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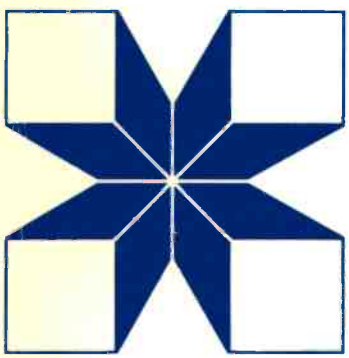

CANADA

OIL CROPS: SESAME AND SUNFLOWER SUBNETWORKS

PROCEEDINGS OF THE JOINT SECOND WORKSHOP HELD IN CAIRO, EGYPT, 9–12 SEPTEMBER 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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OIL CROPS:
SESAME AND SUNFLOWER SUBNETWORKS

Proceedings of the Joint Second Workshop held in Cairo, Egypt, 9–12 September 1989

Edited by
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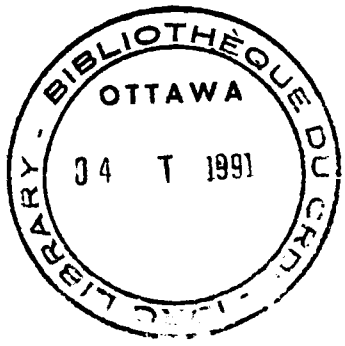
Technical Adviser, Oil Crops Network



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FOREWORD

In September 1989, the Sunflower and Sesame subnetworks held their bi-annual meetings in Cairo, Egypt. The meetings were well attended and papers, presented in these proceedings, provide a very informative overview of some of the cropping systems, management practices, production constraints and research highlights for both crops in several countries.

Chronic edible oil deficit is a major problem facing many developing countries in Africa and Asia where most countries are forced to import large quantities to satisfy the requirements of their growing populations. With the present rates of population increase and the improvement of nutrition standards it is likely that the consumption of edible oil will rise over the years, increasingly drawing on scarce foreign exchange for the importation of this vital food staple. For this reason, several countries have opted to increase self-sufficiency in edible oil.

Production deficits are due to a number of factors, among which neglect in oilcrops research, in both developed and developing countries has been a major one. This is particularly true for minor crops such as sesame. In the context of the IDRC oilcrops network, initiated in 1981, the interchange of information and the sharing of results between scientists have proved to be very useful and beneficial for the generation of scientific knowledge and the stimulation of research in this important area. It is hoped that conclusions and recommendations of this meeting will stimulate further research and development in the future.

A second important reason for limited national production has been the exceptionally low levels of world prices for oils and fats in the 1980's and the comparative advantage of importation over production for developing countries. The description of a case study using a system's approach to analysis the Vegetable Oil/Protein System of Kenya has stirred much interest during the Cairo meetings and it is hoped that similar work can be carried out in other countries in the future.

The Cairo meetings will also unfortunately be remembered as the one which has witnessed the diagnosis of the fatal disease of late Dr. Hiruy Belayneh, Chairman of the Brassica Subnetwork. We will all regret his absence.

On behalf of IDRC and of all participants, I would like to thank the Government of Egypt for its hospitality, the organizers for the excellent arrangements and all those who contributed to the success of these meetings by their presentations and discussions.

Eglal Rached,
Senior Program Officer,
IDRC, Cairo

CONTENTS

SUNFLOWER AND SESAME RESEARCH IN THE PHILIPPINES

Nenita M. Tepora

Sunflower and sesame are minor oil crops in the Philippines. Sunflower is an introduced crop while sesame is grown in marginal areas by few farmers. Most, if not all, of the cultivation of these crops is in Central Luzon where the Central Luzon State University (CLSU) is located and where there is very distinct dry and wet seasons.

There is increased interest in upland crops to increase the productivity and income of irrigated and rainfed lowlands as well as uplands. This is where sunflower and sesame could fit in.

Sunflower

Continuous sunflower research has been undertaken by CLSU since 1972. Various studies have been made (Appendix A) and a complete package of production technology had been developed (Appendix B) which is now being pilot tested in three towns of Nueva Ecija. The cost and return analysis for one hectare of sunflower seed production shows a return of investment of 137% (Appendix C).

The technology has shown high potential for increasing the income of farm families, especially when the seeds are processed as cracked seeds. Sunflower crack seeds have become popular around CLSU. It is better than the common watermelon crack seeds in terms of nutritive content and palatability.

Sunflower production can be one of the potential alternative cash crops for farmers. The limitations to production are lack of quality seeds and low seed setting in the farmers' field. For high seed set, pollinators like bees are needed but normally the farmers do not engage in beekeeping.

Sesame

Sesame research in the Philippines is conducted only by CLSU and has been continuous since 1982 though in a limited scale.

At present, there are 128 accessions of sesame germplasm in the CLSU, Table 1. Duplicate seed lots of these accessions were brought to the National Plant Genetic Resources Laboratory (NPGRL), Institute of Plant Breeding of the University of the Philippines at Los Banos (IPB-UPLB) for storage.

Table 1. CLSU sesame germplasm collections.

Number of Accessions	Origin	Source
5	Thailand	Bureau of Plant Industry
1	Guatemala	Philippines
2	Sri Lanka	
5	Philippines	
8	Thailand	IRRI thru Dr. Carangal
1	Colombia	
10	Philippines	NPGRL, IPB-UPLB
7	Thailand	CLSU graduate students
		FAO thru Dr. Campos
14	Greece	
7	Mexico	
3	India	Bhabha Atomic Research Center thru Dr. Murthy
6	India	Tamil Nadu Agric. Univ.
5	Introductions to India	Through Dr. Thangavelu
2	China	Institute of Crop Germplasm Resources, CAAS thru Dr. Yu-Shen Dong
20	Israel	FAO through Dr. Pineda
12	Somalia	IDRC Oilcrops Network
3	Sri Lanka	Through Dr. Omran
10	Egypt	
7	Ethiopia	
128		

Last year, 78 accessions were characterized & evaluated, Table 2.

Table 2. Performance of sesame accessions evaluated during 1988 wet season.

Accession No.	Yield /plant (g)	Maturity (DAE*)	Plant Height (cm)	Branching habit	Number of pods /plant	Seed coat color	1000-seed weight (g)	Seed size	Phyllody Disease (No. of plants with disease	Cercospora leaf spot Incidence**	Powdery Mildew Incidence**
1	2	3	4	5	6	7	8	9	10	11	12
68	11	64	116	Basal	88	White	3.0	Small	2	LR**	-
69	10	64	94	Monopodial	28	White	3.0	Big	2	LR	-
43	8	65	90	Basal	60	Cream	2.75	Small	0	LR	-
46	13	65	110	Monopodial	36	Dirty white	3.0	Small	0	LR	-
50	13	65	84	Monopodial	41	Light brown	3.25	Big	0	LR	-
54	30	65	97	Monopodial	21	Cream	3.5	Small	0	LR	-
19	8	65	92	Basal	37	White	3.0	Small	0	LR	-
41	14	67	104	Basal	63	Light brown	3.5	Big	0	LR	-
45	9	67	94	Basal	52	White	3.0	Big	0	LR	LR
51	19	67	78	Basal	34	Light brown	3.75	Small	2	LR	-
21	9	67	78	Monopodial	46	Dirty white	3.0	Big	0	LR	-
20	17	68	110	Basal	68	White	2.75	Small	0	LR	-
17	21	68	159	Top	106	Reddish brown	2.0	Small	1	MR all	LR
38	14	68	130	Basal	75	Dirty white	3.25	Big	0	LR	M
42	8	68	105	Basal	61	Brown	3.5	Big	0	LR	-
44	15	72	110	Basal	112	Dirty white	3.25	Big	0	LR	-
18	11	73	96	Monopodial	60	Light brown	2.5	Small	0	LR	-
55	10	73	120	Monopodial	41	Dirty white	3.75	Big	0	LR	-
59	12	73	129	Basal	109	Dirty white	3.0	Big	0	LR	LR
6A	17	73	171	Basal	107	White	4.0	Big	1	MR all	MR
66D	15	78	140	Basal	97	White	3.5	Big	2	LR	MR
33	15	78	147	Basal	75	Dirty white	2.5	Small	0	LR	LR
35	17	78	171	Monopodial	95	Dirty white	2.75	Small	3	MR all	M
36	13	78	172	Basal	78	Dirty white	2.5	Small	0	MR all	M
37	15	78	165	Basal	96	Cream	3.0	Medium	3	MR all	M
39	22	78	180	Monopodial	98	Dirty white	2.5	Small	0	MR all	LR
05	12	80	141	Top	42	Black	3.0	Big	0	MR all	-
12	29	80	157	Basal	165	Light brwn	3.0	Small	0	LR	-
53	78	80	162	Basal	224	Light brown	3.0	Small	0	MR all	-
16	12	82	101	Monopodial	72	Brown	3.0	Small	0	LR	-
47	14	82	134	Monopodial	51	Dirty white	3.75	Big	0	LR	LR
56	10	82	141	Basal	42	Dirty white	3.25	Big	2	LR	MR
52	15	85	122	Basal	124	Light brown	3.0	Big	0	LR	M
65B	29	85	179	Basal	127	White	4.25	Big	2	MR all	-
75	30	85	105	Basal	138	Dirty white	4.0	Big	0	LR	-
76	4	85	85	Monopodial	40	Dirty white	2.5	Big	0	LR	-
01	13	87	154	Top	66	Cream	2.0	Small	0	LR	-
58	12	88	196	Monopodial	72	Cream	4.0	Big	0	LR	-
65A	16	88	163	Top	50	White	3.0	Big	0	ER all	-
60	21	92	198	Top	120	White	3.0	Big	0	LR	-
70	24	92	151	Basal	104	Purplish-black	3.25	Big	0	LR	-
71	19	92	140	Top	110	"	3.0	Big	1	LR	-
72	25	92	149	Basal	158	"	3.0	Big	0	MR all	-
73	20	92	147	Top	122	"	3.75	Big	0	LR	-Table
74	27	92	140	Basal	85	"	4.0	Big	0	MR all	-
24B	7	94	170	Top	52	White	3.0	Big	2	MR all	M

2 contd.

1	2	3	4	5	6	7	8	9	10	11	12
12	10	95	101	Basal	57	White	3.0	Small	0	LR	M
48	13	95	96	Basal	52	Cream	2.5	Small	0	LR	M
49	9	103	91	Basal	48	Cream	2.75	Small	0	ER all	M
07	82	103	187	Top	576	Black	3.5	Big	0	LR	-
101	19	103	125	Basal	99	Dirty white	2.75	Big	0	LR	-
102	25	103	147	Basal	99	Black	3.0	Big	0	LR	-
61	8	103	173	Top	76	White	3.0	Big	0	LR	-
63	12	103	187	Top	77	Dirty white	3.0	Medium	0	LR	-
77	39	103	70	Top	294	Light brown	2.5	Small	0	LR	-
78	21	103	166	Monopodial	132	White	3.0	Small	0	LR	-
06	16	103	194	Top	126	Black	1.5	Small	0	LR	-
04	8	104	149	Top	44	Black	3.0	Big	0	LR	-
27	12	188	198	Top	90	Light brown	2.5	Small	0	LR	-
10	9	105	175	Top	108	Light brown	1.5	Small	1	LR	-
29	13	105	193	Top	146	Brown	1.5	Small	3	LR	-
67B	23	105	198	Top	223	Dirty white	2.0	Small	0	LR	-
23B	10	106	178	Top	154	Purplish-Black	1.75	Small	8	LR	-
136	18	107	158	Top	120	Cream	3.0	Medium	0	LR	-
26	11	107	174	Top	52	Brown	4.0	Big	0	LR	-
34	19	107	193	Top	196	Light grey	1.75	Small	0	LR	-
30	20	107	189	Top	193	Dirty white	1.5	Small	0	LR	-
24C	12	108	179	Top	93	Greyish black	2.0	Big	0	MR all	-
62	5	108	167	Top	61	Black	3.0	Small	0	LR	-
240	16	108	177	Top	136	Greenish-brown	3.0	Big	0	LR	-
31	10	110	172	Top	66	Grey	3.0	Big	0	LR	-
32	20	110	189	Top	159	Black	2.5	Big	0	LR	-
67A	16	112	196	Top	180	Dirty white	2.0	Small	0	LR	-
28	7	113	184	Top	110	Brown	1.25	Very small	0	LR	-
02	17	123	224	Top	193	Black	3.0	Big	0	LR	-
64	9	124	182	Top	72	Brown	3.0	Big	0	LR	-
03	13	124	177	Top	82	Greenish-brown	3.0	Big	0	LR	-
64A	17	124	223	Top	140	Light brown	3.25	Big	0	LR	-

*DAE = days after emergence, **LR = late reproductive stage, ***MR = mid reproductive stage, ****M = Maturity.

The collections had wide ranges of variabilities including yield (5-82 grams per plant), maturity (64-124 days after emergence (DAE), plant height (70-224 cm), number of pods per plant (40-576), 1000 seed weight (1.25-4.00 g),and seedcoat color (white, dirty white, cream, light brown, brown, reddish brown, greenish brown, light grey, grey, grayish black, greenish black, purplish black and black).

Fifteen accessions from different origins were observed with some plants showing symptoms of phyllody, Tables 3 and 4. Diseased plants were uprooted and burned as soon as the symptoms were observed. Phyllody was more prevalent during the rainy season than during the dry season. Eighteen accessions were susceptible to powdery mildew and three to *Cercospora* leaf spot.

Ninety-seven crosses of outstanding introduced varieties with varieties previously found adapted to the Philippines were made.

Five varieties with the highest yields in a yield trial were multiplied and were programed for multilocation yield test in Northern Luzon- Region I and II.

Table 3. Performance of 23 highest yielding sesame accessions evaluated during 1988 wet season.

Accession No.	Yield /plant (g)	Maturity (DAE*)	Plant Height (cm)	Branching habit	Number of pods /plant	Seed coat color	1000-seed weight (g)	Seed size	Phyllody Disease (No. of plants with disease	Cercospora leaf spot Incidence**	Powdery Mildew Incidence
07	82	103	187	Top	576	Black	3.5	Big	0	LR	-
53	78	80	162	Basal	224	Light brown	3.0	Small	0	MR all	-
77	39	103	70	Top	294	Light brown	2.5	Small	0	LR	-
75	30	85	105	Basal	138	Dirty white	4.0	Big	0	LR	-
54	30	65	97	Monopodial	21	Cream	3.5	Small	0	LR	-
12	29	80	157	Basal	165	Light brown	3.0	Small	0	LR	-
65B	29	85	179	Basal	127	White	4.25	Big	2	MR all	-
74	27	92	140	Basal	85	Black	4.0	Big	0	MR all	-
102	25	103	147	Basal	99	Black	3.0	Big	0	LR	-
72	25	92	149	Basal	158	Black	3.0	big	0	MR all	-
70	24	92	151	Basal	104	Purplish black	3.25	Big	0	LR	-
67B	23	105	198	Top	223	Dirty white	2.0	Small	0	LR	-
39	22	78	180	Monopdial	98	White	2.5	Small	0	MR all	LR
78	21	103	166	Monopodial	132	White	3.0	Small	0	LR	-
17	21	68	159	Top	106	Reddish brown	2.0	Small	1	MR all	-
60	21	92	198	Top	120	White	3.0	Big	0	LR	-
73	20	92	147	Top	122	Black	3.75	Big	0	LR	-
30	20	107	189	Top	193	Dirty white	1.5	Small	0	LR	-
32	20	110	189	Top	159	Black	2.5	Big	0	LR	-
51	19	67	78	Basal	34	Light brown	3.75	Small	2	LR	-
71	19	92	140	Top	110	Black	3.0	Big	1	LR	-
101	19	103	125	Top	99	Dirty white	2.75	Big	0	LR	-
34	19	107	193	Top	196	Light grey	1.75	Small	0	LR	-

*DAE = days after emergence **LR = late reproductive stage ***MR = mid reproductive stage.

Table 4. Incidence of phyllody disease in 15 sesame accessions evaluated during 1988 wet season.

Accession number	Origin/ source	Number of plants with symptoms	Accession number	Origin source	Number of plants with symptoms
23	Philippines	8	68	China	2
29	Philippines	3	69	China	2
35	Thailand	3	65	India	2
37	Thailand	3	58	FAO (Mexico)	1
13	Thailand	2	10	Philippines	1
51	FAO (Greece)	2	17	Thailand	1
56	FAO (Mexico)	2	71	India	1
66	India	2			

Appendix A.

Sunflower Studies Conducted in CLSU from 1972-88.

Field	Number of studies
Varietal Improvement	4
Cultural Management	
- Planting dates, seeding rates, irrigation, harvesting and land preparation	16
- Fertilization	27
- Intercropping	10
Crop Protection	
- Insect pests	13
- Weeds	11
- Diseases	3
Seed Technology	4
Economics	3
Processing	12
Total	123

Appendix B.

Package of Technology for Sunflower Production

1. Recommended variety: Improved CLSUN-190-95 maturity days.

2. Site Selection: The area should have irrigation facilities. The basic soil requirements are moderate to well-drained soil. Soils used for corn, rice and vegetable are suited for sunflower production.

3. Growing season: The best time for planting sunflower for the first cropping is from October-January and the second cropping from February-May.

4. Land preparation: Burn the residues of previous crops and grasses to kill disease organisms prior to ploughing. Plough the field once and leave it for 2-3 days. Harrow twice to obtain good tilt.

5. System of planting: Planting should be done using single row method with rows spaced 75 cm and plants 25 cm within the row. Plant at the rate of 2-3 seeds/hill at a depth of 3-4 cm. Seeding rate is 18-20 kg/ha.

6. Thinning, off-barring and hilling-up: Thin the plants to one plant/hill 14 days after emergence (DAE).

7. Fertilizer application: Fertilizer application should be made on the basis of soil-test results. For soils with high P and K values: 90-0-0 (4 bags urea) and for soils with low P and K values: 90-30-30 (3 bags 14-14-14).

8. Irrigation schedule: First (just after planting), second (15 DAE), third (30 DAE), fourth (50 DAE), and fifth (70-80 DAE).

9. Control of pests and diseases: Insect pests and diseases of sunflower can be controlled using the following:

Insect pests/ diseases	Control measures
Cutworm leafworm Leafhopper Headworm	1) CRop rotation with a non-Leafworm susceptible host plant. 2) In small areas, collect eggs and larva and crush them. 3) Spray using any of the following: Sevin (2-3 tbs/16 l of water), Larnate (3 tbs/16 l of water), Azodrin 202R (2-3 tbs/16 l of water), Thiodan (3-5 tbs/16 l of water). Spray as soon as insect pests appear. If needed, repeat at 7-days interval. Shorten spray interval in cases of heavy infestations.
Sclerotium wilt Leaf spot Leaf blight	1) Pull out infected plants and burn them immediately. 2) Use the following fungicides: Leaf blight Arasan, Brassicol (5-10 g/kg of seed); Manzate, Daconil (3-4 tbs/16 l of water). Thoroughly mix with the seeds before planting for Sclerotium wilt control. Spray when symptoms of infection appear.

10. Bees as pollinators (optional): In sunflower production, introduction of bee colonies during the onset of blooming is important to increase seed setting. Bees as pollinators increase seed setting to as much as 20%. Wind and some other beneficial insects can also help in pollinating the crop.

11. Harvesting of heads: Harvest the head when the green back side of the flower disks turned to yellowish brown. Cut the stalk with a scythe or lingkaw just below the head. Spread harvested heads in a single layer on dry ground with their faces up. Dry for 2 or more days or until the seeds start to separate from the head.

12. Threshing: Sunflower heads are ready to be threshed when the seeds separate easily from the head. Threshing can be done using a screen board with nails laid out in squares 1 cm apart or by a self-feeding power sunflower thresher.

13. Cleaning: Clean the threshed seeds before storage to prevent heat accumulation. Clan with a winnower or a seed blower.

14. Drying: Dry the seeds to a moisture content of 8-10%.

15. Storage: Seeds should be packed in plastic bags/sacks. Store in a ventilated room or area to prevent the attack of storage pests. Seeds intended for planting should be treated with pesticides before storage.

Appendix C.

Cost-Return Analysis for One Hectare Sunflower Seed Production

Item	Rate & quantity	Value P
I. Gross Income	1,000 kg	
Yield	at P15/kg	15,000.00
II. Expenses		
A. Cash Costs		
1. Labor*		
a. Land preparation	P850/ha	850.00
b. Planting/replanting/Thinning	18 MD	540.00

Item	Rate & quantity	Value P
c. Fertilization	6 MD	180.00
d. Hilling-up (tractor)	P175/ha	175.00
e. Spraying	5 MD	150.00
f. Irrigating	12 MD	360.00
g. Harvesting/Threshing/Hauling	25 MD	750.00
h. Cleaning/Drying/Bagging	6 MD	180.00
Sub-total		3,185.00
2. Inputs		
a. Seeds	20 kg @p15	300.00
b. Fertilizer (Urea)	4 bags @p165	660.00
c. Pesticides (Insecticides)		555.00
d. Irrigation fee		425.00
Sub-total		1,940.00
B. Overhead cost		
Interest on Capital (12% per annum)		153.00
Land rent		1,035.00
Sub-total		1,188.00
Total Expenses		6,313.00
III. Net Income		8,687.00
IV. Return on Investment (ROI)		137%
V. Production Cost per kg		6.31

*P30.00 per MD.