popularization. Another dual purpose type is being sought, the combination of the fibre crop and the low-linolenic grain of the type recently developed in Australia. Linseed is often broadcast into a rice paddy some time before harvest, so that the young plants are established and growing before the rice harvest is taken off. (eg. "Utera" cultivation in Madhya Pradesh).

Perhaps all of the niger crop produced in India is grown by Tribal peoples. There is no substitute for it, no other oilseed can produce under the harsh conditions where niger is grown: it will establish on very dry soils, and grows in most unpromising thin, often rocky soils. It also flourishes in forest clearings. The parasitic weed *cuscuta* is often a problem, difficult to control, difficult to eradicate, a situation parallel to that of *Striga* on cereals. Niger is mainly a subsistence crop, consumed in the areas where it is produced, but some 10,000 mt are exported annually as bird-seed. (Great care is taken to avoid contamination with *Cuscuta* seed). Dr. Rao stressed that the Network should aim to include all the people involved with these crops, whether producing, processing, or marketing; whether in the Developed or in the Developing World; including producers such as Argentina, the USSR, the USA, Ireland, or other European countries. All producing countries should be involved, or the Network will not function properly. Private and public sectors must be concerned. Germplasm raises particularly important issues - germplasm must be available to all. The Developing World has given, and gives, its germplasm freely: this must be fully reciprocated by the Developed World. "Poor Man's Crops" are in special need of this kind of cooperation.

The technology mission for Oils brought together those activities in 17 different ministries that are related to oils and to oil crops. A start has been made in blending oils: certain combinations have been permitted, and more will follow, permitting oil mixtures with a more balanced nutritional quality to be sold to the public.

Impressive progress has been made during the two-years of the Commission's existence. Last years's oil crop production was good, in spite of poor rains. This year, the crop is expected to reach 15 million tons, three million more than the previous record: it is hoped that 18 million tons will be produced in 1990. A truly multi-disciplinary approach has been adopted, each person with his own role and responsibility.

Mr. Andrew Ker: Thanked Dr. M.V. Rao on behalf of IDRC. He had been very impressed by the standard of farming seen on the tour from the G. B. Pant University around a part of Northern India. India's achievements in food and oilseeds production are the best attainments of any country trying to achieve self-sufficiency.

The Oilseeds Network was begun in the early 1980's and has reached the point where sub-networks of various oil crops are being formed. Safflower, linseed and niger are being considered for the formation of a joint sub-network: safflower has already formed its own advisory and coordinating committee. IDRC is not a large donor agency, and its inputs to the network have been minimal. The sharing of germplasm, planning for collaborative research, and training needs, should all be given full attention. It is proposed that the complete network should have a steering committee.

Dr. Engels: From IBPGR, mentioned briefly the reorganization and redeployment of his Board. Emphasis is being placed on germplasms research that relates to crop plants. Research topics are: i) conservation methodology, ii) utilization, iii) better access for plant breeders, iv) careful study of quarantine problems, v) fostering free germplasm exchange. IBPGR might consider funding research projects in these fields. The IBPGR Regional offices would have their own field programs. Headquarters are located in New Delhi, Beijing, Nairobi, Rome, Singapore and Kew. (The New World was not mentioned). In the past, IBPGR has also given less priority to the "neglected" oilseeds. Their diversity must be preserved. IBPGR would consider a project on the germplasm utilization of these crops, and would welcome advice. Where should the base collections be kept? A global data base is required, and descriptor lists for niger and linseed are needed. IBPGR would support work on any germplasm problems.

Dr. Engels' presentation was good, and he is evidently eager to be as helpful as possible, which we all welcomed. He may not yet have realized quite what a mine field there is in the whole germplasm issue. His first task is to build confidence and to dispel wrong ideas and misgivings. Quite a lot of people in the Developing world suspect that the whole IBPGR exercise is an attempt by the West to get hold of "their " Third World germplasm, to exploit it, and then to make enormous profits by selling the products back to the Third World. There is a major confidence-building exercise required, and it will take time to build up to level of mutual trust required if there is to be free movement of germplasm.

Dr. Ranga Rao: Reported on the Safflower Conference. Sixteen countries were represented by 110 delegates, 45 of whom came from countries other than India. The following were among the principal recommendations:

Pest and disease resistances must be identified: *Alternaria* is especially important.

The development of hybrid safflower must be undertaken.

A steering committee on global genetic resources should be set up, to determine:

a) priority areas for collection b) the base location for the collection c) preparation of a global data base. Dr. Abbas Omran offered to arrange for the re-export of safflower germplasm from Ethiopia.

An international centre for all oilcrops other than groundnuts and soya is needed.

A diagnostic handbook for pests and diseases of safflower should be produced. Neglected research areas should be identified, e.g. safflower physiology. The next safflower conference should be held in China, or failing that, in Australia in 1993.

Dr. Abbas Omran: Presented a brief history of the Network development, followed by a projection of its probable further growth, including the creation of an Oilseeds Research Unit. He then proposed a vote of thanks to Dr. M.V. Rao.

Niger

India

Dr. S.M. Sharma: presented a paper on Niger in India. In 1985-86, 620,000 ha of niger were grown, and produced 190,000 mt of seed: the mean yield was 305 kg/ha. The crop is grown mainly by tribal people on poor soils, with a minimum of care, effort, or expenditure. Seventy-five percent of the harvest is used for oil extraction, mostly for food, though some goes into the perfume industry. Lower grades of oil are used for soap-making and for burning in lamps. Eighteen percent of the seed is used for making chutney. The oil cake is fed to livestock.

The crop is extensively grown on marginal and sub-marginal lands, and grown over a range of rainfalls, 1,000 -1,300mm probably being optimum. Prolonged rain at flowering depresses the activity of the honey-bee pollinators and so reduces yields. The seven available "improved varieties" are either local varieties, or selections out of local varieties. Other selections from similar sources are awaiting release. Timely planting increases yields: fertilizer application of 20:20 kg/ha of NP with half of the N applied at 30 days after planting gives much improved yields. Given a reasonably clean field at planting, niger competes well with weeds. Two weedings are advised, at 15 days after planting, and again (if needed) at the time of nitrogen top-dressing (30 days after planting). Cut-worms, grasshoppers, and a number of caterpillars are recorded as pests. The statement "These may be controlled by appropriate dusts or sprays" tells us nothing about the economics of doing this. Diseases include powdery mildew, *Alternaria* and *Cercospora* leaf spots. Seed-dressing with Thiram is recommended.

The future development of the niger crop depends firstly on breeding varieties that respond well to inputs and good management, secondly on Cropping Systems Research using such varieties.

Problems of soil management in the hilly tribal areas will take a long time to solve; but improved niger cvs might well extend the areas under the crop, and also might begin to contribute towards the solution of the soil management problems. (The speaker's photographs of some of the areas where niger is growing were very disturbing, and left the viewers with a profound respect for this crop. Is there anywhere it cannot grow?

Dr. A.V. Joshi's paper reported mainly on niger in Maharashtra. Again, released varieties were obtained by selection within local types. Dr. Trivedi is working at Kanki, Bihar, with over 175 germplasm lines maintained by sibbing. He aims to canalize desirable genes into one gene pool. Superior varieties have been identified from Indian germplasm,

and a genetic male-sterile has been obtained: this is potentially useful in crossing work, and perhaps for hybrids in due course.

Ethiopia:

Niger breeding in Ethiopia has made good progress: self-compatible (self- fertile) lines have been extracted, and populations developed. Two varieties have been released, yielding 10 q/ha, with 40% oil content. Studies have shown that selection for higher oil content is much assisted by a de-hulling technique, the percentage of hull shows a high negative correlation with oil-content, while higher oil-content is associated with larger seed size.

General comments:

I am filled with a great sense of frustration: here we have two excellent, imaginative breeding programs at Kanki in Bihar and Holetta in Ethiopia, yet the main benefit of the Network remains unharvested. We all know that the productivity explosion in the maize crop came from putting together that northern flints and the southern dents. We all know that the productivity explosion in the sorghum crop came from putting together the northern milos and the southern kafirs. This was why the Network was developed: we know that there is a great burst of productivity waiting to be released when we bring together the Ethiopian crop populations with the corresponding Indian crop populations - or is it that we do not understand, or believe in, population genetics? Why after more than eight years have the Ethiopian and the Indian nigers not yet been brought together, when the right kind of programs are just there waiting for them to be put together? Is it an administrative problem, or does not anyone really believe that this will work? I would urge those concerned to get together and make a bilateral agreement to exchange exactly equal numbers of varieties or composites, exactly the same number of seeds if necessary, but to get that exchange done at the earliest possible moment. Then they will begin to get an idea of how big a bonanza they are sitting on at present.

Sunflower was developed as an oilseed crop within the last 150 years: the development of safflower as an oilseed crop is even more recent. These are both close relatives of niger, and this crop may have an even greater potential for development. It at least starts as an oilseed crop, whereas the other two were grown for their flowers or edible seeds.

Niger should be selected under good management and medium to high input levels, to see how productive the crop can be made. I always favour selecting initially under good management, because that exposes differences, then reselecting the material under both good and poor, hard conditions. With a crop such as niger, which can be handled as a composite, such selections can be run as composites with mass selection until F_5 or F_6. The best material should go into cropping systems observations at an early stage.

The tribal peoples are not going to be taught the benefits of good farming and good soil management overnight, that will be a slow process. There is no point in trying to do this until one has crop varieties that respond profitably to the additional work/cash inputs required. While very conscious of the needs of the Tribal's, we must not confine our thinking about niger to that area. Progress in improvement under good farming conditions in Ethiopia is most encouraging. Add in the

heterosis which will follow the linking of the Indian and Ethiopian populations, and we shall find that we have an oilseed crop with a potential at least as great as that of sunflower and safflower as well as a crop from which it should be possible to select populations able to be productive under very unpromising conditions of soil and moisture.

Linseed

India

This crop is receiving good attention in India, and has found in Dr. Manga Rai, a scientist determined to exploit the full potential of linseed. India has 14 centres with 32 scientists working on linseed. Other scientists at various universities are also involved in linseed research. The area under the crop is 1.5 million hectares, with productivity averaging some 250 kg/ha, against a world average of 550 kg/ha. The crop is regarded by the Indian farmer as a second grade oil seed crop, so it receives little care and attention. Some 25% of the total area is cultivated on the traditional "Paira" or "Utera" systems which give an average yield of only 100 kg/ha. The oil content of the seed is in the range 35-45 percent. Linseed is a good intercrop, especially when fertilizer is used. Certain crop combinations show interesting effects: intercropped with chick-pea, the infestation with *Heliothis* is much reduced, so this is a profitable crop combination. Lentil and *Lathyrus* are also good intercrops with linseed, as are potatoes. The amount of breeders' seed being released increases every year, and 19 varieties have been developed to match different cropping systems, many of which have good disease resistance levels. Rust, powdery mildew, and *Alternaria* blight are important diseases, and there is a disease race problem. Crop rotation is recommended to minimize wilt (*Fusarium* sp.). A "Bud Fly" (*Desyneura lini*) can be a troublesome pest.

Dual -purpose types have also been developed, combining good fibre (flax) production with good seed yield. Two such varieties have recently been released, "Gaurav" and "Jeevan". More research stations are being upgraded for linseed research under the Seventh 5 -year plan.

Pakistan

In Pakistan, some 10,500 ha of linseed are grown, producing 5,600 mt of seed, an average yield of 533 kg/ha. The crop is generally grown as a mixed crop with field peas, rapeseed/mustard, and wheat. As a sole crop, it often follows rice, mostly without irrigation. Given irrigation and optimum inputs, seed yields up to 2,800 kg/ha are obtainable. Little breeding work has been done: L-1 is the only variety grown commercially. A slightly earlier variety, Pr-2/4, with a higher yield potential, is about to be released.

Ethiopia

Linseed occupies some 105,000 ha, and is widely grown in the highlands. The mean yield is about 360 kg/ha. The crop may be grown as a sole crop on marginal and submarginal lands. As with many oilcrops, the local practice has been to leave oil crops to the end of the rotation, and to keep inputs of all kinds to an absolute minimum. Local varieties are landraces, but the introduction of material from France and Ireland together with a hybridization program has resulted in the release of four high-yielding exotic varieties. There is good material in the pipeline from the

hybridization program. Earliness, wilt resistance, and little lodging are major breeding objectives. Powdery mildew, seedling blight, pasmo and fusarium wilt are important diseases: *Heliothis* is a common pest, golden Plusia a sporadic one. Oil contents have been improved by some 2 to 3 %, while yields have been improved by some 10 to 40% depending on location. Better varieties, supported by improved agronomy, with a good series of farmers' trials, are contributing to steadily improving yields.

Safflower

This has been dealt with in a separate conference. I would only note the progress being made in India on developing spineless varieties, and the fact that China already has such types. I believe that further progress along such lines is desirable before serious attention is given to the spread of safflower into Africa.

General Comments

Germplasm

I would stress my comments made above, under niger. There is a great need to put together the Indian germplasm and the African germplasm of all these crops. They have been separated for 2,000 years or longer. It is really important that appropriate bilateral agreements for the exchange of germplasm should be made as soon as possible. There will be no "one-way" benefits: each country needs the germplasm of the other to produce populations that will yield excellent new material to knowledgeable, dedicated and diligent plant scientists. There is a great willingness on the part of IBPGR to help, and more exploratory discussions should be going on, at least about where and what needs to be collected.

Oil crop improvement

One noticeable characteristic of the crops we have been considering is the way that farmers have treated them in traditional agriculture as crops to be planted and left to grow as best they may. This is a tribute to their capacity to grow on impoverished land with little care. However, there is every indication that given carefully bred varieties and good agronomy, we can expect to see very substantial advances in production during the coming decade or two. I am particularly glad to see the increasing attention being given to On-Farm trials; those were missing in the early days, the farmer had no real input to the research work. I am sure that much faster progress will follow the widespread adoption of this approach.

Oil extraction

It is important to increase the productivity of the oilseed crops: but it is also important to increase the amount of oil extracted, so that even more oil is obtained from each unit area of land under crop. One item in the Ethiopian presentation described comparatively small solvent extraction plant which was being used to extract more of the oil from the cake remaining after crushing by local village methods. This draws attention to Dr. Mangla Rai's opening speech - the shortfall in India's edible oil requirements could be fully met if only all the oil could be extracted from the oilseeds already produced each year. More attention should be paid to extracting more oil from the existing oilseeds harvest. The economics of using a solvent extraction plant to mop up more of the oil left in the cake by the village extraction machines deserves study.

Oil Crops Research Unit (ORU)

The Steering Committee for the Network will be considering the possibility of developing a Unit to provide some basic research for oilcrops which are receiving but little as yet. My impression, re-enforced by these meetings, has been that backup research on sesame, niger, and linseed is relatively less than on other oilseeds, and that these crops are most in need of attention.