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Merger of Agricultural Research

in the Northwest Frontier Province,

Pakistan

A Report

to

The U.S. Agency for International Development

Mission to Pakistan

Pakistan Agricultural Education, Research and Extension Project

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MERGER OF AGRICULTURAL RESEARCH
IN THE NORTHWEST FRONTIER PROVINCE, PAKISTAN

INTRODUCTION

In the "Report of the Design Team for the Northwest Frontier Province Agricultural University"¹ a brief review was given of the crop and livestock production research that was being done in the Department of Agriculture, NWFP. It was "strongly recommended that the policy decision be taken to unify the agricultural and livestock production research of the Province into a single research system. It is further recommended that the responsibility for the entire system be assigned to the NWFP Agricultural University together with concomitant resources to effectively meet this responsibility."

The following benefits were anticipated to result from the merger of the crop and livestock production research under the leadership of the strengthened Agricultural University:

1. There will be a unified and coordinated research system with a developmental, problem-solving approach to meet the needs of farmers and the agro-industrial sector of the economy.
2. The University will provide the essential breadth to research involving not only crops and animal husbandry research but also the important areas of engineering applications, food technology, nutrition, and the rural social sciences.
3. There will be more efficient use of the limited professional talent in the University and the agricultural and livestock production research institutes, stations, and sub-stations.
4. Graduate student research at the University will be fully planned and conducted to contribute to provincial research needs.
5. All researchers will be closely identified with the Agricultural University and its sources of research support: the Library and data bases, the Learning Resources Center, the computer laboratory and data processing center, and modern research laboratories and equipment.
6. Duplication of expensive facilities and equipment will be minimized.
7. The costs of administering the provincial research will be reduced with only one administration for program planning, implementation, and evaluation.
8. It will be easier to retain researchers, all of whom are identified with an academic environment and a strong, unified, and productive system.
9. The unified research system will be more effective in support of the outreach function of the University and the Extension Department in preparation of practice recommendations and packages of practices for the diverse agro-climatic zones of the Province.
10. The research institutes, stations, and sub-stations will serve more effectively as technology transfer centers as well as research stations

¹"Report of the Design Team for the Northwest Frontier Province Agricultural University," a report submitted to the U.S. Agency for International Development Mission to Pakistan by the University of Illinois at Urbana-Champaign in collaboration with Southern Illinois University at Carbondale, June 28, 1983.

thereby strengthening the work of agricultural officers, agricultural field assistants, and livestock production assistants.

11. The University will have the primary responsibility for coordination with the provincially-located but federally-supported research organizations such as the Tobacco Research Station and the Nuclear Institute for Food and Agriculture.
12. The unified research system in the Province will provide a stronger mechanism for linking the research of the Province to that of other Provinces and the federal system, particularly the Pakistan Agricultural Research Council and the National Agricultural Research Centre.

The Design Team recommended to USAID/Islamabad that a supplemental study team make an analysis of (1) the needs for strengthening the non-University NWFP agricultural research and (2) the questions related to unification of the provincial agricultural research system. USAID/Islamabad concurred in this recommendation and this report results from the study team's analysis.

Current Agricultural (Crops) Research

Visits were made to all of the institutes and major stations and most of the substations which are doing research on crops in order to become familiar with their programs, personnel, resources, and methods of operation.

A. Program--Discussions with staff members and study of project outlines indicate that approximately one-half of the work is in applied research and one-half is devoted to demonstration plots and the dissemination of results directly to users and through Extension.

The major kinds of work, listed in decreasing order of resources devoted to them, are as follows:

1. Introduction and testing of plant materials (variety trials) which give high yields and are resistant to diseases. Pre-basic and certified seeds are also increased and released.
2. Work on cultural practices such as planting date, seeding rate, plant population, planting pattern and weed control.
3. Fertilizer experiments (application rates of various nutrients; time and method of application) on different crops.
4. Insect and disease control and some selection for disease resistance.
5. Limited work on micronutrients, amelioration of saline and alkali soils, and soil-water-plant relationships.
6. Limited plant breeding, such as on maize and cold water rice.
7. Provide some fruit nursery stock and investigate root stock for tree fruits.
8. Quality of crops, such as sugar cane and sugar beets.

It is estimated that of the total work on crops there is about 35 percent of the effort on item 1 above, 20 percent on item 2, and 20 percent on item 3, with the remainder (25 percent) devoted to other projects.

B. Personnel--The numbers, training, and grade of staff members in crops research are shown in Table 1.

Table 1. Agricultural (Crops) Research Staff Numbers
by Rank, Training, and Location in NWFP, Pakistan, 1983

Location	Degree Source ^a	BPS 19		BPS 18			BPS 17				BPS 16			Sub-total	Total
		Ph.D.	M.Sc.	Ph.D.	M.Sc.	B.Sc.	Ph.D.	M.Sc.	B.Sc.	B.Sc. ^b	M.Sc.	B.Sc.	S.Sc. ^c		
Tarnab	I O		1	1	1		26	18	1	3	1	4	55	62	
				3			3						7		
Pirsabak	I O						16	13	1			3	33	38	
						1	4						5		
Maroan	I O			1			6	7				2	16	19	
			1				2						3		
Mangora	I O			1			8	11				1	21	27	
			1	3			2						6		
Mansehra	I O						4	3					7	8	
				1									1		
D. I. Khan	I						12	19				1	32	32	
Agr. University	I O			1									1	3	
				1			1						2		
FARC	I O						1	1					2	6	
		1		1			2						4		
Abbottabad	I O						1	2					3	4	
				1									1		
Batakundi	I							1					1	1	
Kohat	I						3	7					10	10	
Karak	I						2						2	2	
Serai Nurang	I						5	5					10	10	
Subtotal	I O			4	1		84	67	2	3	1	11	193	222	
		1	3	10			1	14					29		
Total	All	4		15			188				15				
Percent	I O All	1.8		6.8			84.7				6.7			86.9 13.1	100.0

^aSource of highest degree: I=Inside Pakistan, mostly NWFP; O=Outside Pakistan, mostly from American University, Beirut.

^bPromotee; ^cmatric.

Research leadership must be strengthened. Among the Directors at the six largest institutes and stations (which direct almost all of the work) not all exhibit leadership of the kind that is needed to advance research on the agricultural crops of NWFP. Among the staff members there are only two persons with the Ph.D. degree and one of these is deputed to P.A.R.C. Most of the project leaders have an M.Sc. degree.

Eighty-five percent of the staff members are in grade 17, the level where most of them entered the organization. These men do most of the field work and many of them are dedicated and diligent; however, the current civil service system does not distinguish between productive and unproductive workers and promote them according to merit. This discourages superior workers and is a major constraint in the program.

C. Location and Land--The location, land area, and major emphasis of each of the crops research institutes, stations, and substations are shown in Table 2 and Figure 1. These research facilities are well distributed in the different agro-ecological regions (Figure 2), except for the replication of similar soil and climatic conditions at Tarnab and nearby Nowshera.

The area of available research land is adequate at most locations. Agricultural (Crops) Research uses 294 of 1,025 acres at D. I. Khan and 237 of 437 acres at Pirsabak, Nowshera. The 26 acres which are available at Mingora need to be increased by 20 to 25 acres.

Buildings-- At most, but not all, of the institutes and stations research laboratory and office space are adequate. With a total of approximately 75,000 square feet (8 buildings, each about 230 by 40 feet), D. I. Khan has surplus laboratory and office space, whereas Mingora is deficient in such space. Maintenance is generally poor and utilities are not always adequate. Support buildings, such as for machinery and grain handling, are variable but often minimal. New buildings are being constructed at Mansehra and they were recently built at Mardan and Mingora. Most staff members indicated there was not enough housing, except at Mardan and D. I. Khan.

Laboratory equipment is generally inadequate, except at Mardan, where it was upgraded in 1980-81. Farm machinery is inadequate except at Pirsabak, where Australia recently provided new machinery, and at Mardan which received new machinery in 1980-81.

D. Financial Support--The current and development budget for Agricultural (Crops) Research during the 1983-84 fiscal year is listed in Table 3. In the recurrent budget approximately 80 percent is spent for salaries and allowances (establishment) and 20 percent is operating expenses. The latter amount is inadequate to support effective research work. It is not conducive to research productivity to employ people and then provide inadequate operating funds for them to work effectively. A recent report on Pakistan's agricultural research system states that "experience in other developing countries indicates that in an economy similar to Pakistan's, about 40 percent to 50 percent of the funds (in a project) should be available for operational expenses."²

²International Service for National Agricultural Research (ISNAR)
"Report to the Pakistan Agricultural Research Council on Selected Aspects
of the Pakistan Agricultural Research System," ISNAR, R12, August 1983, p. 27.

Table 2. NWFP Agricultural (Crops) Research Institutes, Stations, and Sub-stations; Location, Staff, Acres and Research Emphasis.

	<u>Location</u>	<u>Staff</u>	<u>Acres</u>	<u>Main Crops</u>
Agricultural Research Institute*	Tarnab	62	200	mixed
Cereal Crops Research Institute	Pirsabak (Nowshera)	38	437	wheat, maize, others
Sugar Crops Research Institute	Mardan	19	96	sugarcane sugarbeet
Agricultural Research Institute (North)	Mingora	27	25	rice, potato, oilseeds, fruits, vegetables
Agricultural Research Substation	Mansehra	8	25	oilseeds, maize
Agricultural Research Substation	Abbottabad	4	68	potato
Potato Substation	Batakundi	1	50	potato
Wheat Summary Nursery	Kaghan	--	46	wheat
Agricultural Research Institute (South)	D. I. Khan	32	1,025	mixed
Agricultural Research Substation	Serai Naurang	10	25	mixed, including sugar
Gram Research Station	Karak	2	29	gram

*Headquarters of the Director General of Agricultural Research, NWFP.

Figure 1. Political Divisions in the Northwest Frontier Province of Pakistan

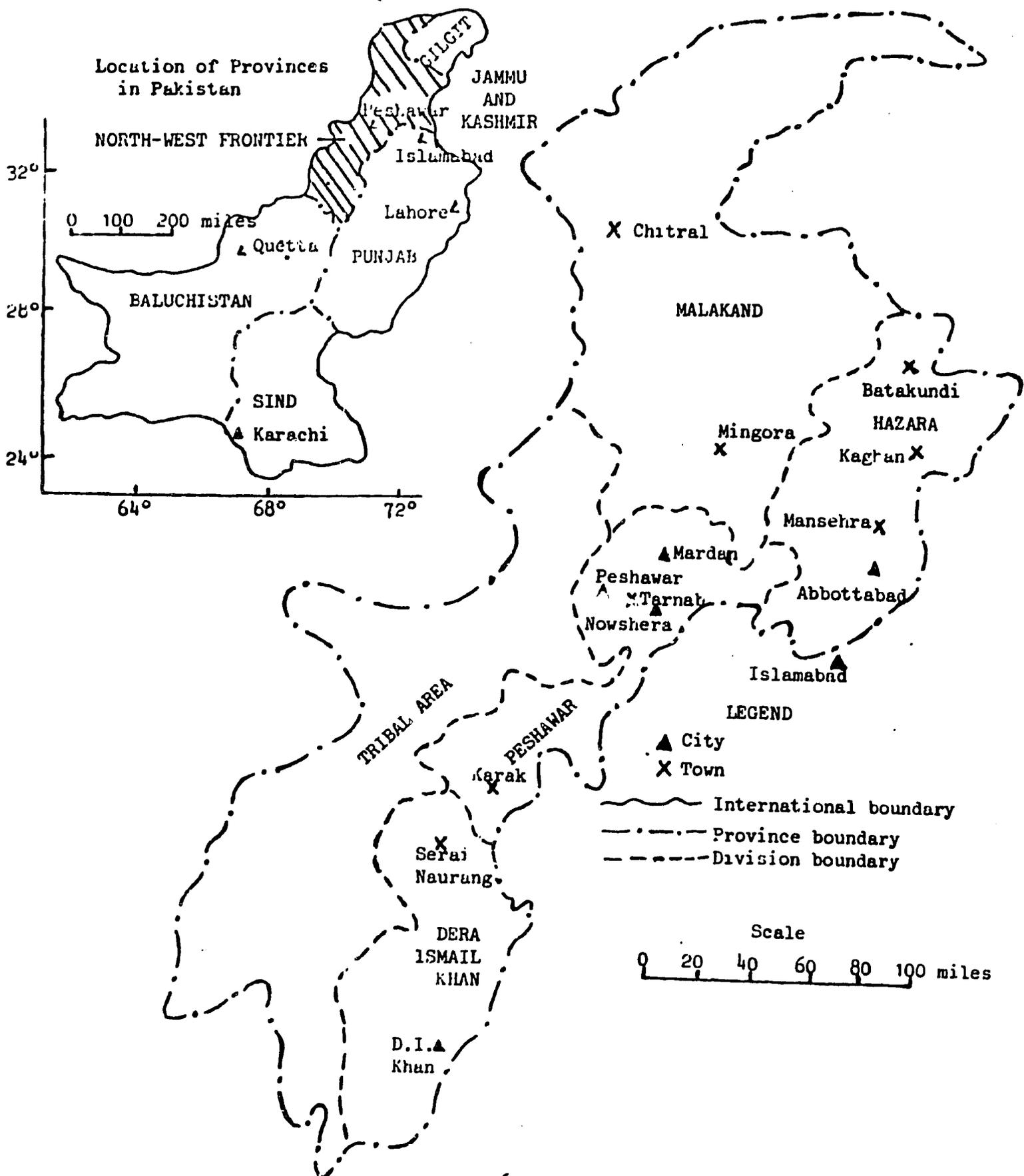
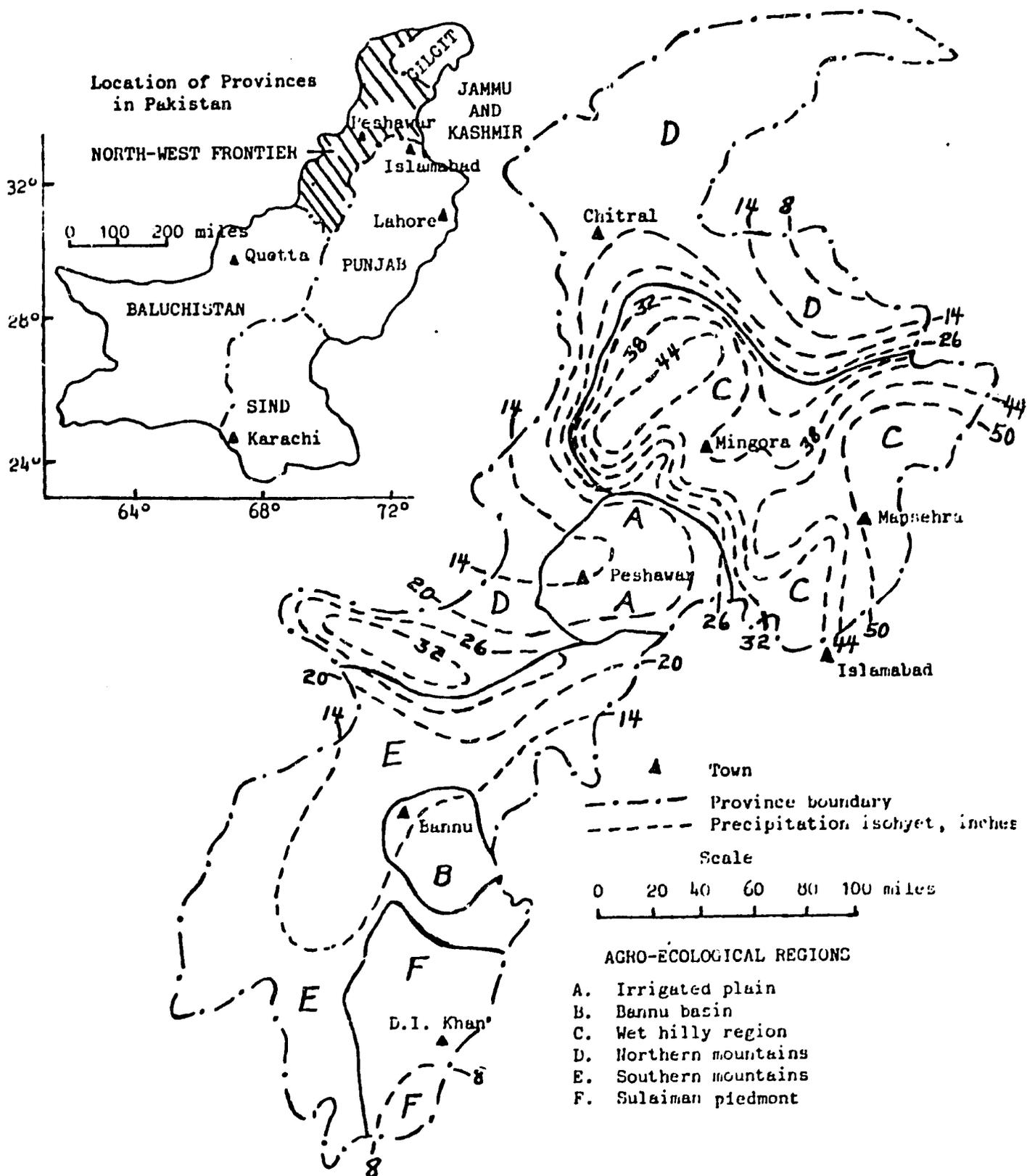


Figure 2. Average Annual Precipitation (inches)
in the Northwest Frontier Province of Pakistan



E. Organization--Work in Agricultural (Crops) Research is administered by the Director General, who is located at Tarnab. There is a Director at each of the institutes (Tarnab, Mardan, and Pirsabak) and stations (Mingora and D. I. Khan), who also direct work at the various substations.

Most of the research project leaders are in grade 18, with a few in grade 17. Much of the field work is done by Assistant Research Officers in grade 17 (see Table 5, below).

F. Major Constraints--The major deterrent to productive research in this organization is personnel policies in the current civil service system which fail to reward persons who do superior work and release those whose work is substandard. Three practices which are disincentives to superior work are:

1. Difficulty in obtaining multiple increments for superior work in service. The primary way to obtain multiple increments is to earn a post graduate degree. It is very unusual for outstanding performance to be acknowledged by awarding multiple increments or for an annual increment to be withheld because of inferior performance.
2. Making promotions on the basis of seniority, rather than merit, is the standard practice. This encourages complacency and discourages superior performance.
3. Maintaining a fixed number of posts, so that a superior worker cannot be promoted to a higher grade or position until such a post is open. More flexibility in numbers of posts would make it possible to reward superior work without undue delay.

Most of the staff members have inadequate training to do high-quality research (see Table 1, above). Forty percent of the professional staff members have B.Sc. degrees and six percent do not hold a university degree (Table 1).

Insufficient operating funds hamper research at most of the institutes and stations. Operating funds comprise only 20 percent of the recurrent budget (Table 3) and are below accepted standards in countries such as Pakistan (see Financial Support, above).

In discussions with staff members, the most frequent complaints were concerning inadequate operating funds, stagnation in grade 17, housing, inadequate schools for their children, and meager amenities, such as for shopping, and health care.

Current Livestock Production Research

In-depth discussions were held with Dr. Mohammad Jan Kahn, Director of the NWFP Animal Husbandry Department, and Drs. M. Y. Ansari, M. B. Qureshi, and other staff members of the Veterinary Research Institute in order to become familiar with their programs, especially in livestock production research.

A. Animal Production Division of the Veterinary Research Institute (VRI) at Peshawar. The Veterinary Research Institute recently established a Division of Animal Production, which is one of five divisions in the Institute. The Division is administered by a Project Leader who reports to the

Table 3. Current and Development Budget for
Agricultural (Crops) Research, NWFP, 1983-84.*

Thousands (000) of Rupees

<u>Item</u>	<u>Capital</u>	<u>Recurrent</u>	<u>Total</u>	<u>% of Re- current subtotal</u>
	<u>Current</u>			
Salaries and allowances (Establishment)		14,034		79.6
Labor charges		893		5.1
Travelling allowances		397		2.2
Petrol, oil and lubricants		409		2.3
Utilities--Electricity, etc.		299		1.7
Stores--seed, fertilizer, chemicals, etc.		684		3.9
Other operating expenses		498		2.8
Durable goods and their repair		<u>418</u>		<u>2.4</u>
Subtotal--Recurrent		17,632		100.0
Subtotal--Capital	485			
			18,117	
	<u>Development</u>			
Production of pre-basic seeds	2,000	380		
Cotton maximization project, D. I. Khan Research Station at Dhodial, Mansehra	2,273	46		
Center for production of seed potatoes	1,450	1,000		
Fruit nursery at Agr. Res. Inst., Tarnab**	100	400		
Research equip. at Agr. Res. Inst., Tarnab**	778			
Cereal Crops Research Institute, Pirsabak**	1,939	61		
Sugar beet seed production in Chitral District**		<u>10</u>		
Subtotal	(8,540)	(1,897)		
			10,437	
TOTAL	9,025	19,529	28,554	

*Data supplied by the Director General, Tarnab.

**New Project in 1983-84.

Director of the Veterinary Research Institute; it is divided into four sections: (a) Animal Nutrition, (b) Animal Reproduction, (c) Animal Husbandry, and (d) Dairy Husbandry.

The main mission of the Division is to conduct problem-oriented research on animal production. Viable research is currently being done in nutrition and feeding, as well as some in management and breeding of local breeds and crossbred with Friesian cattle. Evaluation of the utilization of various forage crops is another area of research.

A research farm at Surizai (22 km SE of Pershwar), acquired by the VRI in 1979, is operated by the Division. Extensive land development (e.g., irrigation system) and building construction (cattle barns, lab and administration building, and houses for personnel) have been done on the 178-acre farm during the last three years. The development is financially supported by the Netherlands Government. The farm has about 35 cows. No organized research is being done because the farm is still under development.

The professional personnel consists of the Project Director, a Research Officer and three Veterinary Officers (see Table 5). Other personnel include the following staff located at the research farm at Surizai: Farm Manager, Field Assistant, Livestock Assistant, Mechanical Supervisor and an AI-Technician. The AI-Technician is, however, paid by the Animal Husbandry Department.

The Division has no separate budget but receives, as needs arise, allocations from the VRI for operational expenditures. The salaries for all personnel are paid by the VRI. The total annual budget is about 900,000 Rupees for salaries, allowances and operational costs (see Table 4). Money for research has to come out of the VRI's regular budget or from grants. Two projects are pending funding in PARC.

At present there is some cooperation with the Agricultural Research Institute at Tarnab concerning forage crops utilization at Surizai. There is no other major cooperation with other research institutes and practically no contact with the NWFP Agricultural University.

Merger with the Agricultural University--This Division has a great potential for becoming a nucleus for doing animal production research. However, it needs better resources and would benefit greatly from facilities, resources and strengthened leadership resulting from the upgrading of the Agricultural University, including the NWFP research system. The professional staff would benefit from improved training possibilities if transferred to the University. The Division has the following elements which fit best with the Agricultural University: facilities for practical research on livestock production, a program that can easily be expanded if given resources, and staff that will make a very good addition to the teaching and research program at the University. Benefits will accrue if the University possesses the leadership and organization needed for operating this program.

The following problems will need to be resolved if this Division is merged with the University:

1. The Division has no separate operational budget to transfer. Some difficulties may arise in coming to an agreement with VRI on this. It

Table 4. Budget for Selected Livestock Research, NWFP, 1983-84

	<u>Subtotal</u> Rs.	<u>Total</u> Rs.
Animal Husbandry Department		
Livestock Experiment Station (517 acres), Jaba		
Current expenses	424,070	
Development expenses	795,000	
		1,219,070*
Veterinary Research Institute	-	
Animal Production Division and research farm at Surizai		900,000**

*Data supplied by Dr. Mohammad Jan Khan. Financial support is also anticipated from the Australian government.

**Estimated, but it does not include operating funds for research. Financial assistance is also provided by the Netherlands government.

will also put pressure on the development budget of the University, since the Division needs research facilities and equipment to be productive.

2. The Dutch Government is involved through extensive support of the development (capital investments) of the research farm at Surizai and also in providing financial support for training of staff (courses given in Holland). The Dutch support is on an annual contract basis and is administered through the Department of Agriculture, NWFP.
3. Mechanisms for transferring selected VRI staff to the University (salaries, grades, and conditions of service) need to be worked out.
4. Staff members of the Division, under the present system, are also required to participate, if needed, in activities of other Divisions of VRI. Transfer of the Animal Production Division to the University may therefore cause administrative problems unless a system for joint appointments can be worked out.
5. The splitting of the Division into several units in the Animal Husbandry Faculty is not ideal and will cause transitional problems and tension. The best solution would be to initially keep the Division together in one of the University Departments (Physiology and Animal Health).

B. Livestock Experiment Station at Jaba--This Station, which was established in 1954, is administered by the Department of Animal Husbandry, NWFP. It is used as a production unit for sheep breeding stock and, to a limited extent, for research. The specific objectives of the Station are:

1. to develop improved sheep breeds;
2. to cross local sheep with Rambouillet for fine wool production and distribute fine wool rams to local sheep flocks;
3. to develop diagnostic and therapeutic techniques for diseases; and
4. to conduct feeding and nutrition experiments.

The Station contains 517 acres, of which only 20 acres are cultivated, and the remainder is range land and wooded hills. The total number of sheep is 460. It is highly inbred stock. Totally, about 1,500 rams have been distributed to local farms since the Station was established.

The personnel consists of one Deputy Director of Animal Husbandry, who is the chief of the Station, and three other professional staff (one wool analyst, one agronomist, and one veterinary officer). The Australian Development Assistance Bureau is in the process of developing a project for improvement of breeding, management and production (see below) and has a project manager who is assisting with the farm management.

The total budget before the Australian Program became involved was only Rs. 80,000 per year. A PARC review of the Agricultural Research institutions in Pakistan in 1981 stated "that the existing budget (Rs. 80,000 per year) is extremely inadequate for the experiment station." In 1983-84 the budget for current expenses was increased dramatically to Rs. 424,070 (Table 4).

There are two buildings that serve as permanent accommodation for staff. In addition there is modest office space. For the animals there are two shelters and a barn. The equipment is very sparse but the Australian Project is currently providing better equipment.

Very little research has been conducted in the past and the Station has merely served as a production unit for breeding stock to be distributed to the local farmers. In a review of the Jaba Station in 1981, PARC stated that work at the Station so far has been confined to the distribution of purebred and crossbred stud rams to the farmers free of cost. No systematic breeding research has been done. The PARC review stated that the Station could be made more productive if adequate research funds were provided. According to the PARC report, there was also need for more arable land, buildings and experimental animals. Insufficient qualified staff was considered another factor that had hampered the development of research.

A program for upgrading research at the Jaba Station is currently being implemented as part of a nationwide program coordinated by PARC and supported by the Australian Development Assistance Bureau: Pakistan-Australian Agricultural Mission for Sheep and Wool. The project, which is a five-year program, will be officially started July 1, 1984. However, preproject activities have already been implemented and the Australian Project has had a project manager in Pakistan (part of the time at Jaba) for the last 14 months. The Jaba Experiment Station is one of eight stations in Pakistan that will be developed. The research at Jaba will focus on the upgrading of fine wool sheep. There will be three outreach stations, one in NWFP (Balakot), each with 5,000 sheep registered on private farms. Production and reproduction data will be collected and analyzed from the herds of registered sheep. A geneticist, a physiologist and a fodder expert from Australia will be working on the project in Pakistan. PARC, through Dr. H. Hasnain, and the Australian Project Manager (Mr. Paul Talay) have stated that it would be very beneficial to the project if the Agricultural University became involved at the Jaba Station. Currently the Agricultural University is not involved in any activities at Jaba.

C. Livestock Production Units with Potential for NWFP-AU Cooperation--
The following three units, which are administered by the Animal Husbandry Department, NWFP, need not be administratively connected with the Agricultural University but they do offer opportunities for cooperative work between the two organizations.

1. Livestock Farm at Harichand--This is mainly a unit for production of breeding stock. Located about 60 km from Peshawar, it has 500 acres of arable land and presently has 84 cows of the Friesian breed. The development of the land and cattle herd is financially supported by the Netherlands Government. Three persons (a veterinarian, farm manager, and building engineer) from the Netherlands are stationed in Peshawar to assist in the development of this project and the Surizai Livestock Farm.

The Harichand Farm has great future potential as a teaching and research farm that can be cooperatively used by the Animal Husbandry Department and the University. However, there is no research at this time and none is planned for the next four to five years.

2. Semen Production Unit at Surizai--This unit is located 22 km SE of Peshawar. Its main purpose is to produce semen for the 26 AI-centers in NWFP. The annual production is semen for 38,000 cows which is about 40% of the total semen supply in NWFP. The center currently has 21 bulls (Friesian, F1 Friesian and Sahiwal and water buffaloes) but will be expanded to a total of 50 bulls within the next two years. It will then be serving the whole province (57 AI-centers). The unit has 10 acres of land, excellent buildings for laboratories, storage and animals. The semen preservation laboratories are of good standard.

The Unit has a great potential as a future training center for Animal Husbandry students from the Agricultural University. Furthermore, it offers excellent prospects for cooperative research on selection of breeding animals, semen quality and preservation, fertility of bulls and females, and progeny testing.

3. Poultry Farm at Peshawar--This is the only governmental Poultry Farm in NWFP. It serves as a production unit for supplying day-old chicks and hatching eggs to farmers and other state and private organizations. The farm presently has 6,000 layers and produced 12,000 chicks last year. The farm also serves as an Extension center by providing short courses for farmers as well as advice on an individual basis. The immediate supervision of the farm is the responsibility of the Deputy Director of the Animal Husbandry Department. Two additional veterinarians make up the professional staff.

The farm has very good potential as a demonstration farm for Animal Husbandry students. It could be used both for the students' internships and for other activities in the University instructional program on poultry production practices.

Plan for Merging Agricultural Research

The crop and livestock research in NWFP is inadequate, fragmented, and not organized or coordinated in a programmatic way to solve urgent problems which are faced by farmers and agribusiness organizations. Most current work is on selected segments of farm problems with little or no consideration being given to other related aspects of problems, most of which require multidisciplinary research to obtain satisfactory solutions. In their work, researchers rarely consider the individual farm as an operating unit.

Research on crop production and livestock production are separated, even though such enterprises are intimately intertwined on almost every farm. No research is being done on how such enterprises and practices should be combined most advantageously on individual farms to economically produce abundant food and fiber. Almost no agricultural economic research is being done, even though such considerations are involved in almost every decision concerning farm production, storage, processing and marketing.

A. Priority Problem Areas--Some priority problems which urgently need attention were outlined in the "Report of the Design Team." These include:

1. Problems in Tree Fruit Production and Marketing
2. Obtaining Fertilizer Use Effectiveness on Individual Fields and Plots
3. Research to Triple the Yields of Maize in the NWFP in Five Years
4. Research to Increase Production and Use of Forage
5. Breeding Systems for Ruminant Livestock
6. Improvement of the Nutritional Level of People in the NWFP
7. Meeting the Oilseed Needs of the NWFP and Pakistan
8. Adoption and Spread of Recommended Technologies
9. Controlling Leaf Blight of Gram

The problems outlined above illustrate the need for agricultural research and the importance of attacking such problems with a cooperative, multidisciplinary team of specialists in order to obtain meaningful answers to many problems that occur on farms, in rural households, and in agri-business.

The following are additional problems that should be considered as the NWFP develops its overall research program. A more thorough analysis will identify additional problems. Careful consideration must be given to selecting the highest priority research problems in terms of potential for obtaining useful results within the time and other resource constraints.

1. Development of improved cropping systems and management practices for barani areas which have 8 to 30 inches annual rainfall.
2. Selection and evaluation of wheat varieties resistant to rust.
3. Growing berseem for forage and as a green manure crop with sugar cane and other crops.
4. Selection and breeding for drouth resistance in crops adapted to barani areas with 8 to 30 inches annual rainfall.
5. Increased production and improved quality of vegetables with better varieties, cost-efficient use of fertilizers, and improved irrigation practices.
6. Storage diseases in fruits and vegetables.
7. Weed control in an integrated crop protection system.
8. Biological and chemical weed control in multiple cropping systems.
9. Control of root-knot nematode in vegetables and sugarbeet.
10. Control of pests in stored grain and seeds.
11. Managing bees for increased honey production.
12. Test different methods of fertilizer application to minimize losses of N and reduce excessive fixation of P in soils.
13. Reclamation of saline and alkali soils with water plus chemical, biological, and/or physical means.
14. Evaluation of selected cropping sequences for optimum production and profit.
15. Feeds and feeding practices for ruminant livestock.
16. Improving cattle and water buffalo reproductive efficiency.

17. Increasing milk production in cattle and water buffalo.
18. Improving the quality and variety of dairy products.
19. Post-harvest handling of fruits and vegetables to reduce deterioration and loss.
20. Development of improved oilseed processing.
21. Evaluation of alternative irrigation systems for various crops.
22. Design, development, and introduction of animal-drawn and simple tractor-drawn seed and fertilizer drills.
23. Improved handling, processing and storage of crops to maintain quality and reduce losses.
24. Improve the materials and practices used in the construction of farm and village buildings.
25. The labor and economic roles of women in livestock production.
26. Farm practices that pay.
27. Economic evaluation of selected farming systems.
28. Availability and use of purchased items, including credit, on small farms.
29. Improvement in marketing agricultural products.
30. Factors related to the success of cooperatives.

Solutions to these and other technical problems will require more resources and better methods than have been used to date in NWFP.

B. Organization of Research--The "new thrust" in research in the unified system will incorporate (1) a problem-solving orientation, (2) a programmatic approach in which there are carefully designed research projects, and (3) coordinated planning, implementation, and evaluation of all research. The problem-solving orientation will require a multidisciplinary approach in view of the complex farming systems that prevail in the NWFP. A new organizational structure, under the leadership of the Director of Research, will be used to facilitate the expanded research program. The Research Directorate will require a staff to give programmatic leadership to and administer the research, both at the University in Peshawar and at the institutes, stations, and sub-stations.

The research program will be administered using a "two-dimensional" type of administration by (1) faculties and departments; and (2) research task groups.

a. Faculties and Departments. Faculties represent broad areas of common research and education interests; departments are made up of more specific applied agricultural disciplines and sub-disciplines. Faculty members with common scientific and applied professional interests are assigned to a faculty and department corresponding to those interests. The faculty and department are responsible for personnel management, including guidance and evaluation and budget allocation. Faculty deans and department heads are to give leadership and coordinate the research of their units, not serve as the principal investigator and director of all programs and projects. Their goals must be to support the ideas and abilities and maximize the productivity of faculty members, individually and collectively.

b. Research Task Groups. A Research Task Group will be formed for each priority research problem area. It will be a multidisciplinary working group formed to cooperate on problem-solving research. Such groups are formed and disbanded as cooperative work is initiated and completed. It may include personnel from the NWFP-AU and cooperating organizations as identified in the research project outline.

This two-dimensional system of research administration combines the advantages of faculties and departments as a base for scientists with common disciplinary interests and the strengths of multidisciplinary groups to solve the complex developmental problems faced by farmers, rural households, and agri-business.

Long-term technical assistance, especially the adviser to the Director of Research, will help University administrators implement the "new thrust" in research. Other long-term and short-term technical advisers will also help staff members and postgraduate students with all phases of their research.

In addition to the technical assistance that was recommended in the "Report of the Design Team," 28 man-months (2 months short-term, then 24 months long-term, and finally 2 months short-term) of technical assistance are recommended to help reorient the field research program and assist in its implementation. This adviser would work with the outlying field stations, as well as with the University experimental farm at Peshawar.

Project leaders, who identify significant problems, develop suitable investigation methods, conduct the research, and report the results are key persons in the research enterprise. Most of these persons and other research workers to be transferred from the Department of Agriculture, as well as many staff members already in the University, are inadequately trained to do high-quality research. Therefore, a substantial program of in-service and post-graduate training will be conducted to increase the research productivity of the staff.

C. Transfer of Agriculture Department Units--In order to merge agricultural research in NWFP, the three units listed below should be transferred to and merged with the Agricultural University together with concomitant allocation of adequate resources to effectively meet this additional responsibility on a progressively sustained basis.

1. Agricultural (Crops) Research, which is administered by the Director General, Tarnab, should be transferred with its functions, personnel, and budget (Table 3). Details concerning its incorporation within the Agricultural University are outlined in a later section of this report.
2. The Animal Production Division of the Veterinary Research Institute, including the Surizai Livestock Farm, should be merged with the Agricultural University. The professional staff should initially be transferred to the Department of Physiology and Animal Health in the Faculty of Animal Husbandry. The present project leader should have a 100 percent appointment with the University and remain as coordinator of the livestock production research, including activities at the Surizai Farm. The other transferred staff members should have joint appointments between the University and the Veterinary Research Institute. The current budget for the Animal Production Division should also be transferred to the University (Table 4).
3. The Livestock Experiment Station at Jaba and its associated budget should be merged with the Agricultural University. The professional staff should be transferred to the Department of Livestock Management in the Faculty of Animal Husbandry. The recently initiated Australian Government sheep and wool project and invitation for the University to

cooperate creates a fruitful atmosphere for strengthening the Jaba Station organization and administration. Before the University can assume responsibility for the Jaba Station leadership and staff must be strengthened in the Animal Husbandry Faculty. Likewise, it is crucial that a well trained faculty member be available to supervise the activities at Jaba. It would be ideal if a faculty member from the Animal Husbandry Faculty could be trained in range management through the Australian program and then assume the immediate responsibility for the station under the Faculty Dean and the University Research Director.

Merger of the three above units with the University could occur at a mutually satisfactory time approximately one year after the beginning of the USAID-University Project.

In addition to merging the three above research units with the Agricultural University, it would be mutually beneficial for the University to develop cooperative working relationships, through Memoranda of Understanding, with other organizations such as the following units in the NWFP Department of Animal Husbandry:

1. Livestock Farm at Harichand,
2. Semen Production Unit at Surizai,
3. Poultry Farm at Peshawar.

D. Transfer of Staff--Smooth transfer of staff from the Department of Agriculture to the Agricultural University will require careful planning and wise implementation. Current staff qualifications, titles, and performance need to be examined in the light of their anticipated and potential function within the unified research system. The transferred staff would be allied with appropriate University Faculties and Departments in accordance with their areas of specialization (Table 5). A small review committee from the University and the incoming units will need to work out these arrangements, but a few important considerations are mentioned here. Personnel records and evaluations of each incoming staff member (for example, recent annual confidential reports) should be made available for use by this committee.

Transfer of staff members from the NWFP Department of Agriculture to the University should not present serious problems for persons who have M.Sc. or Ph.D. degrees since such qualifications are typical for University staff. However, among professional staff members in Agricultural (Crops) Research, 40 percent have only a B.Sc. degree and six percent have no university degree. Their functions are indicated by their titles in Table 5. For these persons and possibly others who have no teaching responsibilities, a series of professional (rather than academic) titles would be used. For example, titles such as those in Table 5 would be suitable for professional staff members in the University. Appropriate job descriptions and standards of performance should be established for professional staff, but they would differ in some respects from academic criteria in which teaching is an important element. The same grades (20, 19, 18, 17, etc.) can be used for both professional and academic staff members in the University, but their titles would be different.

The exact mechanism for transferring appropriate staff from the NWFP Department of Agriculture to the University must be worked out by appropriate officials of Government and the organizations involved. However, some items to consider in transferring staff to the University are as follows:

Table 5. Suggested Departmental Attachment of Current NWFP Department of Agriculture Staff Members in Crop and Livestock Production Research who are Transferred to the Agricultural University*

Current Title	Department in Agr. University	BPS				Total	
		19	18	17	16	Number	Percent
Crops Research							
Director	**	4				4	1.7
Agricultural Officer	**			10		10	4.3
Asst. Research Officer	**			125	12	137	58.8
Economic Botanist	Plant Breeding		6	5		11)	9.4
Assistant Economic Botanist	Plant Breeding			11		11)	
Agronomist	Agronomy		1	2		3)	3.9
Assistant Agronomist	Agronomy			6		6)	
Pathologist	Crop Protection		1	1		2)	
Assistant Pathologist	Crop Protection			3		3)	5.6
Entomologist	Crop Protection		2			2)	
Assistant Entomologist	Crop Protection			6		6)	
Horticulturist	Horticulture		2			2)	1.7
Assistant Horticulturist	Horticulture			2		2)	
Agricultural Chemist	Soil Sci. or Agr. Chem.		2			2)	
Assistant Agricultural Chemist	Soil Sci. or Agr. Chem.			6		6)	5.2
Assistant Soil Fert. Officer	Soil Science			3		3)	
Assistant Physiologist	Agricultural Chemistry			1		1)	
Food Technologist	Food Technology		1			1)	1.7
Assistant Food Technologist	Food Technology			3		3)	
Assistant Agr. Engineer	Agricultural Mechanization			1		1	.4
Assistant Statistician	Statistics			3		3)	2.6
Statistical Assistant	Statistics				3	3)	
Livestock Production Research (Animal Husbandry Department)							
Project Director, Jaba	Livestock Management		1			1)	
Veterinary Officer, Jaba	Livestock Management			2		2)	1.7
Wool Analyst, Jaba	Livestock Management			1		1)	
Agronomist, Jaba	Agronomy			1		1	.4

(continued)

Table 5. (continued)

<u>Current Title</u>	<u>Department in Agr. University</u>	<u>BPS</u>				<u>Total</u>	
		<u>19</u>	<u>18</u>	<u>17</u>	<u>16</u>	<u>Number</u>	<u>Percent</u>
Livestock Production Research (Veterinary Research Institute)							
Project Director, Surizai	Physiology & An. Health	1				1)	
Veterinary Officer, Surizai	Physiology & An. Health			3		3)	2.6
Research Officer, Surizai	Physiology & An. Health			1		1)	
Farm Supervisor, Surizai	Physiology & An. Health				1	1)	
	TOTAL	<u>5</u>	<u>16</u>	<u>196</u>	<u>16</u>	<u>233</u>	<u>100.0</u>

*See Table 1 for the location of crop research personnel and sources of highest degrees.

**To be determined on the basis of qualifications and interest of each staff member.

1. Full protection of existing terms and conditions of service of the staff members transferred.
2. Placement in posts under the unified system for which they are best qualified, by virtue of their qualifications and experience, to make them more productive.
3. Provide for improvement of their professional competence while on the University staff.
4. Provision of equal opportunities for promotion to higher posts on merit.

During recent years, staff transfers such as that suggested herein have been accomplished in Pakistan when the staff of the Electricity Department merged with Water and Power Development Authority, National Health Laboratories joined National Institute of Health, and the Ministry of Foods and Agriculture merged with Pakistan Agricultural Research Council (PARC). The major terms and conditions under which the latter merger was effected through government notification in consultation with the Ministry of Law were as follows:

- "1. Notwithstanding anything contained in any law, contract or agreement or in the conditions of service, every civil servant employed in the Attached Department portion of the Directorate General of the Pakistan Agricultural Research Council and serving in or under the Council immediately before the commencement of this Ordinance, including persons on deputation to other organizations or abroad, shall, save as herein-after provided, cease to be a civil servant and stand transferred to, and become an employee of, the Council on the same terms and conditions, including remuneration, tenure of service, rights and privileges as to pension and gratuity and other matters, as were applicable to him immediately before the commencement of this Ordinance, until his employment in the Council is terminated in accordance with his conditions of service of his terms and conditions are altered by regulations, which shall not be less favourable than those by which he was governed immediately before his transfer to the Council.
 - "2. Any person referred to in sub-section (1) who is on deputation with Attached Department portion of the Directorate General to the Pakistan Agricultural Research Council shall continue in the employment of the Council on deputation in accordance with the terms of his deputation.
 - "3. Any person referred to in sub-section (1) may, within three months from the commencement of this Ordinance, opt not to be transferred to the service of the Council and the option so exercised shall be final.
 - "4. An employee who opts under sub-section (3) not to be transferred to the service of the Council may, as far as possible, be provided a suitable posting elsewhere by the Federal Government.
 - "5. If an employee does not accept the appointment offered to him under sub-section (4), within the time allowed to him, or if it is not possible for the Federal Government to provide a suitable posting to him under that sub-section, his service shall stand terminated on the date on which he declines the offer or the time allowed to him expires or, as the case may be, on which the Federal Government informs him that it is not possible to provide a suitable posting to him, and he shall be entitled to be paid by the Federal Government compensation equivalent to three months remuneration.
- Explanation: The compensation payable to an employee under this sub-section shall be in addition to and not in derogation of his rights as to pension, gratuity, provident fund money or other benefits

- to which he may be entitled under his conditions of service
- "6. The termination of service of an employee under sub-section (5) shall be deemed to be discharged from service owing to abolition of a permanent post for the purpose of admissibility of compensation pension.
 - "7. The Federal Government shall pay pension charges and gratuity in respect of, and provident fund accumulations of each employee transferred, as may be prescribed by rules, a statement showing the estimated receipts and expenditure and the sums which are likely to be required from the Federal Government during the financial year.
 - "8. The Council may open accounts in any scheduled bank in Pakistan. The accounts of the Council shall be maintained in such form and manner as the Federal Government may determine in consultation with the Auditor General of Pakistan."

The above provisions could be adapted for use in transferring appropriate NWFP Department of Agriculture staff members to the University. Recent experience with transferring staff members of the Institute of Development Studies into the Agricultural University should also be helpful in arranging the transfer of staff which is proposed herein.

E. Benefits for Transferred Staff--The Department of Agriculture employees merged with the University would benefit in the following ways:

1. The opportunity to become faculty members of the Agricultural University with teaching and/or outreach, as well as research, appointments for those qualified and interested.
2. Better opportunities of merit promotion for productive workers.
3. Better scope for advanced training abroad to enhance their abilities to undertake meaningful quality research.
4. Better academic environment and other facilities to carry out research in their areas of specialization.
5. Availability of guidance and cooperation of scientists of international standing to plan and accomplish mission-oriented research along most profitable lines with consequent satisfaction for a sense of accomplishment.
6. Better utilization of talent and further development of potential capabilities.
7. Enjoy better social status.

F. Upgrading Personnel To Increase Productivity--This is one of the most important and lasting improvements which will be made during this project (see Major Constraints, above). It will involve development of leadership, in-service training, post-graduate training, and improved evaluation and reward systems.

In-service training will include both current University staff and those from the Department of Agriculture who become University staff members. In-service training will be organized and administered by the Director of Research. At least two levels of in-service training for research will be given to staff members.

Instruction, seminars, and/or workshops in "Research Methodology" will be conducted for persons in grades 16 and 17. Initially, tests will be formulated and given to determine the level of understanding which each staff

member has of how to conduct research. On the basis of the results from these tests, a course of study will be prepared and given to bring all workers up to a higher level of competence. These young workers would be encouraged to actively participate in planning as well as in helping conduct the research. Their ideas would be encouraged so that they could develop as rapidly as their abilities and productivity warranted. After the in-service training is given, terminal examinations will be given to measure the performance of staff members and help in placing them in research areas for which they are best suited.

For all staff members in grades 18, 19, and 20 in-service training will be given in "Research Planning, Execution, and Release of Results to Users." This course will be developed and given after a survey is made to determine the most useful topics to be included in the subject matter. Some topics which should be covered are (1) criteria for selecting a research problem, (2) planning the investigation and preparing a project outline, (3) organizing and conducting multidisciplinary research, and (4) conveying research results to different users in forms which are readily usable. The two-dimensional system of research administration would be introduced, together with methods for reviewing and evaluating research.

These more experienced staff members would be urged to foster collaborative work with their younger colleagues in all phases of the research in order to achieve maximum productivity and development of each person in the team. The theme of cooperative enterprise rather than directed activity should be emphasized.

The program of in-service training for all staff members will clearly indicate what is expected in research and some of the better ways to accomplish it. Instructing staff members in suitable groups will be much more efficient than working with each person individually. The individual approach will be used after the group training is completed. In-service training for research will be a continuing task among staff members.

In upgrading the research system, islands of promise will be identified early (where an important researchable problem, suitable staff, and other resources are available) and these areas will be pushed to successful conclusions. Such successes will show the way for other groups. Then progressively more areas will be given special emphasis, as essential elements coalesce, until a smooth research system is operating.

Postgraduate training is an effective method for increasing the competence and productivity of staff members. Among staff members with the B.Sc. degree, who transfer from the Department of Agriculture (Table 1) to the University, the superior students may be able to earn an M.Sc. degree from the Agricultural University and thereby improve their potential for better work and advancement. Some of these who have special talent in demonstration work and in transfer of technology might be used effectively in the University outreach program.

The best staff members who exhibit the greatest potential will be given opportunities for postgraduate studies, as appropriate, in American universities.

There are 118 persons in crops research with an M.Sc. degree (Table 1) and nine persons in animal production research (with M.Sc. or D.V.M. degrees) who may transfer to the unified Agricultural University. There was insufficient

contact with each of these field staff members to determine exactly which individuals will merit further postgraduate training. However, it is estimated that of these 127 staff members approximately one-third (42 persons) would need and be capable of doing further postgraduate training in U.S. universities. Among these 42 persons about one-half would study for another M.S. degree and one-half would pursue the Ph.D. degree. When field staff members leave for postgraduate study, it would be desirable to replace them with young staff members from the University campus in Peshawar in order to give the latter persons experience in working on research problems in the field as well as in laboratories.

Short-term, non-degree training in the United States, in other countries, or at the International Agricultural Research Centers will also be necessary for another 20 percent (25 persons) of these incoming staff members who already have an M.Sc. degree, plus 10 percent (9 persons) of the crops research group (89 staff members as listed in Table 1) who have only a B.Sc. degree. These short-term trainees would be in a wide range of specialties such as pure seed handling, field station management, outreach technology, equipment maintenance and repair, etc.

G. Staff Duties and Performance Evaluation--On the basis of discussions between administration and each staff member, the time distribution of each person in research, teaching, and outreach functions should be agreed upon and regularized on an annual basis. Suitable standards of performance should be established for each category. Some staff members may have responsibilities in only one function, such as research, whereas other persons may have responsibilities in two functions--for example, 2/3 time in outreach and 1/3 time in research; or 3/4 time in teaching and 1/4 time in research.

The work of each staff member will be evaluated on the basis of established standards of performance in their agreed-upon functional duties. In making promotions and in establishing salaries, more emphasis should be placed on individual staff productivity than has been common in the past.

H. Facilities at Outlying Stations--When the outlying crop and livestock production research stations are merged with the Agricultural University they will be used more intensively and they will be improved. In addition to being centers for research, they will be used for outreach and teaching. For example, it has been recommended in the "Report of the Design Team," that regional outreach centers be established at Tarnab, D. I. Khan, Mingora, and Mansehra (or Abbottabad) to serve the special needs of these agro-ecological regions. All of the outreach and research work at these and other outlying stations would be coordinated and operated as integral parts of the Agricultural University.

If the outlying stations are merged with the Agricultural University it is planned that the facilities as well as the programs will be improved. Special emphasis will be placed on providing better equipment, such as farm machinery, to conduct research, and ample equipment to do effective outreach. See Table 6 below for estimated financial support.

I. Financial Requirements--The merging of crops and animal production research into the NWFP Agricultural University system will require an infusion of funds to support the staff development (training) program, to provide field equipment to the research institutes, stations and sub-stations, to construct needed station buildings and staff housing, and to provide the services of specialists on research station development. The funds required, in addition

to the recurrent and development budgets expected to be transferred by the Department of Agriculture, total slightly in excess of \$8,000.000. Table 6 provides an estimated life of project allocation of the additional monies.

Table 6. Additional Resources Required to Strengthen and Support the NWFP Agricultural University Research Directorate (\$000)

1. Training		\$2,648.0
A. Degree	\$1,804.5	
B. Short Term	843.5	
2. Research Equipment		2,100.0
3. Facilities		2,926.0
4. Technical Assistance		357.2
A. Resident Staff	323.0	
B. Short Term	34.2	
		<hr/>
		\$8,031.2

J. Provincial/Federal Relationship-- With transfer of responsibility for provincial crop and livestock production research to the Agricultural University, and with provincial resources to support the research, the University would be responsible to the Agriculture Department for the research work supported by the Province. The NWFP-AU would also be accountable to the appropriate provincial departments for use of funds allocated to support the research. The Agricultural University would continue its relationship to the University Grants Commission as a source of financial support, primarily for the teaching function; however, it is anticipated that federal funding for agricultural research in the NWFP will increase from both UGC and the Pakistan Agricultural Research Council. PARC currently supports a limited number of research projects at the NWFP-AU. Merger of provincial crop and livestock production research is expected to strengthen provincial/federal linkages and result in increased federal support.