SEED PRODUCTION UNIT

Annual Report 1989

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A joint special project
of
The Government of The Netherlands
The Government of the Federal Republic of Germany
and
The International Center for Agricultural Research in the Dry Areas
(ICARDA)

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Contents

"To reach the CGIAR's goal of contributing 'to increasing sustainable food production,' effective and sustainable seed programs and seed industries must exist in the developing countries around the globe.... The continued and increased investment in agricultural research at the national level and through the CGIAR system requires the development of a more effective seed supply system than exists now..... The IARCs have much of the infrastructure and staff needed to make a sustained and consistent impact in seed sector improvement."

Quoted from: IARC's Role in Seed Research and Seed Sector Improvement: position paper prepared for Centers Directors' Meeting, Kenya, June 22-26, 1987.

1. INTRODUCTION

To strengthen seed programs in West Asia and North Africa a special project "Development of National Seed Production Organizations in West Asia and North Africa" is funded by the Governments of the Netherlands and the Federal Republic of Germany. The first phase (July 85 to July 88) has been successfully concluded and the second phase (July 88 to July 91) is being implemented.

The overall objective of the project is to strengthen the national seed production organizations in West Asia and North Africa. This overall objective covers the following seven secondary objectives:

a) To build up facilities at ICARDA for training in seed production.
b) To train regional seed production staff.
c) To build up seed production infrastructure in the countries of the Region.
d) To make available high quality seed of cereals, food legumes and medics.
e) To disseminate information and develop training manuals.
f) To make available morphological varietal descriptions of cereal and food legume varieties.
g) To carry out region-related seed technology research.

The first objective (a) has been fulfilled and adequate seed production facilities are now available at ICARDA for training of seed production staff from the region. At present the Seed

Processing Center's building is being extended to be able to accommodate the small-scale seed cleaning machines.

Important developments in 1989 were (1) inclusion of a Seed Unit in ICARDA's strategic plan, which indicates a permanent involvement in seed matters, and (2) the selection of an Assistant Seed Production Specialist, who started his duties in December 1989.

2. TRAINING OF REGIONAL SEED PRODUCTION STAFF

The training of seed production staff is one of the most important ways by which an International Center can assist in the strengthening of national seed production programs. A substantial amount of resources is, therefore, annually devoted to courses at ICARDA and in the Region. Table 1 summarizes the 1989 training activities. Table 2 presents the number of training participants since 1985, while Table 3 indicates the organizations from where trainees originated. Compared with the situation before 1985 the percentage of trainees coming from national seed production organizations has significantly increased at the expense of trainees coming from the National Agricultural Research Stations.

Table 1: Seed Production Unit's Training Courses in 1989

Name	Location	Date	No of Participants (a)
Regular Courses			
1. Regional Food Legume Seed Production	Rabat, Morocco	27/3 - 7/4	20
2. Field Inspection	Sakha, Egypt	15/4 - 20/4	30
3. Morphological Variety Description & Maintenance Breeding	ICARDA, Aleppo	14/5 - 26/5	15(22)
Individual Trainees			
4. Seed Testing	ICARDA, Aleppo	23/4 - 4/5	4(12)
5. Seed Processing	ICARDA, Aleppo	18/6 - 29/6	6(14)
6. Seed Processing	ICARDA, Aleppo	01/5 - 30/7	1
7. Seed Production General	ICARDA, Aleppo	3 x 2 weeks	3
8. Residential	ICARDA, Aleppo	01/3 - 30/6	4

(a)In brackets total number if trainees of other seed production courses are included

Table 2: Seed production personnel (by country) trained in ICARDA's seed courses.

Country	Number trained			
	up to 1985	1985–1987	1988	1989
Afghanistan	1	1		
Algeria	1	3		9
Cyprus				1
Egypt	3	34	46	30
Ethiopia		6	25	1
India	1			
Iran	4	1		
Iraq		2		
Jordan	7	2		4
Kuwait				1
Lebanon	1			3
Lybia		1		
Morocco	5	2		11
Pakistan				1
Saudi Arabia		2		
Somalia	2	1		
Sudan	2	8		2
Syria	6	24	3	6
Tunisia	2	3		5
Turkey				1
Yemen (North)		2	23	4
Yemen (South)	2	3		2
ICARDA (GRU)				2
Total	37	95	97	83

Table 3: Seed production staff of different organizations trained in ICARDA's seed courses.

Organization	Number trained			
	up to 1985	1985–1987	1988	1989
NARC	19	21	22	27
IARC	2	3	1	2
NSPO	16	67	74	53
SC	-	4	1	-
Total	37	95	97	83

NARC= National Agricultural Research Center
IARC= International Agricultural Research Center
NSPO= National Seed Production Organization
SC = Seed Company

2.1. Regular Courses

2.1.1. Regional Food Legume Seed Production Training Course, March 27 - April 7, 1989, Morocco

The Regional Food Legume Seed Technology course was sponsored by INRA, FAO and ICARDA's Food Legume Improvement Program and Seed Production Unit. The course was conducted in the premises of the Seed Quality Control Service in Guich, Rabat, Morocco. Five participants from Tunisia, 7 from Algeria and 8 from Morocco attended the course. The Head of the Algerian Seed Production Program also attended the course and participated as lecturer.
The course emphasized food legume crops and covered: (1) Lectures on main elements of seed programs, (2) Practical exercises on aspects of seed quality control, variety identification and roguing, (3) Lectures and discussions on the seed programs of participating countries, and (4) Lectures on the activities of seed companies in Morocco. Considerable time was given to discuss the importance of (1) early initiation of seed production (before release of the variety), (2) shortening multiplication cycles, (3) early inscription in the catalogue, and (4) morphological varietal descriptions.

2.1.2. Field Inspection Training Course, April 15-20, 1989, Egypt

The training course "Certification with Emphasis on Field Inspection" was held in Sakha, Egypt and emphasized wheat field inspection. 30 participants (including 4 staff members from the Jordan national seed production program) and a number of senior scientists from the National Program attended the course.
Lectures and practicals covered morphological varietal description, maintenance breeding, seed certification, field inspection, post-control plots, seed-borne diseases and roguing. Most of the time was spent in the field to carry out field inspections.
The training course was sponsored by the Egyptian Ministry of Agriculture, Central Administration for Seed (CAS); GTZ and ICARDA. National Staff, GTZ, ICARDA, and a Mississippi State University (MSU) seed specialist participated in the lecturing.

2.1.3. Morphological Variety Description and Maintenance Breeding Training Course, May 14-26, ICARDA, Aleppo, Syria

The objective of the course was to train participants in morphological variety description and varietal maintenance techniques. Emphasis was on wheat and barley, but time was also devoted to food legumes and pasture and forage crops. The course was held at ICARDA Headquarters and financed by the Seed Production Unit.

Almost 40 seed production and research staff applied for the course; the 22 carefully selected participants were the maximum that could be accommodated. Participants came from 11 different countries (YAR, PDRY, Cyprus, Egypt, Lebanon, Ethiopia, Syria, Turkey, Sudan, Morocco and Algeria). Two participants per country participated; one from the National Research Organization and one from the National Seed Production Organization.

2.2. Residential Training Course

Participants of ICARDA's residential training courses were instructed in the different aspects of successful seed programs (lectures and practicals). Moreover, four participants were assigned to the Seed Production Unit for the practical part of their four month training period.

2.3. Course Participation

2.3.1. International Course on Seed Production and Seed Technology, April 26 - July 28, 1989, Wageningen, The Netherlands

From June 9-17 the Seed Production Specialist visited the Netherlands to participate in the lecturing to the participants of the above course. Lectures were given on (1) constraints in seed programs, (2) seed quality control systems, (3) seed certification in the tropics, (4) seed processing in the tropics, and (5) fumigation. A total of 18 participants from different parts of the world attended this three month course.

2.4. Development of Course Curricula

Curricula for a Seed Processing & Storage and for a Wheat Seed Production course were developed. Other course curricula developed since the start of the project are: (1) Seed Testing Techniques, (2) Food Legume Seed Production, (3) Morphological Variety Description and Varietal Maintenance, (4) Seed Certification, and (5) General Seed Production.

2.5. Individual Trainees

2.5.1. Seed Testing

From April 23 to May 4, 12 individual trainees were trained in seed testing techniques in the new laboratories of the Seed Production Unit. Participants came from Egypt (1), Lebanon (3), PDRY (1), YAR (2), and Syria (3). Two ICARDA staff members also

attended the course. Funding of individual participants came from FAO, ICARDA and National Programs.

2.5.2. Seed Processing and Storage

From June 18-29 a training session on Seed Processing & Seed Storage was organized; it was the first specialized course on this topic and the Unit's large and small seed cleaning machines were extensively used. Lectures and practicals were given on: seed cleaning (cereals, food legumes, medics), seed treatment, seed storage, fumigation, storage pests and their control; emphasis was placed on practical aspects.
A total of 14 participants attended the course: Syria (5), YAR (2), PDRY (1), Egypt (1), Pakistan (1), Lebanon (3), and Kuwait (1). Funding of participants came from: FAO, ICARDA, and National Programs.

2.6. Publications

During 1989 no additional training manuals have been produced, but the three ICARDA seed production manuals have been reprinted to meet the demand.
The proceedings of the workshop "Seed Production in the Arabian Peninsula" were published in English and Arabic and include a number of papers on various seed topics.

3. BUILDING UP SEED PRODUCTION INFRASTRUCTURE

Seed production infrastructure needs strengthening in the countries of the region. The project contributes to the build up of infrastructure through (1) workshops, (2) round table discussions, (3) consultancies, (4) assistance in morphological variety description, (5) projects, and (6) seed surveys.

3.1. Round Table Discussions

Round Table Discussions are meetings with a few subject matter specialists; they usually emphazise on one aspect of the seed program. Round Table Discussions are efficient and effective tools to strengthen seed production infrastructure.

3.1.1. Round Table "Constraints in Food Legume Seed Production", Morocco

On April 3 a national workshop "Constraints in Food Legume Seed Production" was organized, to identify constraints and to draw

up recommendations for improvement for the Morocco Food Legume Seed Program. INRA, DPV, Seed Quality Control Service, ONICEL, private seed companies, and ICARDA participated in the discussions. A comprehensive set of recommendations was prepared for research, inscription in the catalogue, quality control, and marketing and distribution. Important recommendations concerned (a) the initiation of pre-release multiplications for food legume varieties, (b) the shortening of the multiplication cycle, (c) the early inscription in the catalogue, and (d) the increase in the number of varieties to be accepted for the catalogue.

3.1.2. Round Table "Rules and Standards for Field Inspection of Wheat Seed Fields", Egypt

To implement the recommendations made during the Seed Certification Workshop in 1988 a series of Round Table Discussions was organized in which standards and rules for wheat field inspection were drafted. Breeders, pathologists, and seed technologists participated in the deliberations. Rules and standards for wheat field inspection are now in their final form and may become a Ministerial Decree.

3.1.3. Round Table "Morphological Variety Descriptions", Egypt

On April 22 and October 18, 1989 Round Table Discussions on morphological varietal descriptions were organized at the Central Administration for Seed. The aim of this Discussion was (1) to develop guidelines for the morphological description of wheat varieties, (2) to assure that variety descriptions are made regularly, and (3) to make such descriptions available to field inspectors. Breeding staff, seed production staff, GTZ seed specialists, the MSU/NARP seed specialist, and ICARDA participated in the discussions.
A committee will be appointed by the Undersecretary for Seed Affairs to make recommendations and a preliminary list of characteristics for wheat has been prepared.

3.2. In-country Seed Projects

Annually ICARDA provides a small grant to Lebanon for seed production purposes. The Seed Production Unit is responsible for back stopping. The project emphasizes the initial stages of seed multiplication and aims at (1) identification and release of superior varieties and (2) production of quality seed of selected varieties of bread wheat, durum wheat, barley, lentil and chickpea.
In 1986/87 the project only covered cereals; in 1987/88 food

legumes were included. Promising varieties of cereals and food legumes have been identified and several tonnes of seed are annually made available. The promising varieties are: Sebou (durum wheat), Seri 82 (bread wheat), Rihane (barley), 285260:3-Talia 2 (lentil), ILC 482 (chickpea), and 87-27 & 85-98 (faba bean).

3.3. Initiating Post-control Plots in Egypt

Post-control plots (plots planted with seed taken from seed lots that were approved in the previous season) were initiated in Egypt as an integral part of the Seed Certification System. Each plot in the experiment represents one approved seed lot of 15 tonnes and is thus representative for more than 150 hectares of seed production fields. The total number of plots was over 400 and the post-control plot field provides an overview of more than 60 000 ha of seed production fields in the country.

3.4. Assistance in Morphological Varietal Descriptions

Morphological varietal descriptions are often not made by the breeders and the Seed Production Unit started to assist national programs to describe the most important commercial varieties and promising lines. For details see Chapter 6.

4. SEED MULTIPLICATION ACTIVITIES

A sound multiplication program distributes seed derived from Breeder Seed through one or more multiplications; Breeder Seed is multiplied to Pre-basic Seed, which is in turn multiplied to Basic Seed (the basis for all Certified Seed). The system used at ICARDA is outlined in Fig 1. Eighty percent of the Breeder Seed is multiplied to Pre-basic Seed (10% kept in stock, 10% for distribution purposes). The Pre-basic Seed produced is then used for 5 years to produce the Basic Seed, which will be distributed to the countries of the region. If needed a new cycle may be started, but it is expected that after 5 years the demand for the seed is negligible.
The Unit initiated this system in 1987/88 for wheat and barley and in 1988/89 for chickpea and lentil.
For wheat and barley the Basic Seed production stage and for lentil and chickpea the Pre-basic Seed production stage has now been reached.
Consequently no Basic Seed is yet available from this program for distribution to the region. Therefore, the Unit produces a special class of seed called "Quality Seed". Quality seed is seed produced according to official multiplication practices,

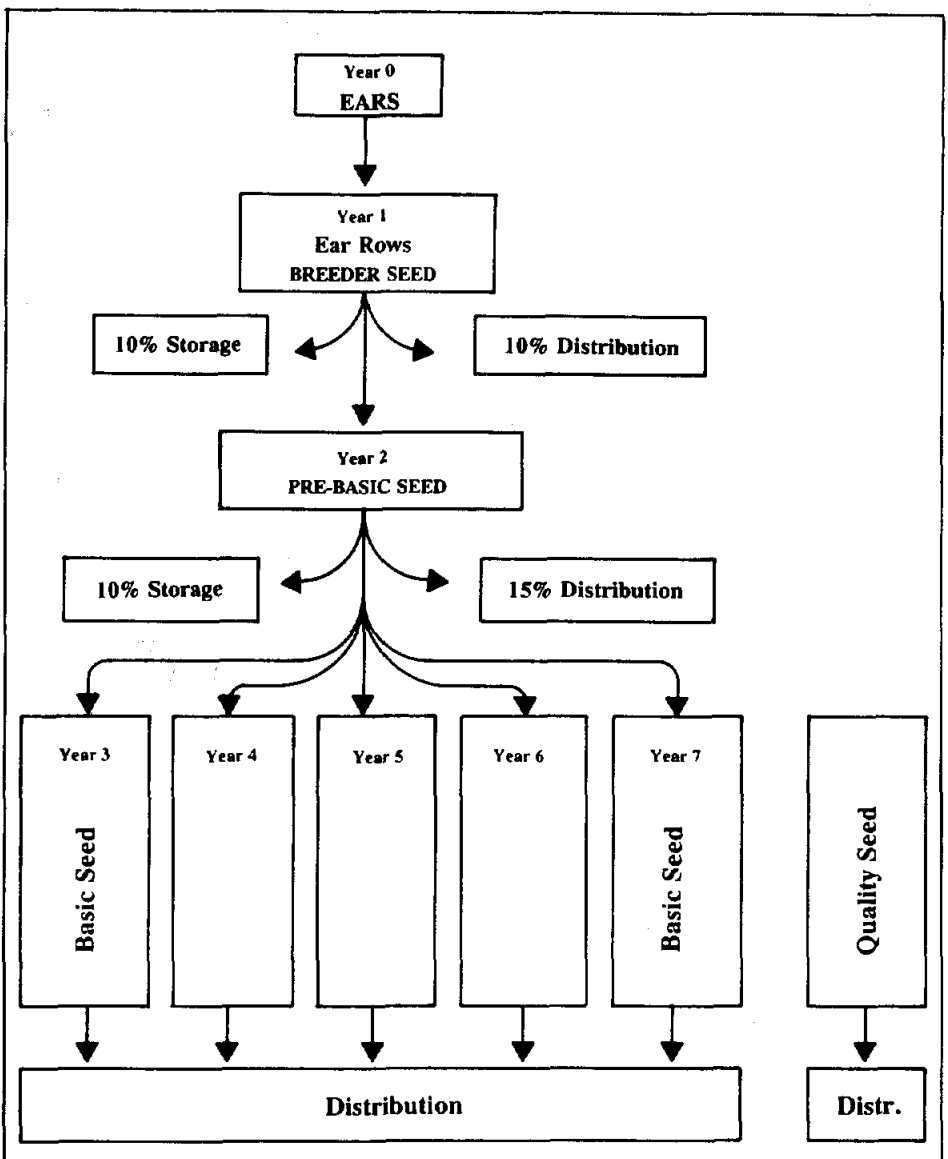

Figure 1: Seed multiplication scheme.

but it does not directly derive (through one or more generations) from Breeder Seed.

4.1. Production of Breeder Seed and Pre-basic Seed

31.5 tonne of seed was produced in the dry year of 1989, as compared to 80.5 tonne in the wet 1988 season. Of this, 13.2 tonne was wheat, 15.9 tonne barley, 1.8 tonne chickpea, 0.2 tonne lentil, and 0.4 tonne medic.

The quantities of Breeder Seed and Pre-basic Seed produced in 1989 are indicated in Table 4.
Breeder Seed (413 kg) was produced of 3 varieties of bread wheat, 5 varieties of durum wheat, 7 varieties of barley, 2 varieties of chickpea, 2 varieties of lentil and 6 species of annual medic. For the cereal varieties 500 selected ears were planted as ear to row lines; for food legume varieties the same number of selected single plants were used to produce the Breeder Seed. Breeder Seed plots were carefully observed on a weekly basis and all rows deviating from the morphological varietal description as well as rows with off-types were rogued. For medic, 'Breeder Seed' was produced of 6 different species. One kilo of each species was purified in the laboratory and planted on 400 m^2. Plots were rigorously rogued at podding stage; hand harvested and again purified in the laboratory. This seed will be used to plant the next generation.

Pre-basic Seed was produced for the first time; 24 varieties (6 bread wheat, 5 durum wheat, and 13 barley varieties) produced 6.1 tonne. Pre-basic Seed will be used to produce Basic Seed.

4.2. Production of Quality Seed

Because no Basic Seed is yet available, Quality Seed is produced for distribution in the region. In 1989 10.8 tonnes of Quality Seed of wheat were produced (Table 4). This seed and the carry-over seed was distributed as follows (Table 5): (1) 19% to the countries of the region, (2) 4% used for next year's plantings of the Unit, (3) 3% to the Syrian Seed Organization for pre-release multiplication, (4) 14% for research purposes, (5) 8% to seed growers, (6) 6% for planting at ICARDA's farm, and (7) 47% is still in the store. The amount of seed in the store is rather large because it includes 1 tonne Seri 82 for YAR, 1 tonne of Sebou for Saudi Arabia. Moreover, 1 tonne of Nesser is kept for distribution to the Syrian Seed Organization in case this variety is released in Syria.
Of barley 11.8 tonnes (Table 4) were produced. The seed was distributed as follows (Tables 5): (1) 13% to the countries of

Table 4: Quantities of wheat, barley, chickpea, lentil and medic seed harvested per multiplication category during the 1989 season

	Breeder Seed		Pre-basic Seed		Basic Seed		Quality Seed		Total
	No of vars	Production (kgs)	No of vars	Production (kgs)	No of vars	Production (kgs)	No of vars	Production (kgs)	(kgs)
Bread wheat	3	70	6	1 100			7	6 200	7 370
Durum wheat	5	130	5	1 100	This stage has not yet		11	4 550	5 780
Barley	7	180	13	3 900	been reached for cereals nor		14	11 800	15 880
Chickpea	2	6	This stage has not yet been reached for legumes		for food legumes		3	1 800	1 806
Lentil	2	1					2	225	226
Medic	6	26					4	390	416
Total	25	413	24	6 100			41	24 965	31 478

Table 5: Seed distributed (in kgs; as per 1/11/1989) by the Seed Production Unit in 1989

Variety	Quality seed produced in 1989	Carry-over seed	Distribution						Clean seed still available (kg)
			Region	Seed Unit	GOSM (Syria)	Research purposes	ICARDA farm	Progressive farmers	
Durum wheat	4 550	3 750	1 950	550	250	1 250	500	650	3 150
Bread wheat	6 200	3 500	1 400	150	250	1 200	500	800	5 400
Barley	11 800	6 000	2 400	80	250	2 400	3 400	800	8 470
Chickpea	1 800	600		300	50	2 000			50
Lentil	225	330	50	300	100	50			55
Total	24 575	14 180	5 800	1 380	900	6 900	4 400	2 250	17 125
%	100		15	4	2	18	11	6	44

the region, (2) 1% used for next year's plantings of the Unit, (3) 1% to Syrian Seed Organization, (4) 13% for research purposes, (5) 5% to seed growers, (6) 19% for plantings of Station Operations at the ICARDA farm, and (7) 48% is still in the store (mainly of non-released varieties). One tonne of Rihane 03 is kept in store in case this variety will be released in Syria.
Only very limited amounts of Quality Seed of food legume varieties were produced: 1.8 tonne of chickpea (three varieties) and 0.2 tonne of lentil (two varieties). Chickpea and lentil seed was mainly used for next year's planting of the Unit and for research purposes. Of both crops a small percentage was given to the Syrian Seed Organization.
A limited quantity (390 Kgs) of Quality Seed of medic species was produced; seed was used for next year's planting of the Unit and PFLP.

5. THE SEED TESTING LABORATORY

The Unit's seed testing laboratory plays an important role in all seed production activities. During 1989 1418 seed quality tests (Table 6) were conducted (283 physical purity tests, 822 germination tests, 165 varietal purity tests, and 148 moisture tests). Twenty seven percent of the tests were carried out for training purposes; 37% to monitor seed multiplication activities; 17% to monitor the storage and processing of seed; and 19% for other purposes (seed surveys, service, etc).

Table 6: Number of samples tested in the seed testing laboratory

	1985	1986	1987	1988	1989	Total
Physical purity	160	200	434	158	283	1 235
Germination	160	200	468	290	822	1 940
Var. purity	120	160	424	304	165	1 186
Moisture	40	50	26	8	148	270
Total	480	610	1 352	760	1 418	4 631

6. VARIETAL DESCRIPTIONS

Morphological varietal descriptions are often not made by the breeders. The project initiated experiments, aiming at producing morphological descriptions of ICARDA-related wheat and barley varieties. Some varieties grown by National Programs are included in these experiments. In 1988 20 barley and 20 wheat varieties were included in this experiment; in 1989 45 wheat and 17 barley varieties are being described.

	Wheat	Barley	Chickpea	Lentil
1987	Preliminary			
1988	20	20		
1989	45	17	Preliminary	
No of characteristics scored	32	31	29	18

Observations are made throughout the growing season and mature ears and seeds are carefully observed in the seed production laboratory. The number of characteristics used is over 30 for cereals. The 1988 and 1989 results will be the basis for the final morphological descriptions of those varieties.

7. SERVICE TO COMMODITY PROGRAMS

A small part of the activities of the Unit is dedicated to serve ICARDA commodity programs; in 1989 it cleaned and treated 38.9 tonnes of seed for commodity programs (Table 7). Other services rendered are (1) training of ICARDA staff as participants of regular seed courses (Table 2), (2) carrying out seed quality tests (Table 6), and (3) managing the ICARDA Central Store.

8. PUBLICATIONS

van Gastel, A.J.G., Varma, S. and Saed Abdul Elah Hamood (eds)-1989. Seed Production in the Arabian Peninsula. Proceedings of the Workshop on Seed Production in the Arabian Peninsula. Sana'a, YAR, 16-18 March 1988; ICARDA, Aleppo, Syria.

Table 7: Seed processed in the seed processing plant as a service to ICARDA's commodity programs in 1989 (Quantities are tonnes of clean seed)

	Wheat	Barley	Chickpea	Lentil	Vetch	Lathyrus	Pea	Total
CIP	-	1.6	-	-	-	-	-	1.6
PFLP	1.8	-	-	-	3.0	1.7	-	6.5
FLIP	-	-	4.3	-	-	-	-	4.3
FRMP	12.4	3.5	1.3	1.1	1.4	0.4	-	20.1
Station Op	-	-	-	-	6.0	-	0.4	6.4
Total	14.2	5.1	5.6	1.1	10.4	2.1	0.4	38.9

These proceedings have been translated into Arabic by W. Serrag and K. Jebeli.

van Gastel, A.J.G. 1989. ICARDA's Role in Seed Program Development. In Seed Production in the Arabian Peninsula. van Gastel, A.J.G., Varma, S. and S. Abdul Elah Hamood, (eds.). ICARDA, Aleppo, Syria.

9. PERSONNEL AND CONSULTANTS

Seed Project Personnel

Dr. A.J.G. van Gastel	Senior seed production specialist
Mr. Zwedie Bishaw	Seed production specialist (1/12/89-31/12/89)
Mrs. Maha Kabbani	Secretary
Mr. Abdul Aziz Niane	Senior research technician
Mr. Gazi Jabri	Research technician
Mr. Saed Hayani	Research technician

Consultants

Ir. Henk Koster	Government Institute for Research on Varieties of Cultivated Plants Wageningen, The Netherlands (May '89)
Dr. Claude Anselme	Director INRA Seed Testing Station, France (April '89)
Mr. N. Istifan	Seed Bureau, Aleppo, Syria (June '89)

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