

**The Nile Valley Regional Program
A Successful Research Collaboration Model Involving
NARS, IARCs and Donors**

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The Nile Valley Regional Program
A Successful Model for Technology Transfer

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1. Introduction

The International Center for Agricultural Research in the Dry Areas (ICARDA) is one of 18 international research centers where activities are coordinated by the Consultative Group on International Agricultural Research (CGIAR). The CGIAR seeks to enhance and sustain food production and consequently improve socioeconomic conditions of people, through strengthening national agricultural research in developing countries.

ICARDA was established in 1975 and became operational in 1977 southwest of Aleppo, Syria. The Center has a world responsibility for the improvement of barley, lentil and faba bean (to be phased out in 1992), and a regional responsibility - in West Asia and North Africa (WANA) - for the improvement of wheat, chickpea, pasture, forage crops and the associated farming system. ICARDA serves 24 countries stretching between the Atlantic and the Indian Ocean - from Pakistan in the east to Morocco in the West, and from Ethiopia in the south to Turkey in the North. ICARDA focus its research in dry areas characterized by hot dry summers and cold wet winters where participation ranges between 200 to 600 mm.

2. ICARDA Outreach Regional Programs

The establishment of regional programs is the major mechanism by which ICARDA can serve the WANA region more effectively and decentralize its present activities. In accordance with ICARDA medium term plan 1990-94 six regional programs were developed on the basis of commonalities of geography, ecology and constraints to production. The first outreach program was the Nile Valley Regional Program (NVRP) which was established in 1979, only two years after ICARDA became operational. These programs link scientists both within countries and within the region. These programs cater for research and training needs to strengthen gaps in National Agricultural Research Systems (NARS). They also provide feedback from these region to ICARDA main research station in Syria to orient its research programs. Outreach programs also promote leadership at the national and regional levels, facilitate cooperation to solve problems common to a group of countries, and optimize the use of scarce resource and encourage self-reliance. Therefore, a genuine partnership is developed between NARS and ICARDA. To strengthen regional programs, a well defined and effective strategies are being set at national and regional levels.

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3. Strategy at National level

Strong national programs are pre-requisite to regionalization and effective regional networks. Member countries in a region or scientist in regional network expect to have mutual benefits when contributing to regional activities. To develop strong and effective national research and transfer of technology program, the following components are essential and complementary to each others:

- a) qualified multi-disciplinary research team e.g. multi-disciplinary researchers, extensionists, farmers;
- b) well set objectives and research approaches with proper plant material;
- c) necessary facilities and resources, through National Program/Donors;
- d) coordination of research activities; nd
- e) more work at farmers levels.

ICARDA strategy would be to help national programs secure these components with close follow-up in early stages of development. This is done in ICARDA mandated crops based on the demand of national programs.

4. Strategy at the Regional Level

In principle, regional strategy is based on interactions a) between ICARDA home-base program in Aleppo and each national program and b) among national programs themselves. ICARDA plays an important role by strengthening both national and regional programs since, as indicated earlier, strong national programs are pre-requisite to regionalization and effective networks. In the second type of interaction - i.e. regional, ICARDA plays a catalyst role. Complementarity in national and regional research work is done through coordination to utilize limited human and physical resource more effectively.

5. History of ICARDA Involvement in the Nile Valley

ICARDA was involved with NARS in the Nile Valley since its establishment in 1977. Cooperation started by providing germplasm, technical support and training for the improvement of food legumes and cereals in Egypt, Ethiopia and Sudan. The Nile Valley Project (NVP) was established in 1979 to improve faba bean production and ICARDA Cairo Office became operational the same year. The International Fund for Agricultural Development (IFAD) financed the first phase of the project (1979-82) in Egypt and Sudan. Based on the achievements of the first phase, the second phase of NVP (1982-1985) was also supported by IFAD with additional investment in research. Ethiopia became a full partner in the project towards the end of 1985.

In the third 3-year phase (1985-88) of the NVP, IFAD scaled down its contribution and Italy supplemented the 3-year grant after realizing the importance of the programs and the achievements made.

Based on the achievements in faba bean improvement and the successes of the NVP, the project was expanded in 1988/89 to become the Nile Valley Regional Program on Cool Season Food Legumes and Cereals (NVRP) to include the improvement of faba bean, chickpea and lentil in the three countries of the region in addition to field pea in Ethiopia as well as cereals improvement (wheat and barley in Egypt; wheat in Sudan; and the barley training component in Ethiopia). NVRP is funded by three Donors: The Commission of the European Communities (EEC) funds the Egyptian component, The Swedish Agency for Research and Cooperation with Developing Countries (SAREC) supports the Ethiopian component and the Government of the Netherlands supports the Sudanese component.

The first 3-year phase of the NVRP in Ethiopia and Sudan was ended on 31 December, 1991, and is being considered for renewal by the same Donors for a second phase (1992-1994). The first 5-year phase for Egypt will end in 1993.

6. Methodology Approach and Activities

6.1 The NVRP Methodology

The NVP project and later on the NVRP program has been adopting a research approach in which planning is done by national programs in collaboration with ICARDA but research is conducted and reported by the national scientists. Expertise at the national institutes is being enhanced through training and participating in professional activities. Thus, the main elements of the strategy adopted for the implementation of the various phases of NVP and NVRP involve:

- a) Enhancement of self-reliance in national program for leadership, coordination, as well as program planning and execution.
- b) Greater emphasis on on-farm trials and demonstrations with direct involvement of extension and farmers in the conduct of demonstration fields; reduced efforts of on-station research.
- c) Close coordination within and between the Nile Valley countries of different disciplines aiming at complementarity in research efforts among the three countries.
- d) The role of ICARDA has been to provide technical support, regional research coordination, fund management and administrative logistics. The technical input of CIMMYT and ICRISAT has also been used for wheat and chickpea, respectively.

The project is executed with the following three research inputs:

- a) Farmer-Managed Demonstration: Using the technologies already tested successfully on farms under the supervision of researchers and extension workers. Large pilot production fields are laid out by farmers themselves with advice from researchers, socio-

economists and extensionists. These demonstrations will provide an excellent tool for extension activities through the organization of field days during the growing season.

- b) **Researcher-Managed On-farm Trials:** The objective of these trials is to evaluate experiment station findings under actual farm conditions. The organization, management and supervision of these trials remains with the research scientists. The treatments which have larger economic return than those normally obtained by farmers are to be included in subsequent farmer-managed demonstrations.
- c) **Back-up Research:** These activities cover gaps in applied research knowledge. They include entirely new areas of research or confirmation of previous preliminary research results. Most of the back-up research is carried out on the research station by the scientists concerned. The main objective of the back-up research is to find solutions to second generation problems identified in the researcher and farmer-managed trials, as well as to identify/develop new cultivars and practices which will further boost production in different agro-climatic zones.

The flow chart of on-farm activities and back-up research are presented in Figure 1, Appendix A.

6.2 Activities of NVRP

The research experience in cereals and food legumes under the various phases of NVP and the first phase of the NVRP have been rewarding in initiating and strengthening the following activities:

- a) Laying out demonstrations and large scale pilot production fields of high yielding cultivars and appropriate agronomic practices through extension workers and farmers in major production areas.
- b) Conducting adoption studies to assess farmers perception of the new technology and provide feedback to researchers to improve the package further.
- c) Testing superior cultivars and improved practices in farmers' fields to evaluate their practicability, economic feasibility and potential utilization by farmers and to provide feedback for researchers to improve the technology through back-up research.
- d) Conducting back-up research to improve current recommendations and to find solutions to specific problems identified in the on-farm research and diagnostic surveys.
- e) Improve sustainability of current production systems by stimulating farmers to adopt ecologically sound practices and making better utilization of resources available to them.

- f) Undertaking multiplication of pre-basic seed of improved cultivars in cooperation with seed multiplication organizations to make high quality seeds available to large numbers of farmers.
- g) Arranging non-degree, and to a lesser extent degree training, study tour, consultancies, coordination meetings, seminars and literature exchange.
- h) Providing key research facilities, breeding material, and essential capital items for field and laboratory use.
- i) Developing appropriate publications to address needs of various groups including extensionists, farmers, Government officials and donor agencies.

6.3 Regional Cooperation

Regional cooperation through exchange of germplasm and research technology, joint planning and evaluation, regional travelling workshops and training etc., is an important feature of the NVRP program. The regional component of the program is being strengthened further to provide complementarity in research efforts in problem areas of common interest to ensure more effective utilizations of the limited human and physical resources of the national programs. The regional activities and networks cover the following research areas:

Food Legumes Networks

- Integrated Management of Wilt and Root-rots of Chickpea and Lentil.
- Development of Autogamous Faba Bean.
- Screening of Faba Bean for Resistance to Aphids (Aphis craccivora and Aphis fabae).
- Survey of Legume Viruses in Egypt, Sudan, and Ethiopia
- Integrated Management of Chocolate Spot (Botrytis fabae) of Faba Bean.

Cereals Networks

- Sources of Primary Inoculum of Stem and Leaf Rusts of Wheat, their Pathways and Sources of Resistance in the Nile Valley Countries.
- An Approach to Identify Selection Criteria for Thermo-tolerance in Wheat and Maintaining Yield Stability in the Environments.
- Water Use Efficiency of Wheat in Nile Valley Countries, Egypt and Sudan.
- Integrated Control of Aphids in Wheat.
- Screening for Barley Yellow Dwarf Virus (BYDV) Resistance in Egypt, Sudan and Ethiopia.
- Field Survey for Barley Yellow Dwarf Virus (BYDV) Resistance in Egypt, Sudan and Ethiopia.
- Characterization of Wheat Germplasm for the Response to Photoperiod and Vernalization.

Socio-Economic Network

- Socio-Economic Studies on Adoption and Impact of Improved Technologies.

6.4 Program Implementation

The program is being implemented as follows (Figure 2, Appendix A):

- a) The program relies on full or part-time efforts of individual National Scientists to implement the program activities according to a pre-set workplan and budget. Junior support staff also contributes to the project. Incentives for national scientists include provisions of research equipment and facilities, and logistical support; opportunities for professional enhancement through training, workshops, and conferences; professional recognition by fellow scientists and administrators, through publications and reviews; and honoraria if applicable.
- b) A National Coordinator for each of cereals and food legumes are responsible for daily project management, coordinating project activities, and developing proposals for budget on annual basis.
- c) Research plans are developed in multi-disciplinary sessions among national scientists. These are discussed and finalized in the Annual Coordination Meeting with participation of NVRP Regional Coordinator and scientists from national programs and ICARDA. The National Management Committee reviews the proposed workplans and training programs and forward them for final approval to the NVRP Steering Committee. Research contracts are drawn up for each participating scientist specifying the type of research, the support staff needed, operational budget assigned, and the amount of the honorarium to be paid where applicable.
- d) The proceedings of the Annual Coordination Meeting are published in the form of annual Workplan and Budget and an Annual Report. These include the highlights of the research of the preceding year, and details of the workplan and approved budget for the coming season.
- e) The monitoring of the program activities are done by the National Coordinators with constant support from the NVRP Regional Coordinator and backstopping of ICARDA scientists. Scientific missions visit the work in the field during the season to get feedback for future planning. An independent review mission is also organized to evaluate the effectiveness of the project if so desired by the donor.

- f) **The NVRP Steering Committee** is held once annually to evaluate the progress and achievements towards the overall objectives of the NVRP Program, assess budget utilization, set the future strategy and decide on action for financing. The members of the **Steering Committee** include: representatives of the three Donor Organizations supporting the NVRP Program in Sudan, Egypt, Ethiopia; Director Generals/General Managers of national research institutes in the three countries, ICARDA Assistant Director General for International Cooperation, concerned ICARDA Program Leaders and the NVRP Regional Coordinator.

7. The Impact of the NVP and NVRP

The impact of the NVP and NVRP was on the outcome of back-up research, transfer of technology to farmers, national program development, regional cooperation and development of facilities. The transfer of technology to farmers made impact on national production in faba bean and wheat.

7.1 Impact on Back-up Research

Through back-up research several improved high yielding cultivars were developed and/or identified for various agro-climatic zones and adverse conditions in all the crops involved in NVRP and in all the three countries (Appendix B). Research also developed a set of recommendations on cultural practices for the local and improved cultivars to constitute improved production packages to be recommended to farmers in different agro-climatic areas (Appendix C). The total number of improved production packages were 8 in faba bean, 5 in lentil, 4 in chickpea, 8 in wheat and 1 in barley considering all three countries. These included improved cultivars, planting dates and methods, crop population density, fertilization, Rhizobium inoculation, weed control and insect pest management.

7.2 Impact of Technology Transfer

All the packages developed in back-up research were demonstrated to farmers in several locations and sites in all three countries. In Egypt, Table 1, Appendix D provide the adoption rates of the components of improved production practices demonstrate to farmers in three growing seasons in Minia. It is apparent that improved varieties, seeding rate and sowing methods were adopted by 85 to 95% of the farmers while fertilization and weed control recommendations were adapted by 33 to 50% of the farmers. Table 2, Appendix D shows the performance of improved faba bean packages in Ethiopia where yield was increased by 48 to 316% as a result of package adoption with a marginal rate of return (MRR) of 329 over locations. A diagnostic survey (54 farmers at random) on adoption of recommended practices in the central zone indicated that 61% of the farmers adopted the recommended improved cultivars, 32% adopted P fertilization and 50% of the growers adopted the weed control recommendation.

The 2.5 folds increase of wheat production in Egypt between 1986 (1.9 million tons) and 1992 (4.6 million tons) is a striking example of the impact research and transfer of improved technology to farmers. For example, farmers adopting improved production practices increased their yields from 19 to 84% in Sohag (Table 2, Appendix D). The increased adoption trend of improved cultivars relative to old cultivars is apparent in Table 1, Appendix D.

Wheat improvement in Sudan provides another good example of the impact of transfer of technology. The Sudan Government, encouraged by the high and very profitable wheat of the demonstration and pilot production plots of the NVRP, made a policy decision to achieve self-sufficiency in wheat. The advantages of adopting improved production packages are shown in Table 4, Appendix D. In response to this policy, wheat production during the last six years has increased by 370% in 1991/92 (from 233 to 865 thousand tons per season) (Table 5, Appendix D). In 1992/93 and 1993/94, wheat production went down due to market prices/high input levels (1992/93, 397,000 t) and excessively high temperature at the reproductive growth stage (1993/94, 492,000 t).

In lentil, Sudan reached self-sufficiency in 1992/93 and eliminated imports as a result of vertical and horizontal expansion to non-traditional production areas (Figure 1, Appendix E).

7.3 Impact on National Program Development

Staff education, training and professional activities, which are important components of the NVRP program, contributed greatly to the development of strong multi-disciplinary national programs in the Nile Valley. For example, during the 1991/92 season a total of 80 national scientists/technicians received various types of non-degree training and participated in professional visits and 251 scientists participated in travelling workshops, coordination meetings and conferences through the support of the NVRP Program. Training was in various specialized research disciplines included agronomy, breeding, entomology, pathology, microbiology, virology, Orobanche control, biotechnology, extension and technology transfer. In addition to the above, three scientists from Ethiopia and four scientists from Sudan are being supported for high degree training.

7.4 Impact on Regional Cooperation

Regional cooperation was strengthened through networks in specific research areas of common interest among Egypt, Ethiopia and Sudan. Regional cooperation among the three participating countries involved exchange of germplasm, technical information and improved technology in addition to participation in regional travelling workshops and regional coordination meeting. These networks are based on complementary of research efforts among the three Nile Valley countries to utilize more effectively the limited human and physical resources available to National Programs.

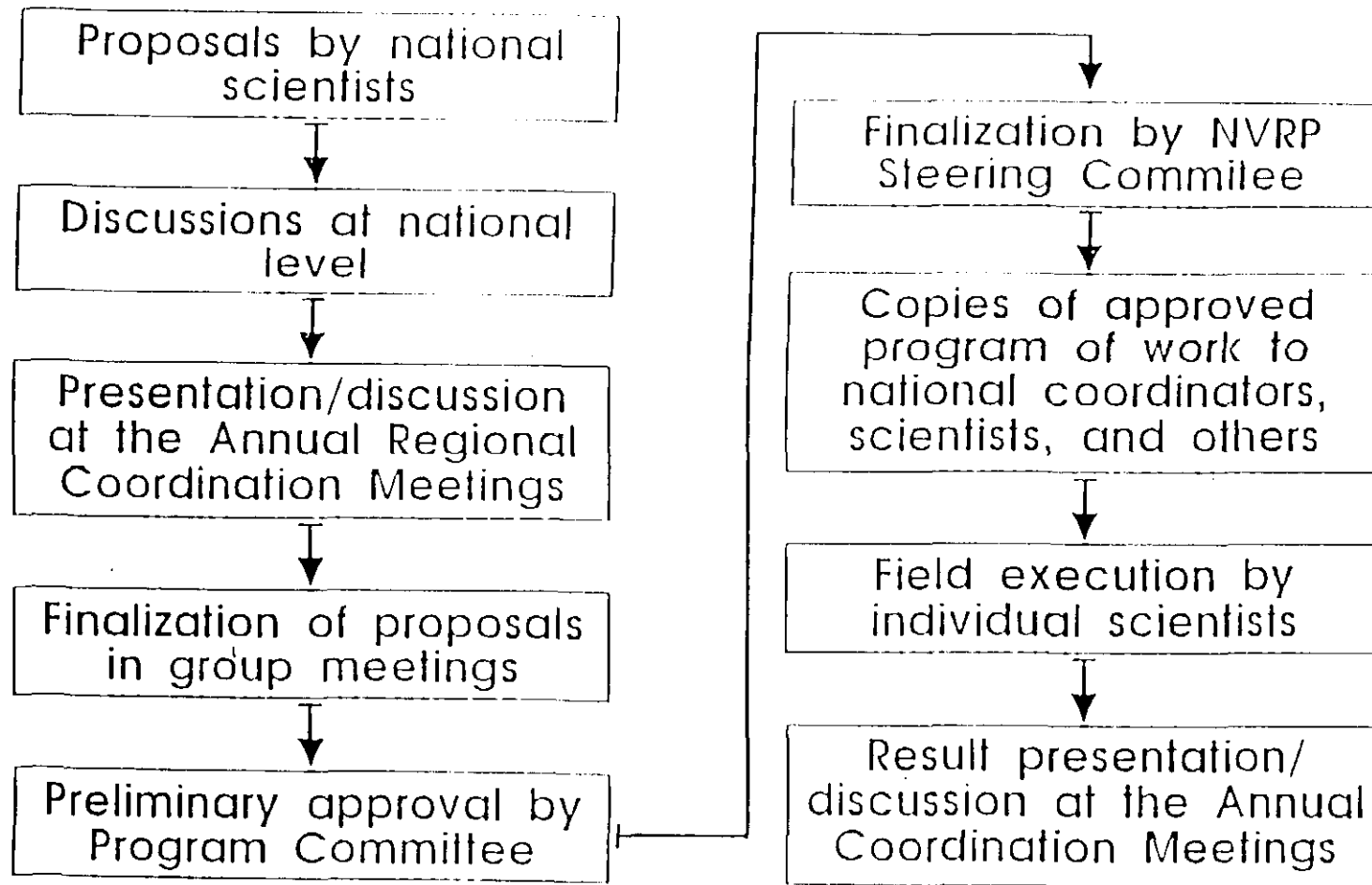
Countries which developed expertise in specific research area are taking a leading role with a regional network coordinator. For example, Egypt is taking the lead in screening germplasm for aphid resistance in various crops while Sudan is taking the lead on the biological control of aphids. Work on heat stress in wheat is led by Sudan while work on water efficient is coordinated between Egypt and Sudan. Ethiopia is taking a lead in chickpea resistance to wilt/root rot diseases. The regional travelling workshops in each of the three countries provided good opportunities to strengthen network development in specialized research disciplines and problem-solving objectives.

7.5 Impact on Research Facilities

The NVRP program also upgraded field and laboratory equipments of the national programs by providing field, laboratory and office equipment in addition to research supplies. These included, for example, plot threshers, plot combines, vehicles, tractors, field implements, incubators, balances, computers, insect rearing cabinets, slide and overhead projectors and spare parts of various equipment.

The affectivity of the NVRP program was mainly due to the new methodology and the multi-disciplinary approach followed by the national program in back-up research and transfer of technology. This involved researchers, extensionists and farmers.

STEPS IN PROGRAM DEVELOPMENT



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APPENDIX A

Figure 1. Steps followed in NVRP Program development.

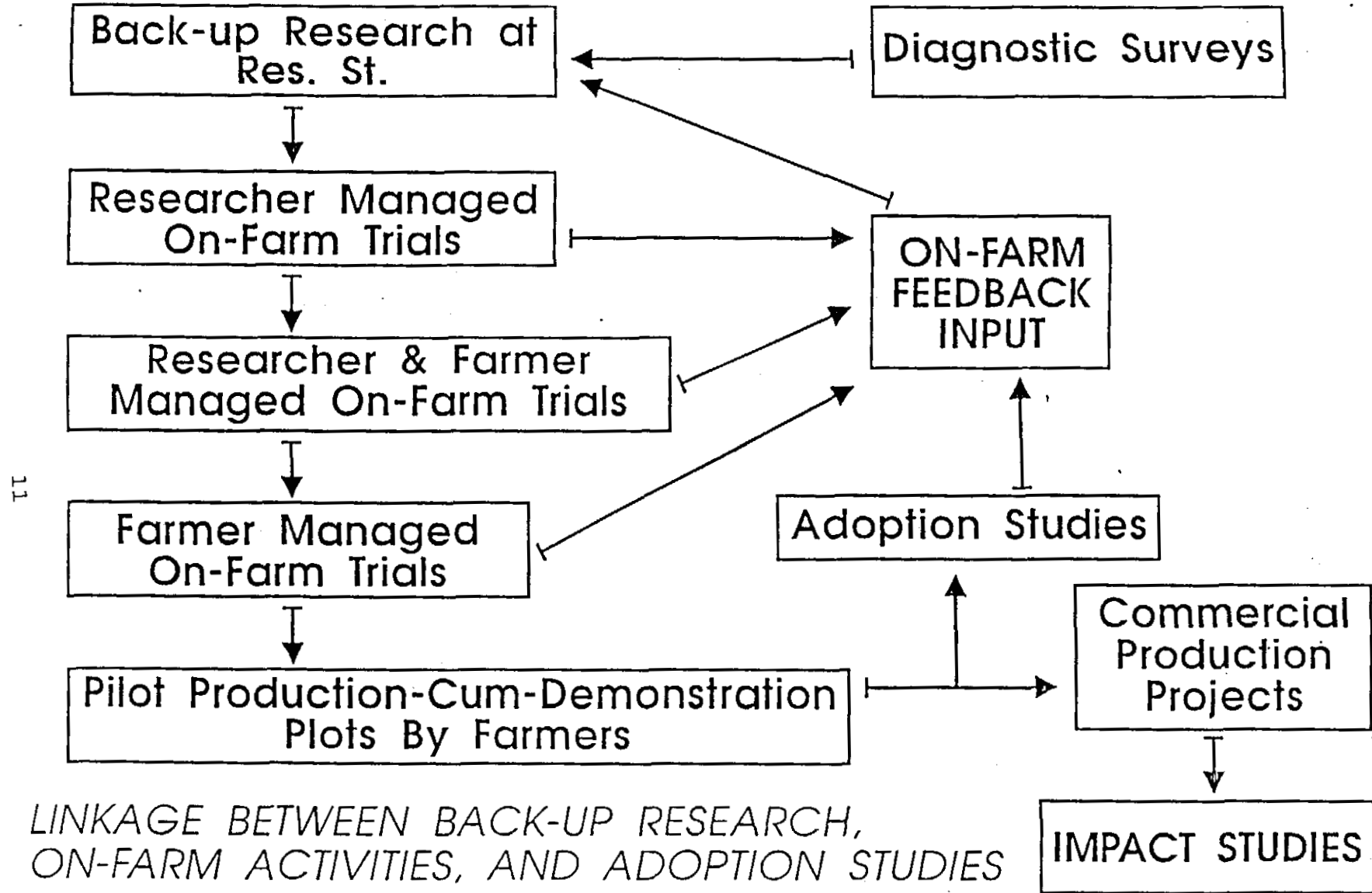


Figure 2. Linkage between back-up research, on-farm activities and adoption studies.

APPENDIX B
Released and/or Spread* Cultivars

Faba Bean

Egypt

1. Giza* 3: for North Delta
2. Giza 402: for tolerance to Orobanche, Upper Egypt
3. Giza 461: for North Delta
4. Giza Blanca: for North Delta

Ethiopia

High Altitude Areas

1. ALAD 160¹
2. Coll. 111/77¹

Medium Altitude Areas

3. MKT Ilubabor¹
4. NEB207X74TA74-6D¹
5. 75TA26026-1-2-1¹

Sudan

Non-Traditional Areas

1. Shambat 75
2. Shambat 104
3. Shambat 616

Traditional Areas

4. Selaim improved (SML)
5. Basabeer
6. Hudeiba 93

Lentil

Egypt

1. Precoz*
2. Giza* 370

Ethiopia

1. NEL2704

Sudan

1. Rubatab 1

Chickpea

Egypt

1. Giza* 88
2. Giza 195
3. Giza 531

Sudan

1. Shendi* 1
2. Jebal Marra 1

Ethiopia

1. DZ 10-16-2

-
1. Submitted for release.

APPENDIX B (Cont'd)
Field Pea

Ethiopia

1. 061K-2P-2192

Wheat

Egypt

For Upper Egypt

- | | |
|----------------|--------------|
| 1. Beni Suif 1 | 2. Sohag 2 |
| 3. Giza* 155 | 4. Giza* 160 |
| 5. Giza 164 | |

For North West Coast (Rainfed Areas)

- | | |
|-------------|-------------|
| 6. Sakha* 8 | 7. Sakha 69 |
| 8. Sahel 1 | |

Sudan

- | | |
|---------------|-------------|
| 1. Condor* | 2. Debeira* |
| 3. El-Neilain | 4. Sasaraib |

Barley

Egypt

- | | |
|--------------|--------------|
| 1. Giza* 123 | 2. Giza* 124 |
| 3. Giza 125 | 4. Giza 126 |

APPENDIX C
Improved Production Packages Developed

Faba Bean

Egypt

- | | |
|--------------------------------|--------------------|
| 1. Delta Region | 2. Upper Egypt |
| 3. <u>Orobanche</u> Resistance | 4. Minimum Tillage |

Sudan

1. Middle and Southern Parts of Northern Sudan (Traditional Areas).
2. Dongola Areas in Northern Sudan.
3. Central Sudan (Non-Traditional Areas of Gezira, Rahad, New Halfa).

Ethiopia

- | | |
|------------------------|--------------------------|
| 1. High Altitude Areas | 2. Medium Altitude Areas |
|------------------------|--------------------------|

Lentil

Egypt

- | | |
|---------------------|------------------|
| 1. The Delta Region | 2. The New Areas |
|---------------------|------------------|

Ethiopia

1. Shewa Region

Sudan

- | | |
|-----------------------------------|----------------------------------|
| 1. Rubatab/Dongola | 2. Wad Hamid Basin |
| 3. Salawa Basin | 4. Sola Scheme in Northern Sudan |
| 5. Selaim Basin in Northern Sudan | |

Chickpea

Egypt

1. Beheira Governorate

Ethiopia

1. Central Highlands

Sudan

- | | |
|------------|--------------------|
| 1. Rubatab | 2. Wad Hamid Basin |
|------------|--------------------|

Wheat

Egypt

- | | |
|----------------|---------------|
| 1. Upper Egypt | 2. New Valley |
| 3. Fayoum | |

APPENDIX C (Cont'd)

Sudan

1. Gezira
2. New Halfa
3. Rahad
4. Dongola/Rubatab
5. Kali/Kaboushia Agricultural Schemes

Barley

Egypt

1. Northwestern Coastal Region

APPENDIX D (Cont'd)

Table 2. Mean grain yield of faba bean (CS 20DK) in demonstrations plots in the Central Zone of Ethiopia, 1991/92.

Demonstration sites	No. of demons.	Altitude (m)	Yield (t/ha)		Yield increase in	
			Local Variety	CS 20DK	t/ha	%
Sademo	4	2400	0.98	1.93	0.95	97
Rob-Gebeye	4	2450	0.77	1.56	0.79	103
Zewolde	2	2280	1.00	1.80	0.80	80
11 Bililigne	1	2280	1.40	2.08	0.68	49
Berehi	1	2480	0.80	2.60	1.80	225
Chofe Donsa	4	2400	0.83	1.90	1.07	129
Kilinto	2	2100	0.90	2.00	1.10	122
Sebeta	1	2050	1.30	2.00	0.70	54
Meta Berga	3	2560	0.40	1.70	1.29	317
Mean			0.93	1.95	1.02	130

Marginal Rate of Return (MRR) over sites is 329%.

LSD at 5%	0.28 t/ha
LSD at 1%	0.40 t/ha
S.E. (+-)	0.08 t/ha
C.V. (%)	17.6%

APPENDIX D

Table 1. Adoption rates for different components of faba bean improved production package demonstrated to farmers over three seasons in Minia in Egypt.

Practices diffused	<u>Adoption ratio</u>								Over four seasons %
	1988/89 (45/demons.*)		1989/90 (90/demons.*)		1990/91 (90/demons.*)		1991/92 (110/demons.*)		
	No.of Farm.	%	No.of Farm.	%	No.of Farm.	%	No.of Farm.	%	
Variety	39	86.7	85	94.9	90	100.0	110	100.0	95.4
Seeding rate	35	77.8	78	86.7	90	100.0	110	100.0	91.1
Sowing methods	32	71.1	73	81.1	87	96.7	102	92.7	85.4
Fertilizers Starter N (37.5 Kg/ha)	27	60.0	32	35.6	47	52.2	22	20.0	42.0
P205 (71.4 Kg/ha)	31	68.9	41	46.0	46	51.1	38	34.6	50.2
Weed control	27	60.0	47	52.2	10	11.1	12	10.9	33.6
Whole package	6	13.3	30	33.3	32	35.6	39	35.5	29.4

* demons. = Demonstrations.

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APPENDIX D (Cont'd)

Table 3: Grain yield of participating farmers (PF) and non-participating farmers (NPF) in wheat demonstrations in the old lands in two governorates in Upper Egypt between 1989-1993.

Governorate/Season	Grain Yield			Mean Gover. Yield (t/ha)	% Increase Over Mean Yield
	PF t/ha	NPF t/ha	Increase Over NPF %		
SOHAG					
1989	6.13	3.87	58	4.84	27
1990	7.36	5.21	41	4.93	49
1991	5.68	3.40	67	4.38	30
1992	6.12	4.04	51	5.15	19
1993	6.93	4.45	56	5.19	34
Mean	6.44	4.19	55	4.49	32
QENA					
1989	4.74	3.70	28	3.99	19
1990	8.60	5.28	63	4.68	84
1991	4.72	3.58	32	3.91	21
1992	6.39	4.54	41	5.30	20
1993	6.60	4.71	40	5.32	24
Mean	6.21	4.36	41	4.64	34

Table 4: The different trends in the amount of certified seeds of old and new wheat cultivars distributed to farmers in Egypt during the period 1986-1992.

Season	OLD CULTIVARS			NEW CULTIVARS	
	Giza 155	Giza 157	Sakha 61	Giza 163	Giza 164
1986	2368	8609	1656	-	-
1987	4773	4900	2034	-	-
1988	3364	3486	2024	54	176
1989	2542	3822	2786	726	2324
1990	1914	1788	1831	7836	4688
1991	463	450	372	8820	7226
1992	246	128	210	11930	10712

APPENDIX D (Cont'd)

Table 5. Comparison of package-applying and neighboring farmers in the different production schemes, 1991/92.

Location	No. of practices farmers	Area (ha)	Average yield (t/ha)	%increase over neighboring farmers	increase in net benefits over N.F. (L.S./ha)	MRR %
Rahad	25	57.8	2.97	29	3969	-
Rahad Scheme	32	73.9	3.35	46	6699	-
6 New Halfa	40	84	2.75	32	3533	15193
White Nile	7	14	2.47	33	4341	-
Blue Nile	20	21	2.68	100	8643	1355
Shendi	9	9	3.29	30	5995	386
Selaim	5	0.6	3.91	61	19875	17945
Burgaig	5	0.6	2.89	6	-	-

NF = Neighboring Farmers.

APPENDIX D (Cont'd)

Table 6. Wheat acreage, production and average national yield in various provinces and schemes in Sudan from 1987/88 to 1991/92.

Location Schemes	Grouping Seasons											
	1987/88		1988/89		1989/90		1990/91		1991/92		1992/93	
	Area 1000 ha	Prod. 1000 t	Area 1000 ha	Prod. 1000 t	Area 1000 ha	Prod. 1000 t	Area 1000 ha	Prod. 1000 t	Area 1000 ha	Prod. 1000 t	Area 1000 ha	Prod. 1000 t
Gezira	106.0	120.0	115.2	148.0	164.8	231.0	257.7	302.0	223.8	536.4	216.0	246.2
New Halfa	12.6	13.9	23.1	31.0	32.4	47.0	34.6	31.2	26.7	42.6	28.0	29.0
White Nile	8.4	6.7	18.9	16.0	25.5	25.0	50.4	40.0	42.9	69.1	25.0	31.0
N. Region	14.7	27.9	20.2	38.0	31.4	67.0	58.8	105.0	45.1	134.8	40.0	56.0
Rahad*	0.0	0.0	0.0	0.0	3.5	5.0	26.6	30.3	27.6	62.5	26.0	31.5
Blue Nile*	0.0	0.0	0.0	0.0	2.6	2.3	14.9	10.5	7.4	12.0	4.6	3.3
Suki*	0.0	0.0	0.0	0.0	0.4	0.4	4.1	2.0	-	-	-	-
Other*	0.0	0.0	0.0	0.0	0.0	0.0	3.3	3.0	6.3	7.8	-	-
Total	141.7	168.1	177.4	233.0	260.6	377.7	453.3	524.0	379.8	865.2	339.6	397.0
Average National Yield (t/ha)	1.19		1.31		1.45		1.16		2.28		1.17	

* New areas where Wheat Production was introduced through the NVRP pilot production/demonstration plots.

APPENDIX E

