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THE PUNJAB AGRICULTURAL UNIVERSITY
AN ASSESSMENT OF PROGRESS
TO 1970

PART II

JOINT INDO-AMERICAN STUDY TEAM REPORT

ICAR

INDIAN COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI

APRIL 1970

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Preface

This is a Report of a Joint Study Team set up by the Government of India is consultation with the United States Agency for International Development and the Indian Council of Agricultural Research with the following terms of reference:

"The First Joint Indo-American Team made recommendations which led to the establishment of Agricultural Universities in India. The Second Joint Indo-American Team recommended that there should be strict adherence to basic principles of the Agricultural Universities. The Education Commission recognized that the most distinctive feature of the Agricultural University is the integrated programme of research, training and extension and recommended that these Universities should, in addition, have the following features:

(*i*) Their concern with all aspects of increasing, disseminating and applying knowledge related to agriculture including basic and applied research;

(*ii*) Their primary emphasis on teaching and research directly and immediately related to the solution of the social and economic problems of the countryside;

(*iii*) Their readiness to develop and teach the wide range of applied science and technologies needed to build up the rural economy;

(*iv*) Their readiness, not only to teach undergraduates, post-graduates and research students, but also to give specialized technical training to young people who are not candidates for degrees; and

(*v*) Their emphasis on adult and continuing education side by side with teaching regularly enrolled students.

"The first Agricultural University was established in 1960 and the Second in 1962. A stage has been reached when it is necessary to develop suitable criteria and methodology for measuring the progress made in developing an Agricultural University and achieving the aims and objectives envisaged by the Education Commission. For carrying out such study, the Punjab Agricultural University is considered appropriate and convenient.

"The Government of India have decided to set up a study team in consultation with the U.S.A.I.D. and I.C.A.R. for undertaking the study and completing it within a period of three months."

The report on the work of the Study Team is in two parts. The first, *A Method of Assessing Progress of Agricultural Universities in India*, is a recommended method for judging the progress and effectiveness of an agricultural university. The method was developed and tested at the Punjab Agricultural University and improved upon on the basis of the experience gained. In the view of the Study Team, the method is an effective one; however, its use at additional agricultural universities would no doubt lead to further improvements and refinements. Such use is encouraged and recommended.

The Second Report, *The Punjab Agricultural University, An Assessment of Progress to 1970*, illustrates the use of the method and procedures detailed in the first named Report and reports on the progress of the Punjab Agricultural University. Recommendations for the future are set forth for the consideration of University leaders. The effectiveness of this Report must be judged on the basis of its usefulness to the P.A.U. and the applicable information it may contain for other agricultural universities with common goals and aspirations.

The two reports are presented as companion reports, each to stand independently but many, particularly those interested in the method and procedures, will want to use the two reports together.

Agricultural universities are complex institutions with responsibilities for teaching, research, and extension education and with linkages to the society to be served. No two universities are identical. Similar rates of growth and achievement are not to be expected in view of (*a*) the different starting points of the universities, (*b*) limitations imposed by Acts as regards the responsibilities, area of operation, and authority vested in the University, (*c*) varying socio-economic conditions of the rural people whom the university is expected to serve, (*d*) varying financial and political support to the university by the Government, and (*e*) varying capabilities. The progress of an agricultural university is the result of an interaction between its leaders, teachers, students, farmers, administrators and politicians. It is difficult to make inter-institutional comparisons of rates of progress for teaching, research and extension activities. It is obviously not feasible to add up rates of progress for different items. The yard-sticks suggested by the Study Team are to be used more appropriately for watching the comparative progress of a particular university over a period of time rather than for comparing the achievements of various universities.

The assessment method and procedures are designed to be used by an external assessment team; however, the institution-building concepts and the methods and procedures should be useful in internal assessment by the officers and academic leaders of a University. It is hoped that the data sheets and proforma evolved will prove useful for accreditation and will be adopted by the Agricultural Universities in India with modifications

as needed at the particular university. Along with the data, the importance of the institution-building concepts and the need for collective judgements cannot be over-emphasized. It is also to be stressed that the methods are designed for an in-depth study of a university, the kind of critical analysis that hopefully university leadership is making on a continuing basis. This type of study requires that the assessment team spend sufficient time at the University and in studying the service rendered to the society to be served, to be able to make meaningful judgements regarding the intangibles that are so important in the development of agricultural university.

The members of the Joint Study Team wish to place on record the appreciation of the full cooperation given by the Punjab Agricultural University and in particular the Vice-Chancellor, Dr. M.S. Randhawa, the Registrar and Comptroller, the Estate Officer, Librarian, Deputy Director Students Welfare, Deans, Directors and Heads of Departments. The Joint Study Team's task was greatly facilitated by the ready assistance of the Chief of Party and his staff, Ohio State University, U.S.A.I.D. The 154 faculty members and 276 students who responded to questionnaires provided information and ideas that were crucial to the success of the assessment of progress. Professor S.S. Johl and Assistant Professor Gurminder Singh, Department of Economics and Sociology, were particularly helpful in supplying data on the agricultural economy of Punjab.

Representatives of a number of off-campus organizations provided an outside perspective of P.A.U., Punjab Departments of Agriculture and Animal Husbandry; Indian Council of Agricultural Research; Indian Agricultural Research Institute, Indian Veterinary Research Institute, Rockefeller Foundation, and representatives of the P.A.U. Board of Management. The ideas and hospitality of the Punjab farmers and rural leaders are also gratefully acknowledged.

O.P. Gautam
J.S. Patel
T.S. Sutton
W.N. Thompson

Punjab Agricultural University
Ludhiana, March 31, 1970.

Recommendations

The Punjab Agricultural University has made excellent progress up to 1970. A careful reading of the Report provides the basis for this general assessment. But the future will judge P.A.U. in terms of her ability to be innovative, to grow, and to expand to the depth and breadth of service to the rural society. A large number of suggestions either explicit or implied, are made in the Report. In addition, it is hoped that leaders of P.A.U., in whose hands the future of the institution rests, will be able to draw meaningful inferences from the information presented that the assessment team has not been able to perceive.

The following are the more important recommendations that have University-wide significance.

1. *Create the Post of Director of Resident Instruction.* It is recommended that a post of Director of Resident Instruction be created on par with the post of Director of Research and Director of Extension. It is intended that this post replace the post of Dean of Postgraduate studies. The companion report provides some guidelines for developing a statement of powers and duties of the new post. (II)[1]

The resident instruction function of the Punjab Agricultural University has not kept pace with the research and extension functions. This resulted from the disparity in emphasis during the early stages of development when the need for research results that could be carried to the field was of first importance. However, the time has come for the quality of both undergraduate and postgraduate programmes and teaching to be greatly strengthened. This, as well as other recommendations are intended to contribute to this end. (3, 8)[2]

2. *Integrate the Three Functions at College Level.* At P.A.U. integration of teaching, research and extension is excellent at the individual staff member and department level. However, there is a fundamental structural weakness due to lack of integration at the level of college deans, where the coordinating and integrating functions should be particularly vigorous. Therefore, it is recommended that the college deans be given equal responsibility for the teaching, research and extension activities; that the heads of departments be responsible to the Dean of the College

[1] Roman numerals refer to chapters in the companion Report, *A Method of Assessing Progress of Agricultural Universities in India.*

[2] Arabic numerals refer to chapters in this Report.

for the teaching, research and extension activities of the personnel in his Department. The deans are to be responsible to the Director of Resident Instruction on matters relating to the teaching programme, to the Director of Research on research programmes and activities and to the Director of Extension on matters relating to extension education. (8)

3. *Develop Policy Statement on Ranks, Tenure and Promotions.* To provide an understanding and appreciation of the University's interest in encouraging capable and productive faculty members, the University should develop a policy statement on provisions made regarding academic ranks, tenure and promotions. Before such a statement is finalized, representatives of the faculty at all levels should be invited to offer suggestions. This statement should be distributed to all faculty members and to new faculty when employed. (II, 12)

4. *Make Academic Administrative Posts Fixed Tenure Positions.* It is recommended that the positions of department head, dean and director be made tenure positions, with provision for reappointment or return to non-administrative academic posts without salary decrease. This will provide for flexibility in moving from administration to academic work and vigorous leadership at all levels. (II)

5. *Assign Each Faculty Member to Parent Discipline Department.* Each teaching, research and extension person should be appointed to and budgeted in the department representing his discipline. For example, all agronomists should be appointed in the Department of Agronomy. This will encourage professional stimulation of the individual and provide for efficiency in use of valuable professional man-power. (II, 12)

6. *Attach Newly Developing Areas to Related Departments.* It is recommended that disciplines which are expected to eventually grow into full-fledged departments be entrusted to the administration of a related department until sufficiently developed in staff from both the number and quality standpoint to justify a separate department. For example, physics should remain with mathematics until it develops the staff and programme that would justify a separate department. Similarly, the Microbiology staff might be administered by the Department of Botany and Plant Pathology until the discipline is well developed. (II)

7. *Delegate Budgets Clearly to Deans and Heads.* It is recommended that the budgets of all the constituent departments of a college be supervised by the Dean of the College to which the Department belongs. In turn there should be budgetary delegation to department heads. (II)

8. *Organize Regular Teaching Seminars.* It is recommended that teaching seminars be organized and offered at regular intervals to acquaint new staff members with the trimester system, internal evaluation, grading

system, use of library reference material, visual aids, methods of teaching, etc. (4, 5)

9. *Develop Depth of Administrative Leadership.* Depth in administrative capability should be developed at all levels by encouraging greater faculty participation and responsibility in department, college and university committees, boards and councils. (12)

10. *Broaden Depth of Research and Extension.* To date, the major research thrust has been in the crop production area. Continued growth in some of the departments which contribute to crop production, particularly soils and agronomy, should be encouraged. However, during the period immediately ahead, greater emphasis should be given to animal production, agricultural engineering and home science. Thus increased development of extension and research programmes in these three areas is a particularly urgent need. (11, 6, 7)

11. *Acquire More Land.* To provide for future expansion, it is recommended that additional land contiguous to the present holdings be acquired. (14)

12. *Improve Communication with Students.* It is recommended that a mechanism be developed for obtaining student opinion regarding matters of direct concern to them, and used to bring about improvements in students' welfare and academic achievements. The constructive role that the students' welfare organization plays needs to be supported by the faculty. (5, 11)

13. *Establish a Placement Service.* It is recommended that a Placement Service be developed to locate suitable positions for the university graduates and to expand employment opportunities in the agro-industrial sector and in the agencies serving rural people. This Service can also influence the faculty to reorient curricula to meet the needs of employers. (4)

14. *Develop and Foster an Alumni Association.* It is recommended that an Alumni Association of the P.A.U. be organized under the sponsorship of the University to maintain the link with its graduates. While the responsibility for organization and coordination should rest with the Director of Students Welfare, the colleges should play an active role in developing and maintaining the Association. (4, 15)

15. *Improve Record Keeping.* We recommend that with the Tables given in this Report as a starting point, a system of record keeping be devised whereby the progress of the development and growth of P.A.U. can be followed from year to year. The data recorded should be in such form that they can be compared from year to year with little effort. Included should be such items as: number of students and graduates by curricula; number of faculty by ranks, departments and colleges; financial data on budget, resources and expenditures; research and extension data on a comparable

basis from year to year; and publications by colleges and departments. The excellent records of the Library should continue to be maintained. Data on the agricultural economy of the area to be served should be summarized annually and distributed to all segments of the University to serve as a guide in the development of programmes.

CHAPTER 1

A Brief History of Punjab Agricultural University[1]

At the time of the partitioning of the Indian sub-continent of Asia to form the sovereign nations of India and Pakistan, the Punjab State was divided. The old Punjab Agricultural College at Lyallpur and the Punjab Veterinary College at Lahore along with the best agricultural land of Punjab remained with Pakistan. In the mass migration that took place, the faculties and students of these colleges were dispersed and many of those, not of the Muslim faith, found their way to the Indian Punjab. The first facility for the continuation of the education of the refugee agricultural students and the professional employment of the displaced faculty was provided at Khalsa College, Amritsar, on November 17, 1947. The Agricultural College continued operation there until June 1949, when it was shifted to a rented school building in Ludhiana. Likewise, for the students and faculty of the Punjab Veterinary College who were faced with a similar situation, the Punjab Government opened a Veterinary College in a part of the Government High School building in Hissar in February 1948. The background and traditions brought to the Punjab Agricultural and Veterinary colleges which later became parts of the Punjab Agricultural University have not been forgotten. There is still reverence and pride for the old Lyallpur and Lahore institutions among those who were associated with it either as faculty or students. This is illustrated by an answer on a department head questionnaire concerning the data when the department was founded; the answer "1909 at Lyallpur, 1962 in the P.A.U."

An agreement was signed on January 5, 1952, between the Government of India and the United States Government for establishing a programme of technical cooperation. Later on March 30, 1955, a supplement to this agreement was signed which provided for a project specifically designed to strengthen agricultural education, research and extension.

Two important milestones that should be mentioned in any discussion of the history of agricultural universities in India are the Joint Indo-American Team Reports on Agricultural Education, Research and Extension of 1955

[1] For a more complete history of agricultural universities in India and of the Punjab Agricultural University, see K.C. Naik, *A History of Agricultural Universities*, Delhi, Navchetan Press, (P) Ltd., 1968; and D. Sundaresan, *Punjab Agricultural University, Ludhiana*, Punjab Agricultural University Press, 1969.

and 1960.[1] These reports provided recommendations and guidelines which have served a useful purpose in the formative stages of University development. Some of the Indian leaders of that day who were instrumental in getting this programme under way were destined to play an important part in the development of the Punjab Agricultural University. Special mention should be made of: Dr. P.N. Thapar, then Secretary, Ministry of Agriculture in the Central Government, who became the first Vice-Chancellor of the P.A.U.; Dr. M.S. Randhawa, then Vice-President of the Indian Council of Agricultural Research, who became the second Vice-Chancellor of the P.A.U.; and Dr. B.N. Uppal, the Commissioner of Agriculture in the Government of India, who has been the agricultural scientist on the P.A.U. Board of Management since its founding.

Special mention of the late Shri Partap Singh Kairon should also be made. He was the Chief Minister of Punjab State at the time and took an active hand in getting the legislation for establishing the University enacted and then providing the financial support to bring its rapid development. His untimely death in 1965 brought to an abrupt close a public service career that strongly supported agricultural development throughout the years of his tenure in office. Thus the linkage of the P.A.U. with Central and State Governments has an unusual history. This close relationship has been maintained over the years.

During the period of 1950 to 1960 several significant developments took place. In April 1950, through the efforts of Dr. M. S. Randhawa, an area of 500 acres at the edge of Ludhiana was allotted to the Department of Agriculture for a permanent home of the College of Agriculture. This 500 acre area was formally taken over by the College in July 1952. Plans for developing this area and the erection of buildings were begun immediately. On July 6, 1955, the Government of India took the decision that the Punjab Agricultural College was to be provided with an assistance of 30 lakh rupees (Rupees 3 million) in the first instance. On September 23, 1955, the foundation stone of the new building was laid by Dr. Ajit Prasad Jain, then Minister of Food and Agriculture, Government of India. The first Technical Assistance Team under TCM (AID) arrived in New Delhi in October and settled down in Ludhiana on December 4, 1955.

About the time the new building was occupied the Principal of the College of Agriculture was given the additional title of Joint Director of Agriculture and some of the research officers of the department were moved into the laboratories and offices of the building and provided with research land on the College farm. Thus the integration of education and research

[1] *Report of the Joint Indo-American Team on Agricultural Research and Education*, (1955) I.C.A.R. (New Delhi), and *Report of the Second Joint Indo-American Team on Agricultural Education, Research and Extension*, (1960)—I.C.A.R. (New Delhi).

was begun in the Punjab College of Agriculture several years before the University was founded.

On the Extension side, during this period a decision was taken to provide a block of 100 villages in the Ludhiana District as a Laboratory for the training of students in extension methods. A course in Extension Education was introduced in the curriculum and the students were given field experience in extension as a part of their education. Extension Advisory Committees were set up and the farm people were involved in the development of an extension programme to meet their needs through these committees. The College sponsored the first Kisan Mela at the College in 1956. This programme has grown. Today literally thousands of farmers attend this annual function. These developments illustrate the early begining of the integration of extension with research and resident instruction.

Also, during this 1950-60 period 100 acres were transferred from the large Government Livestock Farm to the Veterinary College at Hissar, and a building programme undertaken. Some of these buildings were completed and occupied before the University was founded.

The development of an Agricultural University in Punjab was first discussed in 1956 and a general plan of organization and structure was circulated. Because of financial problems the plan was held in abeyance for a few years, but never forgotten for a moment. The Punjab Agricultural University Act, 1961, received assent of the Governor on the 13th October, 1961, thereby founding the Punjab Agricultural University. The Act specifically provided for the transfer of the College of Agriculture, Ludhiana, and the College of Veterinary and Animal Science, Hissar, as constituent colleges of the University. The Act also provided for a new College of Agricultural Engineering, a new college of Home Science, and any other Government College of Agricultural Sciences, which may be established after the commencement of the Act.

Immediately after the University was established the transfer of all agricultural and veterinary research to the University took place. The Act also provided for the shifting of the extension functions which are primarily of an educational nature. These two functions are organized under the Directorate of Research and Directorate of Extension, respectively.

Ordinance No. I of 1970 promulgated by the President in the 21st Year of the Republic of India (1970) repealed the Punjab Agricultural University Act, 1961, and provided for the establishment of two independent agricultural universities (Punjab Agricultural University and Haryana Agricultural University) in the place of the Punjab Agricultural University established under the Act of 1961.

CHAPTER 2

The Rural Economy Served By P.A.U.

The assessment of progress of a service-oriented agricultural university must be viewed in the light of the rural economy to be served. Service to the society implies that improvements are to be made; thus an agricultural university cannot remain viable unless it, with other complementary institutions, is having a positive effect on the society. Agricultural university leadership should constantly have before it information portraying the nature of the agricultural economy to be served and changes that are occurring. Deliberate decisions regarding university programmes should be made in order to bring about changes in the rural economy that are technically sound, economically feasible, and socially acceptable.

The Punjab

The Punjab is a small State of India with less than two per cent of the area and less than three per cent of the total population. There are 11 districts with a combined area of approximately 50,376 square kilometres and a population in the range of 13 to 14 million, some three-fourths of which is rural.

The topography of the State varies from low mountainous to low-lying plains. In general, there are three main farming areas. The submontane zone to the north has reddish chestnut soils and rainfall from 95 to 160 centimetres. In the central zone, arid brown soils predominate with rainfall in the range of 65 to 95 centimetres. The southwest zone has sierozem and desert soils and precipitation varying from 35 to 65 centimetres. The variations in topography, soils, rainfall and availability of water for irrigation dictate wide differences in crops, farming practices and yields.

Crop Production and Yields

The total cultivated area in the Punjab has remained relatively stable since 1950; however, the total cropped area has increased by more than one million hectares because of the increase in intensity of cropping (Table 2.1). There was a marked increase in intensity of cropping in the early 1950s and during the most recent three years.

The area, production and yields of the most important crops are shown in Tables 2.2, 2.3 and 2.4. The combination of increased area and yield

Table 2.1. Cropped area, net area sown, and intensity of cropping, Reorganized Punjab, selected years, 1950-51 to 1968-69[a]

Year	Total cropped area (000 hectares)	Total cultivated area[b] (000 hectares)	Intensity of cropping[c] (per cent)
1950-51	4,170	3,989	105
1955-56	4,567	3,991	114
1960-61	4,723	4,061	116
1965-66	4,878	4,110	119
1967-68	5,441	4,145	131
1968-69	5,288	4,062[d]	130[d]

[a] Reorganized Punjab refers to Punjab State as constituted beginning in November 1966.

[b] Net area sown plus current fallow.

[c] Total cropped area ÷ total cultivated area × 100.

[d] Current fallow area estimated to be 150,000 hectares.

Source: *Statistical Abstract of Punjab*, 1968; 1968-69 data from Economic and Statistical Organization, Punjab, Chandigarh.

Table 2.2. Area of selected crops, Reorganized Punjab, selected years, 1950-51 to 1968-69 (thousand hectares)[a]

Crop	1950-51	1955-56	1960-61	1965-66	1967-68	1968-69
Wheat	1,137	1,292	1,394	1,548	1,790	2,063
Maize	252	260	326	385	476	490
Rice	120	149	228	293	314	345
Bajra	217	125	124	156	209	193
Gram	851	1,002	871	603	530	348
Groundnuts	38	53	67	135	222	222
Sugarcane	91	96	131	167	137	157
Cotton, desi	146	143	202	237	192	163
Cotton, American	79	287	244	222	227	229

[a] For greater detail on area, production and yields of crops, see *Punjab Agricultural Handbook*, 1970, Punjab Agricultural University.

Source : *Statistical Abstract of Punjab*, 1968, pp. 50-51; 1968-69 data from Economic and Statistical Organization, Chandigarh, Punjab.

Table 2.3. Production of selected crops, Reorganized Punjab, selected years, 1950-51 to 1968-69 (thousand metric tons) [a]

Crop	1950-51	1955-56	1960-61	1965-66	1967-68	1968-69
Wheat	1,024	1,136	1,725	1,916	3,335	4,491
Maize	142	192	370	643	774	706
Rice	107	107	236	293	415	470
Bajra	83	48	59	80	208	204
Gram	511	666	715	371	452	233
Groundnut	25	38	62	165	240	207
Sugarcane	257	270	482	577	480	516
Cotton, desi	25.96	19.02	53.87	62.65	55.90	51.41
Cotton, American	19.74	58.85	65.79	68.97	84.15	82.97

[a] Production of groundnut nuts in shell; sugarcane is in gur.
Source: See Table 2.2.

Table 2.4. Yields of selected crops, Reorganized Punjab, selected years, 1950-51 to 1968-69 (kilograms per hectare)

Crop	1950-51	1955-56	1960-61	1965-66	1967-68	1968-69
Wheat	901	879	1,237	1,238	1,863	2,177
Maize	565	739	1,135	1,670	1,627	1,440
Rice	892	718	1,035	1,000	1,322	1,364
Bajra	382	384	476	548	994	1055
Gram	600	665	821	615	853	670
Groundnut	658	717	925	1,222	1,079	932
Sugarcane	2,824	2,812	3,679	3,455	3,507	3,289
Cotton, desi	178	133	267	264	291	316
Cotton, American	250	205	270	311	371	369

Source: *Statistical Abstract of Punjab*, 1968, pp. 62-80; 1968-69 data from Economic and Statistical Organization, Chandigarh, Punjab.

of wheat has resulted in a dramatic production increase, i.e. more than tripled since the mid-1950s with large responses to the high-yielding varieties beginning in 1967-68 (Table 2.5). Less dramatic but significant increases have occurred in maize and rice production, and in crops subject to the vagaries of the kharif season.

Table 2.5. High-yielding varieties of wheat, maize, rice and bajra, Reorganized Punjab, 1966-67 to 1969-70

Crop	Area in high-yielding varieties (000 hectares)				Per cent of crop in high-yielding varieties		
	1966-67	1967-68	1968-69	Targets 1969-70	1966-67	1967-68	1968-69
Wheat	57	621	1194	1416	3.5	34.7	57.1
Hybrid maize	18	29	49	80	4.1	6.5	10.0
Rice	4	17	26	60	1.4	5.8	7.4
Hybrid bajra	6	51	82	101	0.3	25.8	42.5

Source: Economic and Statistical Organization, Chandigarh, Punjab.

Following the release of high-yielding hybrid bajra in 1966-67, both the area and yield increased for this crop that is particularly important in the southwest part of the State.

With increasing competition from the more profitable wheat crop, gram area and production have declined.

There has been no particular trend in sugar production during the 1960s; however groundnut production has increased, due primarily to tripling of the area in this crop.

The production of American cotton increased during the 1960s due primarily to increase in yields, with a decline in desi cotton area and production during the latter part of the period.

There has been a rapid increase in high-yielding varieties of wheat and bajra beginning with the 1967-68 crop when more than one-third of the wheat and one-fourth of bajra were of the high-yielding varieties. Area under these varieties continued to expand rapidly in 1968-69 and 1969-70 (Table 2.5).

The rate of adoption of high-yielding varieties of maize and rice has been much slower than that of wheat and bajra, with high-yielding varieties accounting for 10 per cent of the maize and 7.4 per cent of the rice in 1968-69.

A summary of the changes in agricultural production (crops only) in the Punjab from 1950-51 to date is shown in Fig. 2.1.

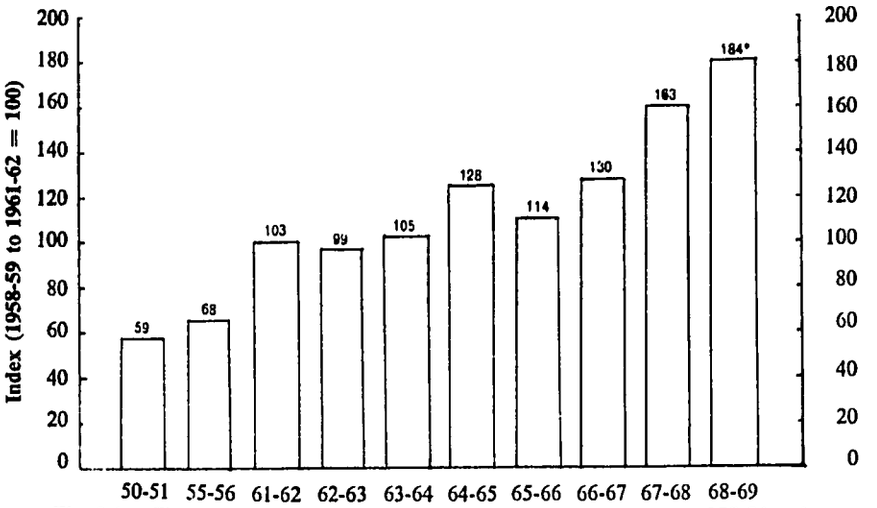

Fig. 2.1. Changes in Agricultural Production in the Punjab, 1950-51, 1955-56 and 1961-62 to 1968-69.

*1968-69 estimated from gross production of major crops.

Source: *Statistical Abstract of Punjab*, 1968, pp. 87-88.

Fertilizer Consumption

Little fertilizer was used in the Punjab at the beginning of 1960 but by the end of the decade, a chemical revolution had occurred (Table 2.6). Significant use was made of fertilizer by high-yielding varieties and there were very large increases in fertilizer use in 1967-68 and 1968-69 concurrent with the large increases in new varieties of wheat and bajra.

Table 2.6. Fertilizer consumption in Punjab State, 1960-61 and 1965-66 to 1968-69 (000 tons)

Fertilizer	1960-61	1965-66	1966-67	1967-68	1968-69
Nitrogen[a]	25	241	230	416	674
Phosphorus[b]	1	21	27	95	192
Potassium[c]	—	1	1	6	17
Total	26	263	258	517	883

[a] Ammonium sulphate equivalent ; [b] Triple superphosphate equivalent;
[c] Muriate of potash equivalent.
Source: Director of Agriculture, Punjab, Chandigarh.

Irrigation

Irrigation, with fertilization, is an important factor accounting for increased agricultural production in the Punjab. The total area irrigated was about 2·25 million hectares from 1955 to 1967; however, there was a large increase in the area irrigated from wells in 1968-69 when two-thirds of the net area sown was irrigated (Table 2.7). This was the first of recent years when there was a large increase in net area irrigated. However, the change in area irrigated does not fully reflect the increase in irrigation. With the increase in tubewells, wells are more closely spaced and water use per unit area irrigated has increased. By 1968-69, in Punjab the area irrigated by wells exceeded the area irrigated by canals on which crores of rupees were invested by the State.

Table 2.7. Area irrigated by sources of water, per cent sown area irrigated, and number of wells, Punjab State, selected years 1955-56 to 1968-69

Item	1955-56	1960-61	1965-66	1967-68	1968-69
Area from canals	1,354	1,181	1,295	1,293	1,294
Area from wells[a]	890	824	887	989	1,352
Area from other sources	15	14	81	7	6
Total (000 hectares)	**2,259**	**2,019**	**2,263**	**2,289**	**2,652**
Per cent net area sown irrigated	62	54	59	57	67
Number of tubewells	—	—	26,066	44,491	62,863
Number of other wells	—	—	165,866	170,550	168,872
Total wells	—	—	**191,932**	**215,041**	**230,735**

[a] Includes tubewells and other wells.

Source: *Statistical Abstract of Punjab*, 1968, pp. 97 and 106; data for 1968-69 from Economic and Statistical Organization, Punjab, Chandigarh.

It is estimated that by November 1969, there were 70,000 wells with electric motor pumps and a like number with diesel-motor power pump sets.[1]

[1]Estimate of Dr. Gurcharan Singh Kalkat Joint Director, Department of Agriculture, Punjab, Chandigarh.

Changes in Mechanization

Mechanization has increased rapidly in the Punjab in the 1960s with the number of tractors increasing from 4,935 in 1961 to about 17,000 in early 1970.[1] With the increase in tractors there has been an increase in iron ploughs, disc-harrows, and cultivating implements of a variety of types (Table 2.8). While the exact numbers are not known, there has been a rapid increase in use of seed-cum-fertilizer drills and threshers, many of which are manufactured in the Punjab.

Table 2.8. Tractors, implements and machines, Punjab State, 1961 and 1966

Item	1961	1966
Tractors	4,935	10,636
Wooden ploughs	673,835	699,157
Iron ploughs	411,815	634,141
Oil engine with pump sets	6,983	25,733
Electric pumps for tubewells	6,565	27,224
Carts	283,575	308,140
Sugarcane crushers, power	1,566	3,223
Sugarcane crushers, bullocks	73,691	88,768

Source: *Statistical Abstract of Punjab*, 1968, pp. 142-43.

Table 2.9. Number of livestock, Punjab State, 1961, 1966 and 1969

Livestock	1961	1966	1969
Cattle	3,099,400	3,161,800	3,213,100
Buffaloes	25,103,00	2,983,300	3,369,900
Sheep	353,300	444,200	620,800
Goats	602,900	620,400	850,200
Poultry	1,154,400	1,680,100	2,233,000
Camels	100,500	118,600	199,800
Horses and ponies	40,100	36,100	425,00

Source: 1961 and 1966 data from *Statistical Abstract of Punjab*, 1968, p. 131; data for 1969 from Director, Animal Husbandry, Punjab.

[1]Estimate of Dr. Gurcharan Singh Kalkat, Joint Director, Department of Agriculture, Punjab, Chandigarh.

Changes in Livestock Production

It is generally agreed that the livestock segment of the agricultural economy has been relatively static in comparison with the crop segment; however important changes in livestock numbers have occurred during the 1960s (Table 2.9). Numbers of buffaloes, sheep and goats have increased while cattle numbers have remained relatively constant. There has been little increase in the efficiency of livestock production to accompany the added numbers. There have been definite advances in poultry technology leading to increased production of eggs and poultry meat. While the increase in tractors and electrification have decreased the need for draft animals, the number of camels is estimated to have doubled from 1961 to 1969.

Summary

With the changes in the boundaries of the Punjab, it is difficult to obtain comparable data over a long period of years. Nevertheless, the combination of evidence clearly shows that the State is changing rapidly, not only by Indian standards but by those of other countries as well. The net contribution from the agricultural sector increased from Rs. 316.6 crores[1] in 1965-66 to Rs. 494.2 crores in 1966-67 and to Rs. 576.7 crores in 1967-68. The use of credit is expanding, e.g. in the Ludhiana District, the cooperative credit advanced increased from Rs. 307 lakhs[2] in 1965-66 to Rs. 813 lakhs in 1968-69. Commercial banks are also becoming active in the agricultural lending field.

The Punjab Agricultural University and the other agricultural institutions of the States are faced with the challenge of sustaining the growth now underway.

[1]One crore equal to ten million.

[2]One lakh equal to one hundred thousands.

CHAPTER 3

University Objective, Structure, Finances, Personnel

The Haryana and Punjab Agricultural Universities Ordinance, 1970, of the Government of India which repealed the Punjab Agricultural University Act of 1961 provides for the establishment of two independent agricultural universities in place of the erstwhile Punjab Agricultural University. It provides for retaining many of the provisions of the Act of 1961. Some of the more significant provisions of this ordinance as related to the Punjab Agricultural University are stated in the following paragraphs.

Objectives

The University shall be deemed to be established and incorporated for the following purposes:

"(*a*) making provision for imparting education in different branches of study, particularly agriculture, veterinary and animal science, agricultural engineering, home science and other allied sciences;

"(*b*) furthering the advancement of learning and prosecution of research, particularly in agriculture and other allied sciences

"(*c*) undertaking the extension of such sciences to the rural people of the State; and

"(*d*) such other purposes as the State Government may by notification direct."

Agriculture is defined in Section 2(b) page 1 as follows:

"(*b*) 'Agriculture' means the basic and applied science of soil and water management, crop and livestock production and management, home science and the betterment of the rural people."

Among the powers of the University the following are of special interest in developing programmes in agricultural education, research and extension:

"(*a*) to provide graduate and postgraduate instruction in agriculture, veterinary and animal science, agricultural engineering, home science and other allied sciences and in such other branches of learning as the University may deem fit;

"(*b*) to make provision for instruction in applied fields, research and the dissemination of the findings of research and technical information through an extension education programme;

"(*f*) to provide lectures and instructions for field workers, village leaders and other persons not enrolled as regular students of University and to grant certificates to them when deemed desirable;

"(*h*) to institute teaching, research and extension education posts required by the University and to appoint persons to such posts."

These are consistent with similar powers provided in the Model Act.

Structure

The Authorities and Officers of the University as provided in the Act of 1961 and retained in the Ordinance of 1970 which superseded the Act are consistent with those proposed in the Model Act. These are as follows:

Authorities

(*i*) Board;

(*ii*) Academic Council;

(*iii*) Board of Studies; and

(*iv*) Such other authorities as may be declared by the Statutes to be authorities of the University.

Officers

(*i*) Chancellor; (Governor of the Punjab State)

(*ii*) Vice-Chancellor;

(*iii*) Dean of Postgraduate Studies;

(*iv*) Deans of the Colleges;

(*v*) Director of Research;

(*vi*) Director of Agricultural Extension;

(*vii*) Director of Students Welfare;

(*viii*) Registrar;

(*ix*) Comptroller;

(*x*) Estate Officer;

(*xi*) Librarian; and

(*xii*) Such other persons in the service of the University as may be declared by the Statutes to be officers of the University.

The Ordinance of 1970 provides that the Board of the Punjab Agricultural University shall consist of:

(*a*) the Vice-Chancellor; (working Chairman)

(*b*) the Chief Secretary to the Government of the State of Punjab;

(*c*) the Secretaries to the Government of the State of Punjab in the Department of (*i*) Agriculture; and (*ii*) Finance;

(*d*) the Director of Agriculture, Punjab;

(*e*) the Director of Animal Husbandry, Punjab;

(*f*) one nominee of the Indian Council of Agricultural Research;

(*g*) two nominees of the Government of the Union Territory of Himachal Pradesh;

(*h*) persons not being officials, appointed by the Government of the State of Punjab from amongst the following categories of persons, namely:

(*i*) two from amongst persons who are, in the opinion of that Government, eminent agricultural scientists with background of agricultural research or education;

(*ii*) two from amongst persons who are, in the opinion of that Government, progressive farmers or livestock breeders having experience of, and interest in, scientific farming and livestock improvement;

(*iii*) one from amongst persons who are, in the opinion of that Government, distinguished industrialists, businessmen, manufacturers or livestock breeders, associated with agricultural development; and

(*iv*) one from amongst women who are, in the opinion of that Government, outstanding social workers, preferably with a background of rural advancement.

The Registrar shall be ex-officio Secretary to the Board.

The term of office of the members of the Board, other than the official members, shall be three years, provided that two members, not being official members shall retire at the end of each year.

Section 32(1) of the Ordinance of 1970 makes the following provision regarding statutes: "The Statutes made by the existing University under Section 30 of the Punjab Agricultural University Act, 1961, and in force immediately before the commencement of this Ordinance shall, in so far as they are not inconsistent with the provisions of this Ordinance, and subject to such adaptations and modifications as may be notified by the appropriate Government, be the first Statutes of a corresponding University."

The Academic Organizational Structure of the Punjab Agricultural University as it exists today is outlined in the accompanying Academic Organization Chart (Chart 3.1).

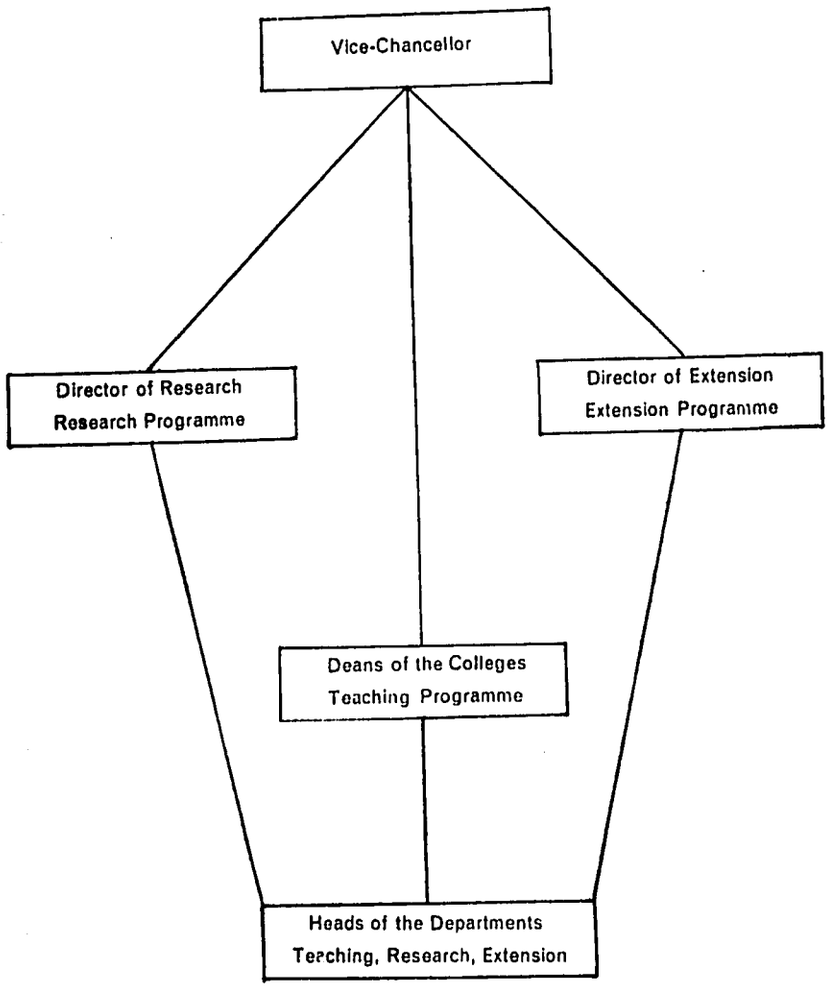

Chart 3.1. Academic Organization Chart of P.A.U.

The Ordinance of 1970

The constitutional framework within which the Punjab Agricultural University now functions is the Government of India Ordinance of 1970 which superseded the Act of 1961, and the Statutes in force immediately before the commencement of the Ordinance. The adequacy of these documents may be examined with reference to the distinguishing features of agricultural universities enumerated by the Education Commission in its 1964-66 Report. The Model Act for Agricultural Universities in India drafted by the I.C.A.R. provides a good check for testing the suitability of the Ordinance and Statutes to carry out the vital and important role of agricultural development of the State.

Recommended Features	**Features of P.A.U.**
Model Act and Commission Report	*Government of India Ordinance No. 1 1970*
(1) Statewide responsibility for education, research and extension in agriculture in its broadest sense.*	(1) Section 24(2) lists the following as constituent colleges: Agriculture, Agricultural Engineering, Basic Sciences and Humanities, Home Science and Veterinary Medicine at Ludhiana and the College of Agriculture at Palampur. Provisions are made also for including any other Government College of Agriculture that may be established hereafter as a constituent college and for a Central Government agricultural institution to be integrated as a constituent college. Also see (2) constituent college. Also see (2) below.
(2) Territorial jurisdiction and responsibility shall extend to the entire State.*	(2) The Punjab Agricultural University shall function with respect to teaching, research and extension education within such territories to which the functions of the existing University extended immediately before the commencement of the ordinance.

(3) The University should have at least colleges of Agriculture, Veterinary and Animal Science, Home Science, Agricultural Engineering and Technology and a school of Basic Sciences and Humanities. At least three colleges should be located on a single headquarters campus.*	(3) See (1) above.
(4) All colleges to be constituent colleges.*	(4) See (1) above.
(5) All State supported colleges of Agriculture, Veterinary and Animal Science to be constituent colleges.*	(5) See (1) above.
(6) See (1) above.	(6) Section 22 of the Act of 1961 transferred the research and education functions of the Department of Agriculture and the Department of Animal Husbandry to the erstwhile Punjab Agricultural University and the Ordinance of 1970 (Sections 25 and 26) retain these functions in the Punjab Agricultural University.
(7) The primary emphasis on teaching and research directly and immediately related to the solution of social and economic problems of the countryside.**	(7) Consistent with the objects of the University as stated in Section 7 of the Ordinance.
(8) Integration of programmes of research, training and extension so that the University is concerned with all aspects of increasing, disseminating and applying knowledge related to agriculture, both basic and applied.**	(8) Section 16(9) of the Ordinance provides that the Vice-Chancellor shall be responsible for the close coordination and integration of teaching, research and extension education.

(9) Research and extension education programmes of the agricultural related sciences to be fully integrated with the teaching functions.**	(9) Section 24(5) states that there shall be a Head of each department who is responsible to the Dean for Resident Instruction and to the Director of Research and Extension, respectively, for research and extension and Section 26(2) provides that all Extension Specialists shall be members of staff of their respective subject-matter sections. Section 21(3) of the Ordinance states that the Dean shall be responsible for the organization and conduct of resident instruction of the Department of the College.
(10) The University should not only teach undergraduate, postgraduate and research students but also give specialized technical training to young people who are not candidates for degree.**	(10) Section 9(f) of the Ordinance provides for lectures and instruction for field workers, village leaders and other persons not enrolled as regular students.
(11) The University should lay emphasis on adult and continuing education side by side with teaching regularly enrolled students.**	(11) See (10) above.
(12) Authorities of the University:	(12) There is no Postgraduate Board of Studies at P.A.U. and the Board of Studies are constituted on a College basis rather than on a faculty basis.
(13) Grants to the University not less than the expenditure incurred on activities transferred to the University plus expenditure for running and developing the University.*	(13) Transferred in 1963. Section 35 of the Ordinance provides for the Division of assets and liabilities between the Haryana and Punjab Agricultural Universities.

* Model Agricultural Universities Act—I.C.A.R.

** Education Commission Report 1964-66 (Ministry of Education, G.O.I.)

Ordinance No. 1 (Feb. 2, 1970) establishing the Punjab Agricultural University is in essential agreement with the Model Act and the Education Commission Report of 1964-66 except for the duties of the Dean as stated in Sec. 14(5) of the Model Act.

Financial Resources

P.A.U. Funds and Expenditures. The financial resources and the sources of funds available to P.A.U. from 1962-63 to 1969-70 are shown in Table 3.1. These include the funds received from Haryana, Union Territory of Himachal Pradesh and the Union Territory of Chandigarh. In view of the reorganization of the erstwhile State of Punjab, beginning in 1967-68, grants from Punjab, Haryana, Himachal Pradesh and Chandigarh were in the proportion of 51.77: 39.50: 8.43: 0.30, respectively.

For 1969-70, the estimated funds available to P.A.U. is 3.93 crores (39.3 million) rupees with about 80 per cent from State sources. About 10 per cent of the funds are from Central Government sources, primarily I.C.A.R. The data in this Table show that I.C.A.R. has been an important source of funds since 1966-67. Data for years prior to 1966-67 were not available. The funds from technical assistance sources shown in Table 3.1 do not include funds directly expended by technical assistance agencies.

The P.A.U. expenditures from 1962-63 to 1968-69 are shown in Table 3.2. The changes in the area of the Punjab and responsibilities of P.A.U. to Haryana and Himachal Pradesh make it difficult to separate the expenditures by campuses of the erstwhile P.A.U. Likewise, with personnel of several P.A.U. departments on more than one campus, it is not possible to obtain an allocation of expenditures by departments and colleges for the Ludhiana campus.

Technical Assistance. Technical assistance has been an important source of personnel and financial resources at P.A.U., with U.S.A.I.D., Ford and Rockefeller Foundations making highly significant contributions. Some of the technical assistance efforts preceded the establishment of P.A.U. in 1962 as was pointed out in Chapter 1. The Ohio State University began to provide technical advice and assistance under a U.S.A.I.D. Contract to five cooperating agricultural and veterinary institutions in Punjab, Rajasthan, Himachal Pradesh and Delhi in 1955. With the beginning of Punjab Agricultural University, with campuses at Ludhiana and Hissar, and the Rajasthan Agricultural University (later University of Udaipur), Ohio State University began to concentrate its efforts at the two Universities with the erstwhile Punjab and Rajasthan being served under a single contract until November 1, 1964.

Table 3.1. Sources of funds, Punjab Agricultural University, 1962-63 to 1969-70

Source of funds	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70[a]
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1. From preceeding year	—	107,967	1,699,846	1,674,508	163,761	5,422,203	3,239,936	2,234,941
From States:								
2. Punjab	2,325,269	12,300,514	20,583,732	18,471,019	23,395,692	10,482,710	12,166,065	16,312,770
3. Haryana	—	—	—	—	2,844,450	8,504,845	8,928,430	12,164,519
4. Himachal Pradesh	—	—	—	—	801,302	1,771,220	1,947,168	3,084,122
5. Union Territory of Chandigarh	—	—	—	—	28,030	84,000	42,030	68,784
6. Punjab Community Dev. and Edu. Deptts.	—	—	—	—	—	1,600[b]	40,0000[c]	—
7. Sub-total from States (2—6)	2,325,269	12,300,514	20,583,732	18,471,019	27,069,474	20,844,375	23,123,693	31,630,195
From Central Government:								
8. Indian Council of Agricultural Research	—	—	—	175,145	4,511,455	5,983,630	7,782,426	3,639,190
9. Central and other schemes	—	—	—	800	815	642,245	150,827	348,540

10. University Grants Commission	—	2,500	12,500	28,000	6,076	500	—	500[d]
11. Sub-total, Central Government (8—10)	—	2,500	12,500	203,945	4,518,346	6,626,375	7,933,253	3,988,230
From Technical Assistance:								
12. U.S.A. PL 480	—	94,201	347,039	446,138	839,476	657,750[e]	440,415	421,640
13. Ford Foundation	—	—	—	—	—	12,892	7,600	94,930
14. Rockefeller Foundation	—	500,000	35,568	—[f]	56,179	—	—	—
15. Sub-total, Technical Assistance (12-14)[g]	—	594,201	382,607	446,138	895,655	670,642	448,015	516,570
16. Other Income[h]	—	1,102,729	1,493,136	1,796,247	—	—	—	965,600
Grand Total:	2,325,269	14,107,911	24,136,251	22,591,857	32,647,237	33,563,595	34,744,897	39,335,556

[a] Estimated; [b] Community Development Department; [c] Education Department; [d] Council of Scientific and Industrial Research; [e] Includes Rs. 105,422 Foreign Equipment Project 28; [f] Rs. 5.00 lakhs in equipment from Rockefeller Foundation; [g] Excludes Technical Assistance funds dispersed directly by donor agency; [h] Includes income from fees, rent, farm produce sales and miscellaneous services.
Source: Office of the Comptroller, Punjab Agricultural University.

Table 3.2. Expenditures, Punjab Agricultural University, 1962-63 to 1968-69

Expenditures	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1. Administration, Staff and Contingencies	—	—	3,281,595	2,370,100	3,506,740	4,594,936	3,454,219
2. Administration, College Facilities	—	—	—	1,285,627	1,311,551	1,743,235	2,096,520
3. College Research and Extension Schemes	1,917,305	7,095,741	8,768,987	9,725,815	13,318,107	15,747,023	28,277,834
4. Buildings (including maintenance, excluding I.C.A.R.)	—	4,356,319	10,439,734	8,678,058	5,768,361	6,472,180	3,188,279[a]
5. Buildings, I.C.A.R. Schemes	—	—	—	—	—	2,671,181	3,072,000
6. I.C.A.R. Research Schemes (excluding buildings)	—	—	—	3,000	—	2,249,365	3,617,947
7. Centrally Sponsored schemes[b]	—	1,003	—	32,687	20,264	301,784	362,533
8. U.S.A. PL 480 schemes	—	—	288,650	437,532	747,630	925,313[c]	555,080
9. Ford Foundation	—	—	—	—	—	—	63,097
10. Rockefeller Foundation	—	140,996	—	—	87,693	—	—
11. Miscellaneous schemes	—	—	12,275	—	—	1,567	45,389
Grand Total:	1,917,305	11,594,059	22,791,241	22,532,819	24,760,346	34,706,584	44,934,898

[a]Includes Rs. 2.00 lakhs from G.O.I; [b]Includes University Grants Commission; [c]Includes Rs. 105,422 Foreign Equipment Project 28.
Source: Office of Comptroller, Punjab Agricultural University.

The dollar expenditure on the Ohio State University U.S.A.I.D Contract at P.A.U. from November 1, 1964 to June 30, 1969 was nearly one million dollars divided approximately as follows: U.S. personnel, 50%; participant training, 30%; books and equipment, 10%; and other costs, 10% (Table 3.3). As costs prior to November 1, 1964 are excluded, the expenditures in Table 3.3 understate the U.S. aid to P.A.U.

Table 3.3. Dollar expenditure on U.S.A.I.D. Contract[a], P.A.U., November 1, 1964 to June 30, 1969

Cost Component	Amount $
Personnel[b]	466,306
Equipment	104,687
Participants	311,632
Other costs	101,864
Total	984,483

[a]Contract A.I.D./nesa 147.
[b]Includes salaries and travel.
Source: Office of Controller, U.S.A.I.D., New Delhi.

In addition to the U.S.A.I.D. dollar expenditure, 33 lakhs of rupees were expended on the Ohio State University A.I.D. Contract from November 1, 1964 to August 31, 1969 (Table 3.4). An additional 26 lakh of rupees were spent from 1955 to October 31, 1964.

Eleven Ohio State University experts were located at Ludhiana (or Chandigarh) prior to the beginning of P.A.U. and served in the following fields: animal and poultry husbandry, agricultural extension, agronomy, agricultural economics, and rural sociology. Since P.A.U. was established, 18 experts have served at Ludhiana in a wide range of disciplines: agricultural economics, agricultural engineering, animal and poultry husbandry, home science, agronomy, soils, entomology, plant pathology, agricultural extension, agricultural information, and administration.

The U.S.A.I.D. programme has also made a very significant contribution to P.A.U. through participant training with a total of 65 staff members receiving training since the beginning of the programme in 1955. Of these, 26 are now members of the faculty at P.A.U., Ludhiana. In addition there are a number who hold responsible positions in Government or at other universities.

The Ford Foundation, through the Ohio State University Department of Agricultural Engineering, has assisted in the development of the College of Agricultural Engineering. This programme, which was initiated in

1964-65 has provided one long-term and 16 short-term consultants, staff training, and books and equipment. This programme continues with $560,399 being expended through December 31, 1969 (Table 3.5). Five College of Agricultural Engineering faculty members have returned from training and there are six faculty members away for training as of March 15, 1970.

Table 3.4. Rupees expenditure on U.S.A.I.D. Contract, P.A.U., September 21, 1955 to August 31, 1969 and November 1, 1964 to August 31, 1969

Cost component	Sept. 21, 1955 to Aug. 31, 1969[a]	Nov. 1, 1964 to Aug. 31, 1969[b]
	Rs.	Rs.
U.S. personnel support	2,942,707	1,443,058
Demonstrations, seminars, research, etc.	1,361,620	842,096
Participants' travel	460,819	148,813
Local staff salaries	373,674	229,096
Other direct costs	788,692	641,187
Total	**5,927,512**	**3,309,250**

[a] Includes regional assistance programme through October 31, 1964 and Contract A.I.D./nesa from November 1, 1964 to August 31, 1969.
[b] Contract A.I.D./nesa 147 which is included in the previous column.
Source: Office of Chief of Party, Ohio State University/U.S.A.I.D.

Table 3.5. Dollar expenditure on Ford Foundation, Ohio State University, Project in Agricultural Engineering to December 31, 1969

Cost component	Amount $
Personnel	260,860
Fellowships	170,186
Books and equipment	100,943
Other expenses	28,410
Total	**560,399**

Source: Ford Foundation, Ohio State University Consultant, P.A.U.

The Rockefeller Foundation has provided substantial financial and other support to P.A.U. for a variety of purposes: development of the main research station; purchase of books, periodicals, and equipment; preparation of architectural and structural plans for the College of Home Science; and travel grants, scholarships and fellowships for faculty members.

Personnel

The Punjab Government Agricultural College was formally transferred to the Punjab Agricultural University in December 1962 and steps were taken to disaffiliate the College from the Punjab University. A large number of vacancies existed in the faculty ranks when the University came into existence.

The faculty was reorganized into 21 sections for the whole University as follows: College of Agriculture, 6; School of Basic Sciences and Humanities, 8; College of Veterinary and Animal Sciences, 7.

The First Annual Report of the University for 1962-63 reported the sanctioned strength of the teaching staff as: Professors, 11; Associate Professors, 8; Assistant Professors, 35; and Lecturers, 45. The figures are exclusive of Veterinary and Animal Sciences but include the faculty of the School of Basic Sciences and Humanities.

The Second Annual Report of the University (1963-64) lists the sanctioned strength and number in position as follows:

Ranks	*Sanctioned strength*	*Staff in position*
Professors	11	10
Associate Professors	8	6
Assistant Professors	49	43
Lecturers	48	44
Total	116	103

These figures again are exclusive of Veterinary Science but include those in the School of Basic Sciences and Humanities. The Second Annual Report also lists the research workers and the location of their posts. Those who were assigned to posts which are in the present Punjab State are listed in the column under 1963-64 in Table 3.6. For a more detailed listing by departments see Appendix Table 1.

Table 3.6. Staff strength by colleges and ranks, P.A.U., Ludhiana Campus, 1963-64 to January 1, 1970

Colleges	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	Jan 1 1970
Agriculture							
Professor	2	3	4	5	5	6	9
Associate Professor	11	14	17	16	20	27	31
Assistant Professor	30	68	75	86	90	91	101
Lecturer	6	22	39	42	36	43	36
Research Assistant	77	72	75	68	80	88	105
Total	126	179	210	217	231	255	282
Agricultural Engineering							
Professor	1	1	0	1	2	2	1
Associate Professor	2	3	8	12	15	14	16
Assistant Professor	1	3	6	21	22	24	23
Lecturer	2	2	2	3	2	2	14
Research Assistant	0	0	0	0	0	0	0
Total	6	9	16	37	41	42	54
Basic Sci. and Humanities							
Professor	4	5	5	5	5	6	6
Associate Professor	4	14	15	15	19	16	19
Assistant Professor	20	43	47	47	53	56	64
Lecturer	7	27	29	28	34	33	32
Research Assistant	31	41	44	45	50	51	49
Total	66	130	140	140	161	162	170
Home Science							
Professor	0	0	0	0	0	0	0
Associate Professor	0	0	0	0	1	1	1
Assistant Professor	0	0	0	2	4	6	6
Lecturer	0	0	0	1	5	6	7
Research Assistant	0	0	0	0	0	0	2
Total	0	0	0	3	10	13	16
Veterinary Medicine							
Professor	0	0	0	0	0	0	3
Associate Professor	0	0	0	0	0	0	7
Assistant Professor	0	0	0	0	0	0	12
Lecturer	0	0	0	0	0	0	16
Research Assistant	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	38
Total University Strength	198	318	366	397	443	462	560

The College of Basic Sciences and Humanities was established by a decision of the Board of Management of June 27, 1964, and the College of Agricultural Engineering admitted its first class of students in July 1965. In Table 3.6 the strength of staff assigned to posts in the present Punjab State including teaching, research and extension for each year is recorded.

The College of Home Science admitted its first class of students in July 1966 with a faculty strength of 3. At the beginning of the Second Trimester of the 1969-70 academic year the College of Veterinary Medicine opened an instruction programme on the Ludhiana campus. The faculty was transferred from the Hissar campus and consisted of 22 members with the rank of Assistant Professor or above and 16 lecturers of which 13 were temporary substitute lecturers.

As of June 1969 there were 95 on the faculty of P.A.U. at Ludhiana who held doctorate degrees.

CHAPTER 4

Resident Instruction—Students and Curricula

The Degree Programme

The Punjab Agricultural University offers the following programmes:

B.Sc. in Agriculture offered since the University came into existence. This has included a 4-year course for Higher Secondary students and a 5-year course for Matriculates. There is also a 3-year special course for Village Level Workers of the Department of Agriculture, begun in 1968-69.

B.Sc. in Agricultural Engineering offered beginning in 1965-66.

B.Sc. in Home Science offered beginning in 1966-67.

Bachelor in Veterinary Science (B.V.Sc.) first offered in 1969-70 with the movement of students and faculty from Hissar.

M.Sc. in the fields of Agriculture, Basic Sciences and Humanities, Agricultural Engineering, and Veterinary Science shown in Table 4.3 and beginning in the years indicated.

Ph.D. in the fields of Agriculture, Basic Sciences and Humanities, and Veterinary Science shown in Table 4.3 and beginning in the years indicated.

Student Enrollment. The number of students enrolled at P.A.U. in the several degree programmes is shown in Table 4.1 and the break-up of the 1969-70 students by classes in Table 4.2. In Table 4.3 the 1969-70 postgraduate students by departments and the years the postgraduate programmes were initiated are shown.

P.A.U. has made excellent growth in seven years in number of degree programmes, fields of specialization for postgraduate students, and number of students. This has necessarily meant that, at times, there was growth into areas in which personnel and other resources were only marginally adequate. The wise choice in the years ahead would seem to be for cautious expansion into new areas with emphasis on building depth and quality into academic programmes at all levels.

Entrance Requirements. For the Bachelor's degree four-year courses in Agriculture and Home Science, Higher Secondary Pass with 45 per cent marks or Pre-University or equivalent with science or agriculture or Home Science in the case of Home Science College are prescribed. To provide opportunities for studying agriculture to students from rural areas where

Table 4.1. Enrollment of students at P.A.U. by colleges and years, 1962-63 to 1969-70

	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70
B.Sc. Agriculture	779	806	810	819	922	866	925	931
B.Sc. Agric. Engineering	—	—	—	119	214	229	267	237
B.Sc. Home Science	—	—	—	—	25	58	90	136
B.V.Sc.	—	—	—	—	—	—	—	133
Total undergraduates	(779)	(806)	(810)	(938)	(1,161)	(1,153)	(1,282)	(1,437)
M.Sc. Agriculture*	114	172	318	244	202	305	262	257
M.Sc. Agric. Engineering	—	—	—	—	—	—	—	9
M.V.Sc.	—	—	—	—	—	—	—	8
Total M.Sc.	(114)	(172)	(318)	(244)	(202)	(305)	(262)	(274)
Ph.D. Agriculture*	4	3	17	35	41	53	69	99
Ph.D. Veterinary Medicine	—	—	—	—	—	—	—	10
Total Ph.D.	(4)	(3)	(17)	(35)	(41)	(53)	(69)	(109)
Total postgraduates	(118)	(175)	(335)	(279)	(243)	(358)	(331)	(383)
Total all students	897	981	1,145	1,217	1,404	1,511	1,613	1,820

*Includes postgraduate students in Departments of College of Basic Sciences and Humanities.

Table 4.2. Number of students enrolled at P.A.U. by colleges, January 1, 1970

	Colleges				P.A.U. Total
	Agric.	Agric. Engg.	Home Science	Veterinary Medicine	
Undergraduates					
1st year	217*	27	52	24	320
2nd year	184*	42	28	25	279
3rd year	178*	106	31	41	356
4th year	240*	62	25	43	370
5th year	35	—	—	—	35
Special course	77†	—	—	—	77
Total undergraduates	931	237	136	133	1437
Postgraduates					
M.Sc.	257‡	9	—	8	274
Ph.D.	99**	—	—	10	109
Total postgraduates	356	246	136	151	383
Total students	1287	246	136	151	1820

*Includes both 4-year course and 5-year course.
†Special 3-year course for Village Level Workers, Department of Agriculture.
‡Includes 128 students in departments of College of Basic Sciences and Humanities.
**Includes 46 students in departments of College of Basic Sciences and Humanities.

facilities for teaching sciences up to the Higher Secondary level are not provided, matriculates are admitted to a 5-year curriculum in agriculture.

For the four-year course leading to a Bachelor's Degree in Veterinary Medicine, first year science medical, pre-medical or pre-veterinary with atleast 50 per cent marks are necessary for entrance. For the four-year course in Agricultural Engineering, pre-engineering is prescribed; earlier a five-year curriculum after Higher Secondary or equivalent was being run which has been discontinued.

Table 4.3. Years first postgraduates students were admitted and number of students, during 1969-70, by Colleges and Departments, P. A. U.

College and Department	Year students were first admitted		Number of students 1969-70	
	M.Sc.	Ph.D.	M.Sc.	Ph.D.
Agriculture				
Agronomy	1968-69	1969-70	19	6
Animal Science[a]	1968-69	1969-70	6	4
Extension Education	1964-65	1965-66	13	8
Food Sciences and Technology	1969-70	—	5	—
Horticulture	1964-65	1964-65	35	11
Plant Breeding	1964-65	1964-65	20	10
Soils	1968-69	1968-69	31	14
Total : Agriculture			(129)	(53)
Basic Sciences and Humanities				
Botany and Plant Pathology	1968-69	1969-70	15	6
Economics and Sociology[b]	1964-65	1964-65	25	9
Chemistry and Biochemistry	1964-65	1964-65	30	18
Genetics	1968-69	1969-70	10	3
Mathematics and Statistics[c]	1965-66	1966-67	8	1
Microbiology	1969-70	—	7	—
Zoology and Entomology[d]	1964-65	1964-65	33	9
Total : Basic Sciences and Humanities			(128)	(46)
Total : Agricultural Engineering	1969-70	—	(9)	—
Veterinary Medicine				
Bacteriology and Parasitology[e]	1969-70	1969-70	2	3
Pathology	1969-70	—	3	—
Pharmacology and Medicine[f]	1969-70	1969-70	1	5
Physiology	1969-70	1969-70	1	2
Surgery and Gynaecology	1969-70	—	1	—
Total : Veterinary Medicine			(8)	(10)
University Total			274	109

[a] Includes Breeding, Nutrition, and Physiology
[b] M.Sc. and Ph. D. in Agricultural Economics, M.Sc. in Rural Sociology
[c] M.Sc. and Ph. D. in Statistics only
[d] M.Sc. and Ph. D. in Entomology, M.Sc. in Zoology
[e] M.Sc. and Ph. D. in Bacteriology, M.Sc. in Parasitology
[f] M.Sc. and Ph. D. in Pharmacology, M.Sc. in Medicine

To provide opportunities for higher study to weaker sections of the society, a certain number of seats are reserved for scheduled tribes (20 per cent), backward classes (2 per cent), women (5 per cent), outstanding sportsmen (2 per cent except for Ph.D.), sons of practising farmers (1 per cent for all undergraduates) and in-service candidates for Masters Degree (20 per cent) and a limited quota for students from Africa and Union Territories. Even within the reserved groups preference is given on the basis of merit. In-service candidates for postgraduate studies are those who are serving in the University or the Punjab Government. The standards prescribed for in-service candidates are less rigorous in view of their length of service. To afford better scope for merit to play its part in postgraduate education and subsequent employment it appears desirable to discontinue consideration of third division degree holders as in-service candidates and gradually this may be extended to second divisioners so that first class non-in-service candidates experience less competition.

The minimum entrance requirement for the Master's degree is a grade point average of 2.5, or 55 per cent marks at the Bachelor's degree in sciences, agriculture and veterinary medicine. For the Master's degree in agricultural engineering the requirements are stricter—2.8 grade point average. It is a good policy to admit pure science graduates for the M.Sc. programme with the stipulation that they should take the missed electives of the undergraduate stage over and above their normal course requirement that count toward the grade point average.

The entrance requirement for the Ph.D. is 3.2 grade point average at P.A.U. or 55 per cent marks at the M.Sc. examination provided the candidate had obtained not less than 2.5 grade point average or 50 per cent marks at the Bachelor's level. In-service candidates enjoy lower requirements in view of their experience. It seems desirable to gradually eliminate these relaxations. Otherwise, entrance standards and procedures are regarded as satisfactory.

Applicants seeking admission are required to appear at an interview before a selection committee, excepting those seeking admission to the four-year programme in agriculture and having not less than either 50 per cent marks in F.Sc. or 55 per cent marks in Pre-University/Higher Secondary or equivalent, and applicants for the Master's degree. The marks at the discretion of the selection committee are relatively small and do not constitute more than 5 per cent of the total marks to be taken into consideration while selecting a candidate. This is, however, not the case for the selection for admission to the Ph.D. programme where quite appropriately percentage of marks at the Master's examination, 20 marks for the quality of experience and 10 marks for the viva voce, are allowed. Relaxation is made by the Academic Council for the in-service candidates on the basis of their record of service.

Applicants and Admissions. The P.A.U. has continually had more applicants for admission than could be admitted (Table 4.4). During the most recent four years about 30 per cent of the applicants for B.Sc. (Agric.) curricula have been admitted. During the early years of admissions in Agricultural Engineering less than 10 per cent of the large number of applicants were admitted; however this percentage increased to 25 in 1969-70 with the halving of number of applicants resulting from difficulty in placement of the first batch of graduates.

Table 4.4. Number of applicants for B.Sc. courses and per cent of students admitted by colleges, P.A.U.

Year	Agriculture				Agricultural Engineering		Home Science	
	5-year course		4-year course					
	Applicants	Per cent admitted	Applicants	Per cent dmitted	Applicants	Per cent admitted	Applicants	Per cent admitted
1962-63	381	22	543	36	—	—	—	—
1963-64	35	66	426	51	—	—	—	—
1964-65	188	29	485	52	—	—	—	—
1965-66	102	69	292	70	1,800	8	—	—
1966-67	250	30	790	30	1,136	9	145	17
1967-68	235	23	461	32	268	9	125	25
1968-69	252	31	496	31	264	18	832	39
1969-70	438	17	512	29	134	25	120	43

The number of Home Science applicants has been relatively small with about 40 per cent of the applicants being admitted in 1968-69 and 1969-70.

Students from Rural Areas. Admission of students with rural background is a means of obtaining students with knowledge of practical farming and an orientation toward the rural section of the economy. Nearly 70 per cent of the students admitted to the B.Sc. (Agric.) curricula were rural from 1962-63 to 1968-69; however, this percentage dropped to 58 in 1969-70 with the diversion of urban applicants from Agricultural Engineering to Agriculture (Table 4.5).

About 40 per cent of the Agricultural Engineering students are from rural areas with only 30 per cent of those admitted in 1969-70 being rural in origin.

Table 4.5. Number of students admitted to B.Sc. courses and per cent from rural areas by colleges, P.A.U.

	Agriculture		Agril. Engineering		Home Science	
	Admitted	% Rural	Admitted	% Rural	Admitted	% Rural
1962-63	280	69	—	—	—	—
1963-64	240	69	—	—	—	—
1964-65	305	68	—	—	—	—
1965-66	275	63	138	38	—	—
1966-67	314	68	106	38	25	72
1967-68	202	68	25	32	31	39
1968-69	229[a]	70	49	43	32	31
1969-70	222[b]	58	33	30	52	42

[a] In addition, 49 of 50 students admitted to 3-year course for Village Level Workers were from rural areas.

[b] In addition, 31 of 32 students admitted to 3-year course for Village Level Workers were from rural areas.

Quality of Students. The P.A.U. has not compiled statistics on a comparable basis over several years to determine whether there are changes in the quality of new students who enter. Fifty seven per cent of the faculty members responding agreed with the statement: "The educational background of the undergraduate students admitted to the University in 1969 was better than it was in 1965."

It would seem desirable for the Office of the Registrar, in cooperation with deans of colleges, to compile statistics on the quality of students admitted on a comparable basis from year to year.

Foreign Students. The P.A.U. has had foreign students enrolled each year (Table 4.6). These were primarily post-graduates in 1962-63 and 1963-64; however, the number of undergraduate foreign students has increased steadily and about 90 per cent are currently in this category.

Nine foreign countries are represented by the 61 foreign students of 1969-70, with over one-half of the students from Nepal and Malaysia (Table 4.7).

Table 4.6. Undergraduate and postgraduate foreign students at P.A.U., 1962-63 to 1969-70

Year	Undergraduate	Postgraduate	Total
1962-63	1	!0	11
1963-64	1	10	11
1964-65	6	3	9
1965-66	13	—	13
1966-67	13	4	17
1967-68	36	6	43
1968-69	44	5	49
1969-70	57	4	61

Table 4.7. Undergraduate and postgraduate foreign students at P.A.U., 1969-70, by country

Country	Undergraduate	Postgraduate
Nepal	17	—
Malaysia	20	—
U.S.A.	3	—
Mauritius	5	—
United Kingdom	4	—
Afghanistan	4	1
Thailand	3	1
Tanzania	1	—
Philippines	—	2
Total	57	4

P.A.U. and Curricula Standards

In the P.A.U., teachers initiate proposals on what is to be taught in a particular topic. These are discussed in the department in the context of

allied topics and further examined in the Board of Studies of the College to determine the relationship and the time allocation for the topics in the overall programme. Before it emerges as a university curriculum after its approval by the Academic Council, it is discussed among colleges which participate in a particular degree programme.

The four-year curriculum in agriculture provides for 222 credit hours and the five-year curriculum 276 credit hours in addition to 24 credit hours of practical field training. The second workshop recommended 200 credit hours for a four-year course in agriculture with relative weightages as shown in Table 4.8.[1] In agriculture at P.A.U., the electives are about one half of the recommended with increase in the basic sciences and humanities, both of which may be desirable.

Table 4.8. Percentage weightage to groups of subjects in curricula, P.A.U., and recommendations of Second Workshop on Agricultural Universities of India[a]

For Bachelor's Degree in	Credit Hours (number)	Percentage of Hours in			
		Core Courses	Basic Sciences	Humanities	Electives
Agriculture	222(200)	46(50)	30(20)	15(10)	9(20)
Agr. Engineering	220(250)	72(76)	20(16)	8(8)	—(—)
Home Science	216(—)	55(61)	18(17)	13(13)	14(9)
Vety. Medicine	243(250)	97(76)	3(16)	—(8)	—(—)
Animal Science[b]	216(—)	50(—)	30(—)	11(—)	9(—)

[a] Figures in parentheses are per recommendations of Second Workshop; others are for P.A.U.

[b] For Animal Science Curriculum at Haryana Agricultural University, Hissar.

In 1964, the credit requirements for agriculture were 241 which were reduced to 216 in 1966 as a result of condensation of courses and an effort to reduce the course load on students. These were raised to 222 in 1969 to provide for an increase in agricultural engineering, soils, agronomy and horticulture as a result of changing Punjab agriculture. In the future perhaps farm management and marketing course contents will be enhanced.

The Agricultural Engineering Curriculum is patterned closely on the lines of the Second workshop.

[1]For a listing of credits by departments for each of the P.A.U. curricula, see Appendix Table 2.

In the Home Science curricula there is a slight reduction in the core courses and a corresponding increase in the electives which is rather necessary in view of the very broad spectrum of subjects of concern to Home Science. For the same reasons an increase in humanities may be considered.

The undergraduate curriculum in Veterinary Medicine at P.A.U. provides a tiny base in the basic sciences and is totally devoid of humanities and electives. The experience of the I.I.T.s in engineering education in India, in finding it very profitable to increase the content of sciences and humanities, would likely be worthy of consideration by those in veterinary education. With no provision for electives in veterinary medicine, a separate programme would be required for B.Sc. education in animal science.

Though the College of Animal Science is now not a constituent college of the P.A.U., the curriculum for this programme is included in the table in view of the importance of animal production—a field which continues to be neglected. Standards of relative weightages have not been evolved for this course. In general the curriculum in animal sciences gives similar weightage to the four broad areas of courses as in the Agriculture Curriculum at P.A.U. with somewhat less emphasis on humanities and more in core courses.

Degree and Grade Requirements

The normal residential requirements for four-year courses are 12 trimesters (15 for 5-year agriculture course) and the minimum is 6 trimesters. These apply to degree in agriculture, home science, veterinary medicine and agricultural engineering for which a minimum grade point average of 2.00 (A=4; B=3; C=2; D=1; F=0) is essential. For the Master's programme, the normal residential requirement is 6 trimesters with a minimum grade point average of 3.00. For Ph.D., residence of 6 trimesters and the grade point average of 3.00 are required plus reading knowledge of one foreign language.

The Indian Agricultural Research Institute, which was the first to start postgraduate programmes on the lines of the American universities, requires a minimum residence of 2 years for M.Sc. as well as Ph.D. and grade point average of 2.70 and 3.40 for passing, respectively, in M.Sc. and Ph.D. examinations (on an identical scale of grading) in addition to a working knowledge of a foreign language.

The I.A.R.I. requires that a candidate for the Master's degree complete a minimum of 45 credit hours (55 in statistics) of approved courses, in addition to any courses required to make up deficiencies in the undergraduate training, and a thesis of such a nature as to indicate students potentiality

for conducting research. The Second Workshop on Agricultural Universities of India (1965) laid down that the M.Sc. thesis should have evidence of good experimental technique, clarity and precision of expression but it need not be original. The same workshop recommended two years residence and a minimum of 45 credits to be earned through work of which 20 per cent should be from a minor supporting field. The P.A.U. has prescribed 90 credits with 35 credits in the major subjects, 15 in the minor and reckoned 40 credits for the research.

For the Ph.D. programme the P.A.U. has prescribed 2 years residence and 90 credits—24 credits in the major subject, 12 in the minor and 54 credits for the research—with an average grade point of 3.00. The Second Workshop recommended a minimum residence of 2 years after the Master's, 30 to 40 credits for course work of which 20 per cent may be in the minor and the dissertation should be exacting in all respects with evidence of clear and precise expression, reasoning at an advanced level and a thorough knowledge of the field concerned. The I.A.R.I. while not prescribing for the Ph.D. programme any specific minimum credits recommended that the courses shall be specified by the student advisory committee, and the programme will include at least two minors each having a minimum of 9 credits. The dissertation must indicate that the candidate possesses the ability and imagination necessary for independent constructive thinking and that it makes a definite contribution to the subject.

In the P.A.U., a Ph.D. student is required to pass a preliminary examination in the courses already completed and in the general field of his major and minor studies about half way of his Ph.D. programme of study. This examination is conducted through a written paper, one each in major and minor fields, and an oral test. The oral examination is conducted with the help of an outside specialist in the students' major field. There is an oral examination on the thesis by the students' advisory committee plus an external examiner appointed by the Dean, Post-Graduate Studies. The dissertation should demonstrate capacity for independent research and must be a significant contribution to knowledge. The evaluation of the dissertation and the final oral examination on the dissertation as well as general fields of major and minor studies shall be conducted by the students' advisory committee with other members of the postgraduate faculty and additional persons from outside the University as may be designated by the Dean.

The graduation standards of 2.00 grade point average for the undergraduates and 3.00 grade point average for postgraduate along with the credit requirements are regarded as high. At P.A.U. when a student earns 'F'=0 he is required to repeat the course but the previous grade is ignored after the course is repeated and the new grade obtained. According to Second Workshop, however, when the student fails and repeats the

course, the overall grade point average should be computed by including both the previous and the subsequent grades.

Course Load Requirements

At the P.A.U. during the trimester of 14 weeks duration the normal course load is 18 credit hours (maximum of 24 and minimum of 12). One credit hour is equal to one contact hour, 2 hours of independent work, or 2 to 3 hours of practical work. The maximum credit hours during the summer session is 12 for an undergraduate student and 15 for a postgraduate, with a minimum of 9. The maximum course load for a graduate assistant is 36 credit hours a year including the summer session. Provisions exist for placing a student on scholastic probation and for dropping him.

Transfer of credits is permissible but not of grades, as these are based only on the performance at P.A.U. For postgraduate students, arrangements exist for collaboration with the National Dairy Research Institute at Karnal, the Central Potato Research Station at Simla and the Irrigation and Drainage Station at Amritsar.

Student Financial Assistance

In the first Annual Report, Punjab Agricultural University, 1962-63, Vice-Chancellor Thapar pointed out the need for a generous policy of student financial assistance that was initiated and has continued:

> "Another major problem facing Agricultural Education in this country is that it is not able to attract the good students of the year who prefer to take up either Engineering or Medicine. Barring some exceptions, only the rejects of the Engineering and Medical institutions are left for the Agricultural and Veterinary Colleges. Unless the basic human material is promising, our attempts to stage a breakthrough in the stagnant field of Agriculture will not be successful. In order, therefore, to attract good students to the Agriculture and Veterinary faculties, the University had to decide to institute a number of merit scholarships."

The financial assistance received by students in the Colleges of Agriculture and Basic Sciences and Humanities are shown in Table 4.9 and for B.Sc. students in Agricultural Engineering and Home science in Table 4.10. In addition 26 of the 133 B.V.Sc. students receive assistance and the postgraduate students in Veterinary Medicine are receiving income from employment as teaching assistants. Eight of the M.Sc. students in Agricultural Engineering also receive assistance.

About Rs. 870,000 are provided for student financial assistance during 1969-70. Nearly all of the M.Sc. students and three-fifths of the

Table 4.9. Financial assistance and per cent of students receiving assistance, College of Agriculture, P.A.U., 1962-63 to 1969-70*

Year	Amount (Rs.)	Per cent receiving assistance		
		B.Sc.	M.Sc.	Ph.D.
1962-63	114,379	47	13	100
1963-64	204,171	47	100	100
1964-65	292,857	41	87	94
1965-66	467,313	34	99	100
1966-67	484,788	32	98	93
1967-68	689,074	71	80	77
1968-69	727,314	66	92	60
1969-70	745,073	71	99	60

*Includes scholarships, fellowships, stipends, students aid fund, loans and fee concessions. Postgraduates in departments in the College of Basic Sciences and Humanities are included.

Table 4.10. Financial assistance and per cent of students receiving assistance, B.Sc. students in colleges of Agricultural Engineering and Home Science, 1965-66 to 1969-70[a]

Year	Agricultural Engineering		Home Science	
	Amount (Rs.)	Per cent	Amount (Rs.)	Per cent
1965-66	27,530	64	—	—
1966-67	69,750	58	4,500	20
1967-68	92,116	61	9,000	17
1968-69	103,174	59	13,500	17
1969-70	92,513[b]	54	18,000	14

[a] Includes scholarships, fellowships, stipends, students aid fund loans and fee concessions.

[b] Includes amount for 8 M.Sc. students.

Ph.D. students in Agriculture and Basic Sciences and Humanities receive assistance, the proportion of Ph.D. students being recipients having declined in recent years. This is probably desirable in the interest of encouraging students at lower levels. About one-half of the agricultural engineering students receive assistance; however the percentage of Home Science students receiving assistance has not exceeded 20 per cent and has declined to 14 per cent with the build-up of four classes of students.

In general P.A.U. students give the adequacy of scholarship and other financial assistance a very good rating of 3.35.[1] The rating by undergraduate students in Agricultural Engineering and Veterinary Medicine Colleges with relatively low proportions of students receiving assistance, is low; however, Home Science students give a high rating although the proportion receiving assistance is low.

Practical Field Training

All P.A.U. Colleges with undergraduate students have practical field training programmes. The programme in Agriculture started in 1965-66 but problems arose due to deficiencies in planning and supervision and the students not being given credit or grades. Subsequently, the training was made compulsory, students received grades, and earned 2 credit hours per trimester for 3 hours of training received each Saturday. Students in each class are divided into 3 sections, each section being assigned to a department which has planned the operations to be performed with the department training plan approved by the Academic Council. Each section of a class is rotated among departments from one trimester to the next, thereby giving experience in a variety of operations. Students are accompanied by a faculty member who relates the practical work to classroom and laboratory study.

In Agricultural Engineering the practical programme has two phases. First, the students in their first three years have practical training each Saturday morning with the following areas covered: tractor driving, field operation of tractor machinery, tractor and machine maintenance, land use and water management, field-oriented survey projects, electrical equipment design and installation, basic workshop practice, and assembly and dismantling of internal combustion engines. The second phase is a summer programme in which the students in the first three years undergo practical training for 4 to 5 weeks in factories, mechanized farms, or government departments.

Fourth year students in Home Science receive practical training in several areas of home science by working in a village but this programme

[1] 5=Outstanding; 4=Excellent; 3=Good; 2=Fair; 1=Poor.

has been handicapped by problems of transportation to the village. Veterinary medicine students work in ambulatory clinics in villages in addition to daily clinical practice in the veterinary hospital.

There is strong support among P.A.U. faculty for practical training with 153 of 154 faculty members expressing agreement with the statement: "Practical training should be a part of the requirements for undergraduate students in an agricultural university." Nine out of ten respondents "strongly agreed." However, there was less strong agreement that "the practical training requirements of this University are reasonable and successfully organized and implemented" with 74 per cent agreeing with the statement. Only 57 per cent of the associate professors and professors agreed with the statement.

The average rating of undergraduate students of the practical field training programme was "fair" (1.97) with nearly 40 per cent in agriculture and over 50 per cent in agricultural engineering and veterinary medicine rating it as "poor".

There are real strengths in the practical field training programme at P.A.U.; however, there is need for continual efforts to strengthen it. There is a strong feeling among students that they are serving only as a source of labour with hand tools. They would like to have opportunity to use improved implements, less repetition of activities, and more new learning experiences. A significant number of students question the dedication of faculty members, as well as fellow students, to the programme.

The N.C.C. Training Programme

Every male P.A.U. undergraduate student (excepting those selected under National Sports Organization Scheme, foreign nationals, and those exempted for reasons of health) is required to be enrolled for N.C.C. training for first six trimesters of his studies. Undergraduate students rate this programme as fair to good (2.58). The comments of students suggests the need for developing better understanding among the students of the purposes of N.C.C. Training.

The Output of Graduates

The output of graduates of P.A.U. is shown in Table 4.11. Only one batch of agricultural engineers has received the B.Sc. degree. The first class Home Science students will complete the B.Sc. degree at the end of 1969-70. Likewise, the first class of veterinary students, who moved from Hissar to Ludhiana, will complete the degree course at the end of the current academic year.

Table 4.11. Degrees awarded in Agriculture and Agricultural Engineering, Ludhiana, P.A.U. 1962-63 to 1968-69

Academic Year	Agriculture			Agril. Engineering
	B.Sc.	M.Sc.[a]	Ph. D.[a]	B.Sc.
1962-63	114	48	—	—
1963-64	231	65	—	—
1964-65	118	67	—	—
1965-66	126	145	—	—
1966-67	225	83	5	—
1967-68	181	65	10	—
1968-69	160	137	7	53
Total	1155	610	22	53

[a] Included postgraduate students in departments in the College of Basic Sciences and Humanities.

Many of the undergraduate students in Agriculture and postgraduate students in Agriculture and Basic Sciences and Humanities who have completed degrees since 1962 started as students in the Government Agriculture College, Ludhiana. For example, the first students under the new M.Sc. programme were admitted in 1964 and completed in 1966.

At P.A.U. there is need for a centralised record in the office of the Registrar of the degrees awarded by colleges of undergraduate students and by departments for postgraduate students.

Employment of Graduates

To date there have been annual B.Sc. graduates in Agriculture, and one class of B.Sc. graduates in Agricultural Engineering and M.Sc. and Ph.D. graduates in Agriculture and Basic Sciences and Humanities. Many of the B.Sc. graduates have moved on to postgraduate study at P.A.U.; of those completing the M.Sc. a substantial number have continued with the Ph.D. programme. Most of those who have completed the M.Sc. and Ph.D. have moved into staff position on the campus or in extension field positions.

The records of employment of graduates in Agriculture need to be improved. Of the 181 B.Sc. graduates in 1968, 80 are in postgraduate

study at P.A.U., 4 are employed by the State Department of Agriculture, one is in a school, but the employment of 96 is not known. Similarly, of the 1969 graduates, 72 are in postgraduate study, one is employed by a farm input supply organization, and the employment of the other 87 is not known.

The records of employment of the 1969 Argicultural Engineering B.Sc. graduates are excellent: postgraduate study, P.A.U., 10; postgraduate study at other universities, 3; employment by P.A.U., 10; G.O.I. scheme of training for one year, 8; State Department of Agriculture, 10; other State Departments, 7; Ford Foundation 2; Haryana Agricultural University, 2; and an agricultural college, 1.

In the survey of P.A.U. faculty members, 74 per cent agreed with the statement: "Lack of employment opportunity for graduates retards the rate of growth of this University."

Student Placement Service

The P.A.U. Statutes specify among the duties of the Director of Students Welfare: "to assist in the placement of graduates of the University; and to organize and maintain contact with the Alumni Association of the University."

Only recently the Punjab Government has opened an employment and advisory bureau in the Universit, that is attached to the Directorate of Students Welfare; however, this representative of Government alone is not sufficient to provide students and graduates with the information on employment opportunities in the broad area of agriculture, animal husbandry, agricultural engineering, veterinary medicine and home science.

The College of Agricultural Engineering has a Committee that assists student placement, and the College of Home Science and Veterinary Medicine are planning to give students assistance in placement but there are no definite placement programmes although there will be graduates in mid-1970. The College of Agriculture does not have a student placement service.

Ninety per cent of the faculty members responding to the faculty questionnaire agreed with the statement: "This University should put more effort into seeking employment opportunities for its graduates." (66 per cent "strongly agreed" and 24 per cent "agreed somewhat".)

P.A.U. has now developed to the point that a concerted effort is needed in student placement. The University cannot continue indefinitely to move a large proportion of its B.Sc. graduates into postgraduate study and faculty and government appointments. The placement services should have two broad objectives: (1) to get graduates placed in available positions, and (2) to expand the positions available through aggressive efforts to make potential employers aware of the services that can be performed by the

P.A.U. graduates. The Director of Students Welfare should be responsible for organizing and coordinating this work; however, administrators and faculty members in each College and Department have an active role to play in student placement.

Keeping Graduates linked to P.A.U.

An activity closely related to placement of graduates is the organization of those who have received degrees or were formerly faculty members. The College of Agriculture has an unofficial "Old Boys' Association" that consists mostly of officers of the Departments of Agriculture and Animal Husbandry who come to the Campus for finalizing the recommendations for kharif and rabi crops. This group does not include many recent P.A.U. graduates. As yet, the Colleges of Agricultural Engineering, Home Science, and Veterinary Medicine do not have an organization of graduates.

There will be graduates of all Colleges in 1970. This would seem to be the appropriate time to create a Punjab Agricultural University Alumni Association, perhaps with units on a College basis. Such an organisation can serve the University in a number of ways: assistance in employment of new graduates; informing people of the services provided by the University; encouraging young people to study courses offered at P.A.U.; building loyalty to the institution, etc. In turn, graduates will gain from continuing to be closely identified with this University. The leadership for such a development can be expected from the Vice-Chancellor and the Director of Students Welfare; however, widespread support must come from officers, administrators, and faculty members if the P.A.U. Alumni Association is to flourish.

CHAPTER 5

Resident Instruction—Teaching and Student Evaluation

The teacher has the opportunity to impart knowledge in the classroom and laboratory but these are also the places where faculty members have opportunities to influence and encourage students to think and learn outside of the classrooms. Methods of instruction and examination determine to a large degree how students use their time in thought and study: whether a limited amount of information is memorized, whether text-books and library sources are used, whether facts alone are learned or whether these are related to both general principles and practical problems. Therefore, the teacher has a key role in the learning process of the student.

In referring to the introduction of the trimester term and internal examination system in the First Annual Report of the Punjab Agricultural University for 1962-63, Vice-Chancellor Thapar stated:

> "A good deal of purposeful and detailed thinking had to precede this introduction, and within a very short period, the University has been able to work out the detailed arrangement required for the implementation of this system. It is a matter of gratification that both the students and the teachers have responded to this change-over with enthusiasm and we have not had to encounter any setbacks."

Continued support by faculty and students of the institution's educational system, i.e. term length, instructional methods, and examination and grading system are crucial for the success of the teaching and learning process.

The Trimester System

The trimester length of term has been successfully introduced at P.A.U. There is questioning among both faculty and students of the relative merits of the trimester and semester system, just as in universities in other countries. However, P.A.U. faculty responses on the effects of the trimester system on the pattern of study of students shows fairly strong support for this length of term. Eighty-one per cent of the faculty members agreed with the statement: "The trimester system stimulates constant study throughout the term and discourages student cramming and frustration just before the terminal examination" (Table 5.1). The trimester system is less strongly supported in the College of Basic Sciences and Humanities than in other colleges,

which probably is a reflection of different educational backgrounds of faculty members of different colleges.

Internal Evaluation and the Grading System

Sixty-four per cent of P.A.U. faculty agree that the trimester and internal examination system encourages better understanding of course subject matter, in comparison with the annual centralized examinations (Table 5.1) with stronger agreement among the higher faculty ranks than in the lower ranks. Again, there is weaker support among Basic Sciences faculty members with only 54 per cent agreeing with the statement.

Eighty-four per cent of the faculty think the internal evaluation system encourages teachers to keep course content abreast of current scientific development, and 88 per cent agree that the trimester and internal examination system require more of the teacher's time for class preparation than the system with annual centralized examinations (Table 5.1). If it can be assumed that better class preparation leads to better instruction and student learning, this speaks well for the new system.

There is strong agreement that the trimester and internal examination system reduced the percentage of student failures with 95 per cent of faculty members agreeing (Table 5.1).

Two-thirds of P.A.U. faculty members think that the grading system provides a fair appraisal of students' knowledge of the subject matter being studied (Table 5.1). The higher the faculty rank, the better the satisfaction with the grading system. Students give the examination system a fair to good rating (2.62) as a measure of student knowledge. Both faculty and student response suggests the need for improvement in the use of examinations in testing and in the teaching-learning process.

Students also rate the fairness of the grading system as fair to good (2.53); however it is rated higher by postgraduate students (2.66) than by the undergraduate students (2.42). The students in Home Science and Veterinary Medicine have the most reservations about the grading system, those in Home Science frequently feeling that some faculty members do not make independent appraisal of students' performance. If this is true, it is probably associated with the small number of students in the Home Science College. The most common complaint regarding grading among students is that they are not permitted to see the final examination papers, thus they do not have the opportunity to learn by the mistakes made in the examinations and wonder whether the papers were carefully evaluated.

Students rate the minimum grade point average requirement (2.00= fair for undergraduates and 3.00=good for postgraduates) as good (3.12) with more rating it as "excellent" and "outstanding" than "fair" and "poor".

Table 5.1. Faculty attitude towards the trimester internal evaluation and grading system at P.A.U.

Questionnaire statement	Per cent Agreeing	Per cent Undecided	Per cent Disagreeing
The trimester system stimulates constant study throughout the term and discourages students from cramming and frustration just before the terminal examination.	81	1	18
In comparison with the annual centralized examinations, the trimester and internal examination system encourages better understanding of subject matter in a course.	64	7	29
The internal evaluation system encourages teachers to keep course content abreast of current scientific developments.	84	6	10
The trimester and internal examination system requires more of the teacher's time for class preparation.	88	2	1
The trimester and internal examination system reduces the percentages of student failures.	95	2	3
The grading system at this University provides a fair appraisal of students' knowledge of the subject matter studied.	65	9	26
Student use of unfair means in tests and examinations is a problem at this University.	44	11	45

Faculty members are about equally divided on the question of whether student use of unfair means in tests and examinations is a problem at P.A.U. Forty-four per cent think it is a problem, 45 per cent think it is not and 11 per cent were undecided. Lower ranks of faculty members think it is more of a problem than those with associate professor and professor ranks.

Student Use of Time

Students at P.A.U. were asked to indicate how they use their time during a typical week of the trimester (Table 5.2). The results showed that undergraduate student averaged 33 hours in class and practical field training, 28 hours in studying, and 13 hours in organized sports and athletics, co-curricular activities and recreation. Postgraduates spent 26 hours in class, 40 hours in studying, and 11 hours in sports, athletics, co-curricular activities, and recreation during a typical week of Trimester II, 1969-70.

Table 5.2. Student use of time (in hours) during a typical week, undergraduates and postgraduates, by colleges, Punjab Agricultural University, Trimester II, 1969-70

	Undergraduates					Postgraduates		
	All	Agri.	Agri. Engg.	Home Sci.	Vet. Med.	All	Agric.	B. Sci. and Humanities
Class	29	29	26	27	35	24	21	26
Practical Field Training	4	3	2	4	6	2	3	1
Sub-total :	(33)	(32)	(28)	(31)	(41)	(26)	(24)	(27)
Study								
In hostel	15	16	16	13	18	24	26	21
Library	6	7	4	7	2	12	12	12
Other study	7	5	6	9	5	4	4	5
Sub-total :	(28)	(28)	(26)	(29)	(25)	(40)	(42)	(38)
Sports, Co-curr., Rec.								
Sports and athletics	4	3	3	4	6	3	3	3
Co-curricular	3	2	2	3	3	1	1	1
Recreation	6	6	12	6	12	7	8	6
Sub-total :	(13)	(11)	(17)	(13)	(21)	(11)	(12)	(10)
Total	74	71	71	73	87	77	78	75

The undergraduate class and practical field training time varied from 28 to 41 hours being low in Agricultural Engineering and high in Veterinary Medicine. The study time per week was lowest in Veterinary Medicine (25) and highest in Home Science (29). Postgraduate students spend about 20 per cent less time in class but over 40 per cent more time studying than undergraduates.

Undergraduates average about 15 hours per week studying in the hostels, 6 hours in the library, and 7 other hours in study, most of it outside where, during the day, it is more comfortable than in the hostel or library. Postgraduate students study 24 hours per week in the hostel, 12 hours in the library, and 4 hours in other places.

The hours that students spent in class at P.A.U. are high, particularly if it is recognized that the responses are from students in their last two years of the bachelors programme and postgraduate students. The combined time of 60-65 hours in class and study is reasonable to expect from University students; however P.A.U. should gradually move advanced undergraduate students to more individual study and less time in class. No fixed rules can be established for all colleges but, in general, the ratio of class time to study time should be in the order of 1 to 2 for advanced undergraduates instead of about 1 to 1 as at present. For postgraduate students the ratio of class to study time might well be 1 to 3 instead of 1.2 to 2. This change will require changes in curricula, instructional methods, more dependence on library sources, and preparation of text-books, teaching manuals and cyclostyled materials; therefore the changes in the use of student time must be well planned and coupled with a well-organized programme for improvement of the resident instruction programme.

Student Study Material

Undergraduate students at P.A.U. spend nearly three-fifths (57%) of their study time studying lecture notes and about one-fourth (26%) of the time studying text-books, Library books, and cyclostyled material given to them in class. The time spent by veterinary medicine students studying lecture notes is particularly high (Table 5.3).

Postgraduate students spend about two-fifths of their time studying lecture notes (41%) and text-books, library books, and cyclostyled material (38%). They spend more time on written reports than undergraduates because of thesis requirements. It would be desirable to move towards advanced undergraduates spending as much time studying text and library books and cyclostyled material passed out in class as in study of lecture notes. For postgraduate students they might well spend twice as much time on text, library and cyclostyled material as lecture notes.

Table 5.3. Percentage of study time used for different purposes, undergraduate and postgraduate students', by colleges, Punjab Agricultural University, Trimester II, 1969-70

	Undergraduates (per cent)					Postgraduates (per cent)		
	All	Agric.	Agric. Engg.	Home Sci.	Vet. Med.	All	Agric.	Basic Science and Humanities
Lecture notes	57	54	54	55	63	41	39	43
Textbooks	11	13	22	9	11	18	19	17
Library books	8	9	7	7	9	16	15	17
Cyclostyled material	7	8	4	5	4	4	5	3
Written report preparation	6	6	7	9	1	13	14	11
Oral report preparation	5	3	3	7	5	4	4	4
Other study	6	7	3	8	7	4	4	5
Total	100	100	100	100	100	100	100	100

As was pointed out in the section on "Student Use of Time" such a change should be made gradually as the resident instruction programme is enriched to encourage advanced students to more individual study and thought and to relate facts to general principles and concepts.

Classrooms, Facilities, Teaching Aids

Students were asked to rate the adequacy of classrooms and their facilities and teaching aids and give suggestions for their improvement. In general, classrooms, classroom lighting, desks, and chalkboards are rated "good plus" (Table 5.4).

Table 5.4. Student ratings of classrooms and teaching aids at P.A.U. [1]

	All students	Under-graduates	Post-graduates
Adequacy of classroom sizes	3·38	3·41	3·28
Lighting in classrooms and laboratories	3·07	3·02	3·14
Classroom desk comfort	3·44	3·44	3·40
Classroom desk writing space	3·45	3·48	3·45
Adequacy of chalkboards	3·39	3·21	3·61
Adequacy of laboratory equipment	2·83	3·02	2·57
Adequacy of audio-visual aids	2·67	2·76	2·54

1. Average ratings on scale of: Outstanding = 5; Excellent = 4; Good = 3; Fair = 2; and Poor = 1.

Laboratory equipment is rated less than good (2.83) particularly by graduate students (2.57) for whom laboratory equipment is especially important. The adequacy of visual aids and their use is less than what is desirable, suggesting the need for better visual aids and special measure to be taken to encourage teachers to use more audio-visual material and less time in lectures without the use of effective supporting aids. There is also need for more interchange of ideas among students and between students and teachers. While students rate "teachers willingness to answer student questions in class" as good (3.07), nearly one-third of the undergraduate students rate their teachers as "fair" or "poor" in this respect.

It is encouraging to find that faculty members recognize the need for improvement of visual aids with 83 per cent agreeing with the statement: "There is need for a major improvement of the audio-visual aid facilities

and services of this University." Nearly two-fifths of the faculty also feel the need for improvement of classroom and teaching laboratories.

Student Advisory System

There is recognition among P.A.U. leadership of the need to improve the faculty-student advisory system. This was confirmed by responses to the student questionnaire. This showed variability in the system from college to college and within colleges. Some 20 per cent of the undergraduates and 40 per cent of graduate students did not have conferences with faculty advisors during the past two trimesters. At the same time, some students made frequent use of the counsel that could be offered by the faculty advisors. Students rated the faculty advisory programme as good (3.20) with ratings being somewhat higher in Agriculture and Home Science than in Agricultural Engineering and Veterinary Medicine. A significant number of faculty members (more at the higher ranks) think that the student advisory system takes an undue amount of time from classroom teaching, research and extension work.

There is need for a University-wide effort to strengthen the faculty advisory system including a continuing programme of in-service training for faculty members on the role of the advisory system and means of being effective in this important relationship with students. The Director of Students Welfare and deans of colleges should share the responsibility for more effective organization and implementation of the faculty advisory system.

Encouraging Better Teaching

At P.A.U. there are continuing efforts to improve teaching. In response to the request to list the specific activities within the past three years to improve the quality of class room and the laboratory teaching, 20 of the 23 department heads (excluding the new College of Veterinary Medicine) reported activities of importance. Nine stated that courses had been revised and new course outlines prepared. Five reported that new laboratory manuals had been prepared. Eight reported the development and use of visual aids in teaching. One department reported a regular teaching seminar and another reported a regular departmental discussion on teaching once each trimester. One department reported a programme in which the students evaluated the effectiveness of their teachers. A number of departments reported improvements in laboratories and laboratory teaching equipment.

Substantial progress has been made at P.A.U. in developing capacity to train students at both the undergraduate and postgraduate levels.

The statistical study made by the Department of Mathematics and Statistics on the distribution of grades given by different teachers in the department and on different campuses was noted with interest. Studies of this kind can be helpful in developing uniform standards of teaching and marking examinations. Such a study if conducted on a university-wide basis without identifying colleges or teachers would be useful in improving the standards of teaching and lead to more uniformity in the marking of examinations.

The response of department heads to a question regarding the training programmes for the improvement of teaching was somewhat disappointing. Eighteen of the 23 department heads reported no special programme for the improvement of teaching personnel. One reported a seminar on teaching, two others reported that outside lecturers were invited to the campus. Their lectures were of interest to both teachers and research workers.

Several reported that staff members were encouraged to visit outside institutions and selected members were nominated for special study programmes both in India and abroad. While this can hardly be classified as departmentally sponsored programmes to improve teaching there is no question that participation in outside study programmes do contribute to the improvement of teaching at the Punjab Agricultural University, however, there is a strong tendency for these programmes to improve research competency with insufficient attention to the teaching function.

Nevertheless, there is need for concerted efforts to further strengthen the resident instruction programme. Some of the needs and suggestions for improvements have been pointed out in this Chapter. Others are in other sections of this Report.

CHAPTER 6

The Research Programme

Research Organization

When the Department of Agriculture handed over the agricultural research programme to the Punjab Agricultural University about 30 research farms were transferred to the University. Between 1964 and 1966 the usefulness of these farms in carrying out an effective State-wide agricultural research programme was carefully studied. As a result of this study all but 18 of these farms were turned back to the Department of Agriculture. Upon bifurcation of the Punjab State in 1966, and later the Punjab Agricultural University in 1970, the main Research Station at Ludhiana, regional research stations at Abohar, Gurdaspur, Kapurthala and Jullundur, and substations at Bahadurgarh, Ferozepore, Kheri and Samrala were left under the jurisdiction of the P.A.U. Although the main Research Station of Himachal Pradesh at Palampur and a number of substations throughout the Territory are still under the administration of the Punjab Agricultural University, because of impending separation they are not considered in this Report.

It is the policy to develop new projects and schemes at the main station or at the regional stations. When special commodity or environmental needs are such as cannot be met at the main or the regional station, the substation is to be used for locating the project. The process of upgrading the regional research stations is expected to be completed by 1974. When this is done some of the difficulties that are experienced in inducing qualified and capable staff to serve at these stations will be mitigated.

Research Facilities

At Ludhiana out of the total area of 487 hectares (1203 acres), 303 hectares (750 acres) are allotted to various research departments. There are seven inter-linked tube-wells, supplemented by canal water during the summer. The area and crop emphasis of the regional stations and substations are listed below. They also serve as nucleus seed multiplying and plant propagation centres.

Regional stations	*Acres*	*Crop emphasis*
Abohar	207	Citrus, date palm, cotton, bajra, grape.
Gurdaspur	233	Sugarcane, pulses, rice, oilseeds; diseases of crops, vegetables and fruits.
Kapurthala	305	Rice.
Jullundur	232	Mainly sugarcane, cotton.

Substations	*Acres*	*Crop emphasis*
Kheri	101	Sugarcane.
Bahadurgarh	86	Ber, peach, plum, pear for plains.
Samrala	31	Groundnut.

The numbers of buildings at the regional stations including those for the laboratories, farm and staff residences are inadequate and need to be constructed rapidly to provide some measure of satisfaction to the staff. A laboratory building has recently been constructed at Abohar at a cost of Rs. 4 lakh, and similar laboratories have been included in the Fourth Five-Year Plan for all the regional stations. At Ludhiana a fruit technology laboratory equipped with cold chambers, a radioactive isotope laboratory in the new college of Basic Sciences building, glass-houses and green-houses are under construction. A sub-centre of the Grain Storage Institute, Hapur, is being established. A wing for horticultural and plant breeding departments, a building for the College of Veterinary Medicine, and laboratories and cattle-barns for a project on breeding of buffaloes have been planned under the Fourth Five-Year Plan. The Director of Research, in an answer to a question on research facilities, rightly regards a well-stocked library as a primary need for research and refers to a Rs. 25 lakh worth modern library building now under construction at Ludhiana.

Inadequacy of transport is often a common ailment, and this is being specially felt in the departments of Plant Breeding, Horticulture, and Economics and Sociology.

In the faculty questionnaire there was a question regarding the adequacy of laboratories, experimental fields, facilities and space. The reply indicated that the staff of the College of Basic Sciences and associate professors and professors felt some concern at the inadequacies in this respect.

Research Funds and Staff

Out of the University budget nearly 41 per cent is for research, 34 per cent for teaching, 10.5 per cent for extension and 14.5 per cent for administration. Out of the total research funds about 33 per cent are derived from external agencies, viz. mostly I.C.A.R. and PL 480, and these are earmarked for particular schemes. Out of the research funds only 12.5 per cent are allotted to animal sciences and veterinary medicine. Of the balance the share for agricultural engineering and home sciences is very small because these fields have appeared rather late on the scene. The Director of Research states that "with the present resources in money, men and materials, it has not been possible to give due weightage to the basic research in the University."

The research budget for 1969-70 of the University amounted to Rs. 144.53 lakh of which Rs. 90.52 lakh were for recurring salaries, Rs. 36.89 lakh for recurring contingencies and Rs. 17.11 lakh for non-recurring expenditure. In the Fourth Five-Year Plan Rs. 94.54 lakh have been provided for Agriculture, Rs. 30.00 lakh for Veterinary Medicine, Rs. 15.00 lakh for Animal Sciences, Rs. 20.39 lakh for Agricultural Engineering and 0.80 lakh for Home Science. While there has been a substantial improvement in the provisions for Veterinary Medicine, Animal Sciences and Agricultural Engineering, it must be pointed out that there is a large number of permanent schemes in agriculture for which committed funds are provided outside the Plan. The provision for Home Science is almost insignificant as compared with its needs. This is a field in which hardly any systematic research has been carried out. In this field there is much greater need for research and extension activities than for resident instruction at the University level. Field research is necessary to balance and reorient teaching in the Home Science College.

The allocation of the P.A.U. research budget by fields for 1969-70 is shown in Table 6.1.

In an answer to a question regarding the allocation of research resources to departments and individuals, the staff of the College of Basic Sciences and associate professors and professors of all faculties were most concerned. The overall faculty satisfaction in this respect is also on the border-line, which indicates the need for general faculty-wide participation in the framing of research policy and the need for the university to have some un-earmarked research funds in addition to funds tied to specific projects and schemes.

During 1969-70, 200 research schemes were in operation, of which the Animal Sciences and Veterinary medicine schemes were 26, i.e. 13 per cent (Table 6.2). In Veterinary Medicine, 50 per cent of the schemes are Plan schemes, as Against 28 per cent in Agriculture which has more of permanent schemes.

The replies to the Department Head questionnaire furnish an indication of proportions of resources deployed for research, teaching and extension (Appendix Table 3). Major research thrusts are from the departments of Plant Breeding (67%), Horticulture (67%), Soils (64%), Chemistry and Biochemistry (64%), Agricultural Engineering (57%), Zoology and Entomology (54%), and Economics and Sociology (51%). In the College of Home Science little effort is given to research with no more than 10 per cent by any department. Peculiarly the Department of Extension Education devotes only 2 per cent of its effort to research and is overloaded with the running of farmers courses which needs to form a separate service branch. Microbiology, Mathematics and Statistics, Veterinary Surgery

and Gynaecology and Animal Sciences have also to take up research as a vital activity for good teaching and servicing the rural community.

Table 6.1. Allocation of P.A.U. Research Budget by Fields, 1969-70[a]

Field	Per cent
Plant Breeding and Field Crops	35.0
Horticulture	8.0
Soils	11.0
Botany and Plant Pathology	3.0
Entomology and Zoology	5.0
Agric. Economics and Rural Sociology	3.0
Marketing and Processing	2.5
Genetics	1.4
Agricultural Engineering	4.0
Home Science	0.1
Livestock and Poultry	0.5
Veterinary Medicine	12.0
Not classified elsewhere	4.0
Administration and capital outlay	10.5
Total	100.0

[a] From Dr. Sukhdev Singh, "Role of Agricultural Universities in Building up Research", paper presented at First Convention of Association of Agricultural Universities in India, February 1970.

The University has set up a high standard of qualifications for recruiting its professional research staff members. Two hundred and ninty-two members are employed at Ludhiana and the remaining 70 at the Palampur campus and at regional stations in Punjab and Himachal Pradesh. Excepting for a small service staff which manages the experimental station at Ludhiana, all of them form a part of the departments and are provided for in their budget. The research staff is required to devote one third time mostly for teaching, the extension being generally attended to on special calls or

occasions. The University attaches so much importance to research publications that even those who are budgeted for teaching take up research work. The heads of the departments integrate teaching, research and extension. The heads of departments are free to allot teaching work to staff paid from research or extension provisions.

Table 6.2. Classification of Agriculture and Veterinary Medicine Research Schemes, P.A.U., 1969-70*

Category of scheme	Agriculture (number)	Veterinary (number)
Regular Permanent	20	2
Non-Plan Committed	56	5
Plan	49	13
Centrally Sponsored	4	—
I.C.A.R.	30	3
PL 480	5	2
Ford Foundation	4	—
Atomic Energy	3	—
Self-Financing	2	—
Financed by Commercial Firms	1	—
Out of Savings	—	1
Total	174	26

*From Directorate of Research, P.A.U.

Coverage of Research Work

There are 200 research schemes and 800 research projects under way in the P.A.U. New programmes of research have been planned under the Fourth Five-Year Plan. These include schemes concerning processing and storage of grain, utilization of farm machinery, establishment of a machinery testing centre, coordinated research on buffalo breeding, acceptance of improved tools and utensils and equipment by rural households and impact of customs and traditions of rural communities on human develodment.

In examining the coverage by research it is necessary to keep in mind the areas of research as well as the commodities. Director of Research has identified animal sciences, farm machinery, marketing, food processing and technology as areas which have been neglected, and according to him research gaps exist in areas of improvement of dairy cattle, water use and dry farming, improvement of the cotton crop and introduction of more remunerative and surer kharif crops. Other projects worthy of consideration are: to work out integrated soil; water and crop management practices; a study of the farm enterprise including the family budget to develop better allocation of resources; study the functioning and operating costs of farm machinery and water lifts; a project to determine the potential of cross-bred cows as against buffaloes under better conditions of management; a project to deal with fertility problems in cattle in the field; and a project to study potential reduction in human labour costs in certain types of farming.

Amongst the commodities, pulses (mash, pea, masur and mung), grain jowars for kharif and summer seasons, cabbage, mango and guava, and pigs and cows deserve more attention. The soybean crop may also deserve more attention.

Postgraduate Research Work

It has been accepted as a policy at P.A.U. that in the research organization of the University the postgraduate student is an integral part with a valuable output of research. The research work of the postgraduate student forms a part of the departmental research and the synopsis of the problem to be taken up by him is submitted to the Director of Research as well as the Dean of Postgraduate Studies. As the policy for framing the problems is so well understood the Director has rarely to point out to the Head of the Department that the proposed investigation is not in line with the general research programme.

Collaboration and Coordination

Modern research often requires an inter-disciplinary approach and therefore, collaboration and coordination are the corner-stones for successful research. Individuals who prefer to work in isolation have hardly any place in agricultural research which requires team work. The following arrangements have been developed by P.A.U. to promote collaboration and coordination of research within the University:

(*i*) When the project is being developed all heads of allied disciplines meet and scrutinize the project. Whenever collaboration is required of another department, a faculty member from that department is named as a collaborator.

(*ii*) each college has a project review committee with the college dean as the Chairman. In addition to the heads of departments of the colleges, heads of allied departments of other colleges are members of this committee which examines the projects under initiation as well as the progress of projects started earlier. The Director of Research who is overall Chairman of the Project Review Committee may attend the meetings when an important project is under consideration.

(*iii*) the project is then referred for approval to the Research Advisory Committee with the Vice-Chancellor as the Chairman and all the deans, directors and the Comptroller as its members. This Committee after examining the usefulness of the project recommends:

(*a*) allocation of funds; and (*b*) acceptance of grants and conditions attached to outside financed projects;

(*iv*) the project lists of all departments are circulated by the Director of Research to all departments of the colleges.

(*v*) annually the Director of Research reviews research programmes of each department in association with the other heads of departments. This is another point for collaboration and coordination.

Coordination of research programmes with the State Departments of agriculture, veterinary, cooperation and development is secured by working together in various committees meant for developing agriculture. The relationship with the State Department of Animal Husbandry is regarded as inadequate. Steps have been initiated to forge closer links with the Director of Animal Husbandry and Milk Commissioner by involving them in some of the University's committees. The University officers and the officials of the State Departments concerned with the development of agriculture work together on the following: (*a*) Crop Variety Approval Committee; (*b*) State Fertilizer Committee; (*c*) State Pesticides and Fungicides Committee; (*d*) University Implements Committee; and (*e*) workshop for developing package of practices for rabi and kharif crops.

There has been awareness of the need for fostering collaboration with outside research institutions located within the State but very little could be achieved. Now that the I.C.A.R. has asked its institutions to develop collaboration, the University should take steps to build up a strong relationship with the Central Potato Research Institute, Simla, and its sub-stations at Jullundur and the National Dairy Research Institute, Karnal.

At the national level the I.C.A.R. initiates coordinated research project involving an interdisciplinary approach and collaboration between a number of participating centres. The P.A.U. is a partner in most of the projects and its officers are associated with the formulation of these projects.

All the faculties of the University feel satisfied with the University's relationship with the I.C.A.R. for furthering the research that is needed. In response to a question in this connection 88 per cent of associate professors and professors expressed satisfaction and at no level a score less than 71 per cent was obtained.

The Director of Research who as a salesman of University's research projects has to present them to various financial agencies, has to ensure collaboration and coordination.

Research Programme Review

The progress of research projects is reviewed once a year by the Project Review Committe as well as the Director of Research. The Research results are also presented to the six-monthly workshops of extension officers of the University and development officers of the Department of Agriculture. Progress of all-India coordinated research schemes is reviewed in annual workshop arranged by the I.C.A.R. for each commodity.

A system of review of a department once in five years by outside experts has been introduced and it is observed that not more than three or four departments can be reviewed in a year. Such a review can prove really useful provided the reviewing team is outstanding and can frankly say what it observed.

Study of Field Needs

The extension programme of the University encourages the research officers to demonstrate their findings on farmers' fields. This is a stimulating process for the research worker who catches the appreciation as well as the questions of the farmers. The appreciation and support of the farming community is a rewarding experience.

In the University demonstration centres which are the entire holdings of farmers, research recommendations are tested by the University on a commercial scale. This exposes problems of adoption and economic applicability of the results of research. The farmers during the farmers' fairs (Kisan Melas) at the University visit the plots, listen to the talks of specialists, present their problems and ask questions during the interesting question and answer session. This ensures two-way education. Similarly the Agricultural Officers' Workshop that are held twice yearly provide an excellent opportunity for research and extension workers to exchange views on problems faced by cultivators.

Publications and Publication Policy

The number of research publications of the University is one of the indices of the staff research productivity. During the year 1968-69, the

publications issued by the Staff of P.A.U. numbered 791, of which 274 pertained to extension activity, 35 related to teaching activity, and the balance of 482 to the research fields and trade journals. Nearly one third were unpublished as scientific papers; about 30 per cent were published in Indian journals and 20 per cent in the *P.A.U. Journal of Research.* About ten per cent were published in foreign journals.

There were no publications from the College of Home Science and the College of Veterinary Science contributed 48; the largest contribution being from the Department of Physiology and the least from the Pathology Department. The College of Agricultural Engineering published 39 papers, of which 35 were from the Department of Agricultural Engineering.

The College of Basic Sciences and Humanities published 342 papers of which a large number came from the Departments of Botany and Plant Pathology, Economics and Sociology, and Zoology and Entomology. The College of Agriculture published 362 papers, of which the largest number was from the biggest department, Plant Breeding; Horticulture, Soils and Agronomy also contributed well. The departments that lagged behind were the Animal Sciences and Extension Education and the new Department of Food Science. The largest proportion of unpublished papers was from the College of Agricultural Engineering (50 per cent) followed by the College of Basic Sciences and Humanities (25 per cent).

The University attaches so much importance to the publication of research papers, that all the staff members regardless of the function for which they were primarily recruited, are eager to take up research and secure a favourable comment in the confidential reports which weigh heavily in their future promotion. This overemphasis of research publications may adversely affect the teaching activity. Such heavy emphasis on publication may also be contributing to mediocrity of some of the research papers. While research performance is necessary for effectively servicing the rural community, the number of research papers published is not the best criteria to be used in judging its merit. Suitable criteria should be worked out by the Academic Council to promote more attention to teaching, and secure a more reliable assessment of research output.

The P.A.U. publishes its own research journal which contains research papers concerning all the disciplines in the University. While this might have been justified when other Universities had not developed, in the present state of development it would be better if each University publishes a specialized journal dealing with a limited number of disciplines, as specialists would prefer to subscribe to a journal devoted to a particular field.

Regional Station Contributions

As the main and regional stations are developed and a variety of crops are successfully grown on them, the research will be gradually concentrated

on those stations which have better facilities and superior quality staff. There will, however, remain need for substations to represent particular soil type, altitude, or climatic condition.

The regional station at Jullundur has contributed new varieties of sugarcane and cane production methods, and there are some Jassid-resistant strains of cotton under evolution. The Station at Abohar has some cotton strains about to be released and has developed citrus and grape cultural and management practices. From Samrala, groundnut varieties and method of cultivation have been released. Bahadurgarh has good stock of ber, and pears, peaches and plums suitable for the plains.

CHAPTER 7

The Extension Education Programme

Extension Organization

The Directorate of Extension Education was organized by the P.A.U. in 1961-62, with a Director of Extension Education as its Chief. Its three principal segments are an Agricultural Information Department, a Training Branch under the Department of Extension Education in the College of Agriculture, and a Farm Advisory Service. The Department of Agricultural Information is charged with quick release of research recommendations through radio, press release to newspapers, literature produced by the University and exhibitions at important fairs in which the farmers participate. The Training Branch runs courses in various subjects, generally at the P.A.U. campus, for the farmers, non-official public workers as well as officials whose work is associated with the development of agriculture in the State. Many courses are of short duration. The Farm Advisory Service operates mostly outside the campus and disseminates scientific knowledge, demonstrates profitability of its application, and promotes adoption of scientific methods.

These programmes embrace farmers and farm-women, non-officials engaged in cooperative and Panchayat activities; agencies connected with the supply of fertilizers, pesticides, and farm credit; agricultural and other teachers; and officials of agricultural, cooperative, irrigation, panchayat, animal husbandry, and community development departments. In view of the role played by various agencies in the improvement of agriculture in Punjab, it is necessary to enthuse them about their significant place in the scheme of things and make them aware of farmers' problems and the new vista that has opened up for agricultural advancement. To develop in the various service agencies a unity of purpose and commitment through training programmes is as important a function of extension education, as also is the quick feeding of knowledge to the largest number of farmers.

The function of the supply of inputs has been left to the cooperative and commercial bodies including the agro-industries and National Seeds Corporation. The agricultural development of the State depends upon the P.A.U. for its knowledge input and the cooperative and commercial channels for material and financial inputs. The mass-scale adoption of new knowledge is facilitated through the general extension staff of the State Department of Agriculture which now has to pay increasing attention to

newer problems of: (*a*) marshalling of supplies and credit according to the time table; (*b*) gearing up of marketing, storage and processing to deal with the extra produce; (*c*) sustaining favourable conditions for agricultural development; and (*d*) enforcing quality control of inputs of seeds, plants, fertilizers, and pesticides.

The Director of Extension Education looks after the in-service training of the staff of the departments with agricultural interest including the Intensive Agricultural District Programme, Animal Husbandry, Soil Conservation, Cooperative Panchayat and development, Forest, Education and Jail for equipping them for rural development programmes. For this work he coordinates his work with the heads of departments of the Punjab Government.

The budget of the Directorate of Extension for 1969-70 was 44.99 lakh of rupees of which Rs. 8.17 lakh were for non-recurring and Rs. 8.55 lakh for recurring contingencies, and the balance for recurring salaries including 0.95 lakh for the Director's Office.

The Extension Staff

The Agricultural Information Department comprises an Agricultural Information Officer, an editor, a technical assistant, and a public relation officer.

For the training branch one associate professor, 15 assistant professors, and 5 lecturers are employed to deal with the fields of extension education in relation to agronomy, horticulture, botany, entomology, chemistry, biochemistry, and plant pathology. They form a part of the Extension Education Department.

In the Farm Advisory Service at Ludhiana, six Extension Specialists of the rank of Associate Professor are employed, one each in agronomy, horticulture, entomology, soil science, farm management, and extension education. They form a part of the department (the discipline) to which they belong and are administratively under the control of the Director of Extension Education.

Corresponding with each Extension Specialist in agronomy, horticulture, plant protection, soil science, and farm management there is one Assistant Extension Specialist in the rank of Assistant Professor in each District excepting in the I.A.D.P. District where this staff was already provided.

In all, 162 professional staff members are employed of which 36 are at Ludhiana and 126 at district headquarters.

For promoting extension education on special crops, specific crop extension officers have been provided. Of the three Assistant Cotton

Extension Officers, two are located at Ludhiana, and the remaining one at Abohar. One Assistant Cane Development Officer is posted at Dhuri and another at Jullundur. One Assistant Oilseeds Extension Officer and an Assistant Fruit Preservation Officer are located at Ludhiana.

The research staff employed at the regional research stations is involved in the farmers' training, demonstration centres and plots, varietal trials on farmers' fields, and field days.

Though there is very good integration between the research and extension education staff, the Director of Extension feels that there is scope for improvement and need for greater involvement of research, and particularly, teaching staff in extension work. At the departmental level the head of the department coordinates among teaching, research and extension. The next level of coordination is through the Director of Extension Education. At the University level there is an Extension Advisory Committee with the Vice-Chancellor as the Chairman and the deans, directors and Comptroller as members. The Director of Extension Education is the secretary.

To sustain extension work, a strong productive and responsive research organization is called for. Soon the stage for simple solutions will be over, and a need will arise for much more skilled research specialists as well as extension workers. The P.A.U. follows a good policy in which it insists on the same standard of qualifications and excellence for the extension staff as for the research staff. These extension specialists, if they are to remain up-to-date and productive should remain in constant touch with their parent discipline in the University and not be allowed to waste their talent on routine administrative and supply tasks.

Extension Measures

While the Evaluation Team was on the Campus at Ludhiana, the Agricultural Officers' Workshop was conducted for three days. Since other agricultural universities may be interested in this feature, it is described in some details. It was attended by the Directors, Joint and Deputy Directors of Agriculture and District Agricultural Officers of Punjab, Haryana and Himachal Pradesh. The University was represented by the Directors of Research and Extension and the heads of departments or specialists concerned with the crop. The conference was inaugurated by the Vice-Chancellor; and the Director of Research gave an account of salient research findings. The Director of Agriculture, Punjab, in his ten-minute speech dealt with the drive for the coming kharif season. The Workshop discussed and evolved packages of practices for rice, hybrid maize, cotton, kharif oilseeds, sugarcane, hybrid bajra, kharif fodders, pulses, fruit crops, and kharif vegetables. A panel discussion was held on

"Emerging Problems of Punjab Agriculture". A three-hour visit to the experimental farms including Animal Husbandry and College of Agricultural Engineering was also a part of the Workshop. The recommendations of the Workshop are printed in English, Punjabi and Hindi and issued in March 1970 for the crops to be grown during June to October 1970.

The recommendations will feature in the extension programme for the rainy (kharif) season. Such workshops are held twice a year for the two main seasons—rainy and winter seasons.

Following the Agricultural Officers' Workshop at Ludhiana, farmers' training camps of 1 to 3 days duration are held twice a year at each district headquarters to familiarize them with the latest recommendations. In this training all the assistant extension specialists take part along with selected research personnel.

In extension work, the pride of place is given to demonstrations which are to be followed by group discussion and field days. The demonstration centres are set up over the entire holding of a family and all the assistant extension specialists jointly look after them. Detailed farm business accounts are kept. National Demonstration plots are preferably located on them. In addition each assistant extension specialist organizes 2 to 5 demonstrations pertaining to his discipline.

Adaptive trials of new crop varieties, small research projects of practical nature, special campaigns, lectures, visits to the villages, and issuing of monthly and special bulletins under the guidance of the district agricultural officers are some of the duties performed by the assistant extension specialists. The following are some of the significant extension activities reported for the 1967-68 academic year:

Agronomy. Organized 287 demonstration centres and 597 demonstration plots; shows and exhibitions arranged on 258 occasions, and 59 field days.

Horticulture. Forty-seven demonstrations and 9 short courses on fruit and vegetable preservations; 350 demonstrations on horticultural practices; 73 on pruning and training of grape-vine; 2,500 advisory visits; 25 old orchards rejuvenations.

Plant Protection. Two hundred and fifty demonstration centres; 579 demonstrations; 43 exhibitions.

Soil Science. Sixty-seven thousand, five hundred and two farm soils samples, 16,569 garden soils samples, and 3,453 reclamation soils samples analysed. Irrigation water samples were analysed for suitability and field trials to show benefits of soil tests were carried out.

Farm Management. Keeping of complete accounts of demonstration centres; records of arrivals and price fluctuations in the markets; introduction of farm records.

To train personnel associated with the development of agriculture in the State, in-service and refresher courses are conducted by the Junior Staff School at Ludhiana; this is operated by the Extension Education Department of the College of Agriculture. Different courses are organized for different groups in response to needs and requests. The variety of personnel services includes farmers, young farmers, women, fertilizer salesmen, agricultural credit officers of banks, teachers, jail staff and prisoners, block development panchayat and cooperative officials and non-officials, agricultural, horticultural and irrigation staff, defence personnel and the handicapped.

The areas covered by these courses include extension methods and recommendations, crop-production and irrigation techniques, farm business and management, agricultural finance and credit, teaching of agriculture in schools, gardening, poultry-keeping, dairying, animal hubandry, farm machinery, home science, applied nutrition and fruit and vegetable preservation. During 1968-69, 86 training courses were conducted benefitting 6,965 persons. These courses mostly range between 3 and 10 days but one course for young men is for a year.

In addition to the training programmes associated with the campus, training courses are run at the district, block and village level, mostly with the help of assistant extension specialists. Farmers' training camps, twice a year before the commencement of the main crop season are organized mostly at the district headquarters and are of three days' duration. This reaching out of the University research and extension specialists at the district level where direct contacts are established with over 4,000 farmers per annum is significant and important. The courses at the block and village levels are of duration of one to two days.

The Directorate maintains a Department of Agricultural Information which communicates latest findings of research and recommendations to the farming community through printed literature, and audio-visual media such as exhibitions and shows, radio service, and press releases. Besides being responsible for publishing the *P.A.U. Journal of Research* and research bulletins, this department brings out farm bulletins, and a bimonthly journal "Progressive Farming" in English, Hindi and Punjabi for the benefit of farmers. *The Punjab Agricultural Handbook* and the recommendations for the rainy and winter season crops published by this unit are very useful to the field staff working for the improvement of agriculture. Folders and hand-outs are also issued.

Measuring Effectiveness

The real assessment of the impact of extension education in the area where irrigation is extensive is the increase in productivity provided inputs

are reasonably adequate. In increasing production, however, a number of agencies such as the State's departments of agriculture, soil conservation, irrigation, cooperative, panchayat and development and input and credit services combine and it becomes difficult to isolate the role of the P.A.U.'s extension education organization. The major impact of this organization on the rural economy is dealt with elsewhere in this Report. The remarkable increase in the use of fertilizers, sinking and use of farmer-owned tubewells for irrigation and in the number of tractors reflect very rapid modernization of what was once traditional agriculture.

The package of practices recommended for each major crop has to be examined for its comprehensiveness to determine how far it answers farmers' needs as regards the variety, cultural practices and plant protection measures. Its attractiveness to farmers has to be measured in terms of improvement. Marginal improvement of production and low return on additional investment are unattractive to the farmers. The degree of comprehensiveness and attractiveness of the package may have to be determined area-wise. Such a research study may be taken up jointly by the departments of extension education and economics and sociology, and when the methods of measurement are standardized this may become a regular feature.

To ascertain the impact of field days, exhibitions, radio broadcasts, press releases and printed literature issued by P.A.U., a special survey will be necessary. The numbers of demonstration centres and national demonstration plots are fixed and cannot be readily increased without deploying more staff and the gains may not be commensurate with the investment.

Training courses which are run at the campus and district headquarters with the assistance of extension specialists and research staff of P.A.U. have a substantial impact (Table 7.1). The fact that the number attending these courses continues to increase, indicates their popularity and usefulness.

The one to two days training camps at the block and village levels are also useful. In their organization the assistant extension specialist is associated with the block and village level extension staff.

Another significant item is the demonstration of practices, operation and equipment held in the farmers' fields. If a standard set of definitions and reporting proforma are adopted for all disciplines, a consolidated state-wide report can be prepared in respect of items which are common to all disciplines and special items can be reported discipline-wise. The number of lectures given by A.E.S. is important, but the reporting is not uniform.

The growth in the testing of soils and well water (for irrigation) is a measure of the impact of science through the extension agency (Table 7.2). A similar assistance can be provided by animal diagnostic centres if developed.

Table 7.1 Training courses and trainees at Ludhiana and in districts, P.A.U., 1963-64 to 1968-69

Year	Ludhiana Campus		Districts	
	No. of Courses	No. of Trainees	No. of Camps	No. of Trainees
1963-64	40	1,071	—	—
1964-65	44	1,529	—	—
1965-66	64	2,445	42	3,294
1966-67	63	3,720	57	5,439
1967-68	79	6,728	40	4,177
1968-69	86	6,965	59	6,272

Table 7.2 Soil and water samples analysed, P.A.U., selected years, 1958 to 1969

Year	Number of samples*
1958	7,006
1960	13,552
1962	14,178
1964	55,529
1966	73,130
1968	87,026

*Includes soil and water samples analysed in three laboratories.

Opportunities for Greater Effectiveness

The P.A.U. has raised farmers expectations; the farmer now visits the University's experiment station "to see with his own eyes things of tomorrow." With the growing respect for the extension and research programmes, the responsibilities of the extension education staff have increased.

The function of the extension educator is to transmit knowledge gained through research, to demonstrate its practicability and to stimulate interest in the improvement of rural economy. Knowledge to extend is at present available in reasonable quantum in agronomy, soils, horticulture, and plant

protection and poultry production; it is nearly satisfactory in farm management, farm machinery and power, and veterinary medicine, and far from adequate in crop production in dry areas, animal production (other than poultry production), home science, and rural housing and services. In some of these fields the lag can be made up by adapting the existing knowledge.

For quick communication the University may have its own radio transmission system over which broadcasts can be for longer hours and timed to suit the convenience of the farm worker, thus ensuring daily contact with the interested listener.

Printed literature is a good means of communication provided it can be written in a simple language and printed and distributed to the interested persons in time. Preparation of mailing lists based on the interest of trainees or questionnaires, periodical response-checking, and use of mechanical devices like addressographs may improve the effectiveness of the literature. Even computers may be thought of for listing and printing addresses as per lists.

Demonstrations are the most effective means of teaching, but the limited technical extension personnel cannot be loaded with more demonstrations which require care and interest. If farm-improvement groups can be organized, the group-leader can be taught to conduct demonstrations. A group of 15-20 interested farmers can be set up within a village, or between 2 or 3 nearby villages. Such a group can receive literature from the University and district and disseminate it to the members, and can serve as a focal point for agricultural improvement.

A variety of training programmes for the farmers has been started. Gradually such programmes should be run on the regional research stations. This will enable handling of larger numbers, making the course more area-oriented, and reducing travel costs. A follow-up programme for the trainees needs to be developed so that they continue to learn at home. There are over 7.5 lakh farming families in Punjab and it is not possible to provide University organized training for even 10 per cent. The University has, therefore, to train leading farmers who can locally train others. If this policy is accepted suitable methods have to be devised to locate such farmers and to give preference to them in admissions. The effectiveness of the teaching, course content, and the period of training needs to be tested through suitable survey procedures.

The efficacy and aptitude of the special extension staff needs to be observed. Their approach and techniques as extension workers should be constantly improved. A system of evaluation of extension methods should become a regular feature of research of the Department of Extension Eduaction.

Linkages with the input and credit agencies should be strengthened by working with them. The problems which face them should be identified

and they should be assisted in overcoming them. Apart from conferences with each group of commodity dealers, inter-commodity conferences along with the representatives of users and officials of the Department of Agriculture may be attempted to develop a unified approach and understanding. The input agencies should be encouraged to employ extension trained personnel or get them trained up to a required standard.

While providing assistant extension specialists for the district, agriculture features of the District should be borne in mind. A uniform staffing can be unnecessarily expensive, and an under-utilized specialist can easily be diverted to routine administrative and supply functions. For these reasons appointment of a block-level specialist staff by the university should be related not to the administrative unit, but to the size of the unit where the problem is to be tackled. It may be a catchment in one instance, two or three blocks in another instance and even a part of the block, depending upon the magnitude of work and area to be covered. For example, a special crop extension officer can be withdrawn if for any reason, the special crop loses its importance in the area.

While visiting a young farmer club in the Ludhiana district it was learnt that these young farmers, now that farming programme was profitable, were asking for help in improving the standard of living for their families. If this desire for improvements in living standards is widespread, and it is believed that it is, an excellent opportunity exists for home science extension. The question is : Can the new College of Home Science accept this challenge?

CHAPTER 8

Integration of Teaching, Research and Extension

"The most distinctive feature of the agricultural universities is their integrated programme of research, training and extension."[1] The importance of this feature was recognized in the very beginning of the Punjab Agricultural University. The Legislative Act of 1961 which established the University provided for the transfer of the research and educational institutions of the Department of Agriculture and Animal Husbandry to the Agricultural University [Section 22(2)]. Section 23(1) provides that the University shall be responsible for "the agricultural extension functions in the State which are primarily education in nature."[2] Thus, the legal base for the integration of teaching, research and extention was provided in the original Act. These provisions have been retained in the Government of India, Ordinance I of 1970 (February 2) which established the Punjab Agricultural University as it exists today.

University Level Integration

The Act of 1961 and Ordinance of 1970 which superseded it, provide among the powers and duties of the Vice-Chancellor the responsibility for the close coordination and integration of teaching, research and extension education. In carrying out these responsibilities he is assisted by the deans who report to him regarding the teaching programmes of their respective colleges, the Director of Research who reports to him regarding the University-wide research programme and the Director of Extension who reports to him regarding the University-wide extension programme. Further assistance is provided by the Academic Council which consists of: the Vice-Chancellor (Chairman); the deans of the colleges, the directors of extension and research; and the head of one department from each college, to be selected by the respective college.

Integration in the Colleges

The original Act of 1961 provided that the Dean shall be responsible for the organization and conduct of teaching, research and extension education of the sections (departments) in the college. However, in the 1964-65 academic year the Act was amended to limit the responsibilities of

[1] Report of the Education Commission, 1964-66, p. 350.

[2] Punjab Agricultural University Act, 1961.

the Dean to resident instruction. The Ordinance which superseded the Act is somewhat ambiguous in the statements regarding the deans of the college. Section 21(2) reads "The Dean shall be responsible to the Vice-Chancellor for all matters concerning his college". Section 21(3) reads "The Dean shall be responsible for the organization and conduct of resident instruction of the Departments of the College." Thus the legal base for the exercise to control over and the integration of teaching, research and extension at the college level no longer exists.

Although the deans are members of the Research Advisory Committee and Chairmen of the Project Review Committees of the college they are not in a key position to integrate the teaching, research and extension programmes. His presence at the annual review of research progress covering research projects in his college is not mandatory. To correct this basic weakness in administrative structure, it is recommended that deans of colleges have full responsibility for integration of three functions at the college level. Each department head should be responsible to the Dean of his college for conducting integrated programmes of teaching, research, and extension in the discipline for which he is responsible. In turn, the College Dean is to be responsible to the Vice-Chancellor, through Directors of Resident Instruction, research and extension.[1]

Department Level Integration

At the P.A.U., the department head is responsible to the Director of Research for the research programme in his department, to the Director of Extension for the extension programme and to the Dean of the College for the teaching programme. He may assign teaching duty to a faculty member who was recruited for research or extension work. The performanace of a department head is evaluated jointly by the Dean of the College and the Directors of Research and Extension. Within the individual department, there is good integration of the three functions; however, each department head is responsible to three persons. Furthermore, many persons are responsible to the University-level Directors of Research and Extension and the College Dean does not have the proper opportunity to coordinate and integrate the work within the purview of the college. Therefore, the change in administrative structure discussed in the immediately preceding section is recommended.

Faculty Member Integration of Functions

There has been a long-standing policy at P.A.U. that every faculty member is expected to share his time in at least two of the functions of

[1] See Chart 2.1 and accompanying explanation, Chapter 2, of *A Method of Assessing Progress of Agricultural Universities in India*, the companion report of this publication.

teaching, research and extension. For example, if a faculty member is recruited for teaching he is expected to spend at least 1/3 of his time in either research or extension work, or if he has been recruited for research he is expected to spend 1/3 of his time in teaching or extension work. This mechanism seems to work best with teaching and research. The teacher is anxious to engage in research because of the emphasis placed on research publications and the researcher wishes to teach so that he may be named to the postgraduate faculty and have postgraduate students assigned to him.

Each department head at P.A.U. was asked to indicate the number of staff members performing each of the three functions and their different combinations (Table 8.1).

Table 8.1. Per cent of staff members performing teaching, research and extension functions and combinations of functions, P.A.U. colleges*

Functions performed	P.A.U. Total	College				
		Agric.	Basic Sci.	Agric. Engg.	Home Sci.	Vet. Medicine
Teaching only	9	2	21	2	—	14
Research only	7	—	13	15	—	—
Extension only	11	18	7	4	—	—
Teaching+Research	34	23	46	29	25	59
Teaching+Extension	3	2	3	8	—	9
Research+Extension	12	20	6	6	—	—
Teaching+Research+Extension	24	35	4	36	75	18
Total	100	100	100	100	100	100

*Numbers of staff members, lecturers through professors, January 1, 1970, was as follows: Total, 444; Agriculture, 198; Basic Sciences and Humanities, 158; Agricultural Engineering, 54; Home Science, 12; Veterinary Medicine, 22.

The results showed that 73 per cent of the P.A.U. faculty members (lecturers through professors) perform a combination of functions. This is an excellent degree of integration, particularly when one considers that there are some faculty members who can best specialize in a particular area, e.g. it may be difficult for some extension workers to do either teaching or research.

There are some important differences among colleges. As would be expected the College of Basic Sciences and Humanities has the largest

per cent of the staff engaged in teaching only, i.e. 21 per cent. Single responsibilities for either teaching, research or extension varied by colleges as follows: Basic Sciences and Humanities, 41 per cent; Agricultural Engineering, 21 per cent; Agriculture, 20 per cent; and Veterinary Medicine, 14 per cent. In the College of Home Science all faculty members were reported to be engaged in a combination of duties.

About one-fourth of the P.A.U. faculty are engaged in all the functions, viz. teaching, research and extension. This may be higher than is most desirable since it may lead to spreading talent and time too thinly.

For most faculty members, limiting to two functions at any one time is likely to result in higher quality of performance.

A well integrated programme of teaching, research and extension cannot be measured entirely by numerical data. The spirit and purpose of helpful cooperation and mutual assistance between staff members at all levels regardless of their functional duties are essential elements of a purposeful and effectively integrated system.

CHAPTER 9

The Essential Components, the Colleges and Departments

The Essential Components

The companion report to this one, assessing the progress of P.A.U., briefly described the essential components (colleges and departments) of an agricultural university.[1] This section briefly describes these component parts of the Punjab Agricultural University. It will be noted that the essential parts are all provided for but, as would be expected, both the colleges and departments vary widely in the stage of their development. In Chapter 2 of this Report, the nature of the agricultural economy of the Punjab has been described, including the major crop acreage and production and the available data on livestock numbers. This section should be kept in mind while reviewing the section which follows to ascertain whether the major agricultural needs are being met.

The College of Agriculture

The Punjab College of Agriculture was in existence prior to the founding of the Agricultural University and has been a constituent college of the University from the very beginning. Prior to the transfer of the College from the State Department of Agriculture to the University it had within its administrative structure a number of disciplines which were later transferred to the School of Basic Sciences and Humanities. At a later date the agricultural engineering component was transferred to the College of Agricultural Engineering. At present the College has seven departments each of which is described in the section immediately following. The degree of adequacy of these departments as estimated by the Dean ranges from 20 to 80 per cent. A general policy statement regarding departmental alignments and budgetary allocation and control will be made elsewhere in this Report.

Although the original Act provided (Sec. 17.3) that the Dean was responsible for teaching, research and extension, the Act was amended in May 1965 to make the Dean responsible for resident instruction only. This amendment applies to all deans. The authorized responsibility of the Dean of the College of Agriculture at present is the resident instruction

[1] See *A Method of Assessing Progress of Agricultural Universities in India*, Chapter 2.

programme for four and five-year undergraduate students and a special course for village-level workers. The administration of the post-graduate programme is in the purview of the Dean of Postgraduate Studies. The position of the Dean in relation to the integration of teaching, research, and extension is discussed elsewhere in this Report.

Since the flow of new knowledge on which the applied sciences of agriculture depend stems largely from the College of Basic Sciences and Humanities, strong intercollege relationships regarding instructional matters should be developed.

The College is striving to keep the subject matter of the courses offered up-to-date. Last year the entire curriculum for the B.Sc. Agriculture was reviewed keeping in view the recommendations of the Committee of Deans of Agricultural Universities appointed by the I.C.A.R. (1967). At the time of this College-wide review, duplication of subject matter in the various courses was removed, certain courses were combined to provide greater continuity of subject matter and the total number of courses was reduced.

The admission of students to the College is based on the estimated need of graduates in the 4th Plan Development Schemes. Since the State Department of Agriculture is a major employer of agricultural graduates the relationship between the College and the Department should be strengthened. The Department as an employer should be able to give useful advice regarding the improvement of the educational programme of the College.

The performance of the graduates of an agricultural university in whatever fields of endeavour they may be engaged is an important index of the stature and quality of the university. In this respect the quality of its student product is just as important in creating a favourable image of the institution as the products of research or extension.

Department of Agronomy. Prior to the bifurcation of the University, the Head of the Department of Agronomy was posted at Hissar. Consequently the major thrust in the development of research and postgraduate education was in Haryana State. Bifurcation resulted in an Agronomy Department at Ludhiana, which is somewhat deficient in both faculty and graduate education and research equipment. An additional 50 acres of land for research has been assigned to the Department making a total of 91 acres now available. The agricultural land now assigned is considered adequate for the next 6 years.

The Department Head estimates that 66 per cent of the resources of the Department are devoted to teaching and 33 per cent to research. Agronomy extension is only on a casual basis. However, there is an agronomist on the staff of the Extension Education Department. The present staff

strength is 10 in ranks of lecturer and above and one research assistant. Agronomic research needs to be expanded and intensified. Some of the recent findings relative to the effect of agronomic practices on the yields of wheat and rice support this conclusion. There are a number of sub-disciplines of agronomy that are not being covered or are only partially covered in the research programme. Joint research projects are being carried out with the departments of Soils and Plant Breeding.

The Department Head has only recently been appointed to the post. He inherited a Department that was weak in relation to the overall agronomic needs. At the time of this study he had not had time to develop essential linkages with other segments of the College and University nor with organizations and institutions outside the University. The integration of teaching, research and extension needs to be given particular attention in the development of the departmental programme.

Department of Animal Science. Prior to the bifurcation of the University this Department was a part of the College of Animal Science, Hissar. The Head of the Department of Animal Production and Management was in charge of it. In anticipation of the impending bifurcation, the Department of Animal Science was created and a department head was named at Ludhiana.

Like other departments which were administered by department heads at the Hissar Campus, this Department was largely a teaching department. As now organized it has equal responsibility for teaching, research and extension; however, the development of research and extension programmes are in the initial stages. There is a strong interest in expanding and intensifying these programmes.

At present it is estimated that 82 per cent of the resources are devoted to teaching and only 15 per cent to research. The present staff strength is 14 in ranks of lecturer and above and one research assistant. None of the subdisciplines are estimated to be supported at an adequate level, and some of the more important sub-disciplines such as animal breeding and animal feeding are supported at only an estimated 10 per cent level. At present the Department is handicapped by a shortage of contingency funds.

One hundred acres are now assigned to the Department, only 50 acres of which are in use. The assignment of additional land for developing the flocks and herds required for teaching and research is foreseen. It is estimated that 300 acres will be required within the next 3 years.

Over the years, very little has been accomplished in improving the level of production of the farm animals of India (excepting poultry) although some of the scientific knowledge needed to bring about increased production does exist. The opportunity for a new approach to the problem

in the Punjab is unique at the present time. The development of a strong Department of Animal Science and the development of a College of Veterinary Medicine are both just getting under way. This would be opportune time to try some new innovations in developing programmes of education, research and extension to improve the productive capacity of farm livestock and poultry on the one hand, and do a better job of the control of livestock diseases on the other.

Given support and encouragement, this Department can attain a relatively high standard of excellence. The necessary leadership is there and the philosophy and attitude toward the challenges which confront the Department in improving the livestock of the Punjab are excellent.

Department of Extension Education. The Department of Extension Education has equal responsibility for teaching, research and extension and as such it should serve all segments of the University. As it presently functions it is primarily a teaching and extension department. Very little research is being done. As a resident instruction department, the main responsibility is to teach the philosophy, methods, techniques and organization of extension education on a University-wide basis. The extension responsibility centres around the improvement of methods, techniques and organization of extension in the field.

It is not the function of the Department of Extension Education to teach subject matter such as agronomy, soils, plant pathology and entomology. The appropriate role of this Department is to work with the agronomists, soil experts, plant pathologists and entomologists to help them improve their extension techniques in order to get maximum acceptance of the innovations they wish to promote. The present staff strength is 50 in ranks of lecturer and above.

There is evidence of excellent organizing ability in the Department but research to determine the most effective extension technique and the nature of the barriers to the adoption of innovations needs strengthening. Perhaps imaginative research leadership in this connection is needed.

This Department has developed excellent linkages with other administrative units of the University, particularly in the colleges of Agriculture, Agricultural Engineering and Basic Sciences and Humanities. Similar linkages with the colleges of Home Science and Veterinary Medicine are yet to be developed.

This Department has established excellent linkages with outside groups and organizations. The influence of the University in the developmental process is considerably strengthened by these linkages.

This Department is reasonably well regarded by other agricultural research and educational institutions.

Department of Horticulture. The Department of Horticulture has well developed programmes in teaching, research and extension. The estimated allocation of resources to these programmes is 13 per cent for teaching, 67 per cent for research and 20 per cent for extension. The technical staff members, lecturers and above total 25. In addition there are 24 teaching and research assistants and a field extension staff of 24.

The area assigned to research is approximately 112 acres on the Ludhiana Campus, 97 acres of which are now used, and a total of 230 acres at the regional substations, of which 200 acres are now being used. This total area is considered to be adequate for the next 6 years with the possible exception of a need for an additional 40 acres at Gurdaspur.

The subdisciplines are fairly well supported. The Department Head estimates that pomology and olericulture are supported at a 95 per cent level while the areas of ornamental horticulture are adequately covered. The Department is handicapped by a shortage of contingency funds, inadequate laboratory facilities and insufficient transport equipment.

The improved varieties released have been widely accepted. Likewise recommended fertilization, irrigation, spray and cultural practices have been widely adopted.

The relationships with other agricultural universities, colleges, professional societies and supply firms and organizations are good. There is need for assistance from this Department in the development of better marketing facilities and organizations. Relationships with the State Department of Agriculture, and Central Government research institutions are maintained.

Efforts are made to improve the quality of instruction through periodic review of courses and curricula, attention to the horticulture publications in the library, and the encouragement of the use of cyclostyled notes, reference lists and laboratory guides. Students are encouraged to express their views regarding the quality and methods of teaching. Seminars for the improvement of teaching and research and refresher courses for extension workers are held.

The Department of Horticulture participates in 21 research projects jointly with the departments of Botany and Plant Pathology, Zoology and Entomology, Soils, Genetics and Agronomy.

This Department is highly regarded by other research and educational institutions in India.

Department of Plant Breeding. The Department of Plant Breeding is the largest department in the University. There are 43 staff members in ranks of lecturer and above and 69 research assistants. It is estimated

that 16 per cent of the departmental resources are devoted to teaching, 67 per cent to research and 17 per cent to extension.

Land in Punjab assigned to this Department for research consists of 200 acres at P.A.U., Ludhiana, 305 acres at Kapurthala, 310 acres at Jullundur, 82 acres at Abohar, 31 acres at Samrala, 101 acres at Kheri and 130 acres at Gurdaspur, a total of 1,159 acres. Of the 1,159 acres assigned, 932 acres are now being used.

In the past this Department had strong and effective leadership and has attained an enviable reputation not only in the Punjab but also on a national and international level. Whether or not this position can be maintained still remains to be seen. There is some evidence that a harmonious working relationship within the Department is weakening. More thought needs to be given to departmental organization and the delegation of authority to stimulate a more effective use of personnel.

The financial support of the Department is exceptionally good. Linkages with other departments needs to be further developed. The attitude of self-containment is not consistent with the university concept. Linkages with outside institutions and organizations are very good.

Sixteen research projects are being carried on jointly with other departments. These departments are: Plant Pathology, Zoology and Entomology, Soils, Agronomy and Microbiology.

This Department has released a number of new varieties including food-grains, oilseeds, cotton and sugarcane over the past three years. Of these the dwarf wheats and hybrid bajra have enjoyed widest acceptance.

The favourable public image of the Punjab Agricultural University has been enhanced greatly by the excellence of this Department. The preservation of this degree of excellence will require unusual administrative skill and strong impartial leadership.

Department of Soils. Like other departments which prior to bifurcation of the University had department head posted at Hissar, the programme of the Department of Soils at Ludhiana was, until recently, somewhat limited in scope. Following bifurcation, a number of faculty members migrated to the Punjab Agricultural University, Ludhiana. The present staff consists of 17 in ranks of lecturer and above. In addition there are 15 research assistants.

The Department has responsibilities in teaching, research and extension and the allocations of resources to these responsibilities are estimated to be 24, 64 and 12 per cent respectively.

The land area allocated to the Department for research consists of 50 acres at the Ludhiana Campus and 35 acres at regional substations, all of

which is now being used. It is estimated that within 3 years an additional 20 acres will be needed which will provide adequate area for an additional three years.

Prior to bifurcation, the Soils Department of the Punjab Agricultural University was highly regarded by other research and educational institutions in India. If adequately supported and encouraged the probability of maintaining its high enviable reputation is good. Additional funds, space and equipment are needed. Contingency funds are particularly short.

The essential linkages with other units of the University and with other educational institutions and organizations are well established.

Twelve research projects are carried on jointly with other departments. These departments are: Agronomy, Horticulture, Agricultural Engineering, Chemistry and Biochemistry, Plant Breeding and Agricultural Economics.

The future prospects of this Department are quite good.

Department of Food Science. The development of food science is very much in its infancy at the Punjab Agricultural University. A building is being constructed and three staff members at the junior level have been employed. The original idea of development on an institute basis has been abandoned in favour of a department. This in itself is not a matter of great concern; however, some of the basic ideas in an earlier report recommending an institute should be retained.

Because of the nature of the problems associated with the processing, preservation, packaging, and storage and distribution of food, scientific personnel representing a number of disciplines are needed to develop a well-rounded research and educational programme in food science. These include biochemists, microbiologists, food engineers, etc., in addition to food technologists.

There will be only limited scope for the employment of food scientists or technologists until the food processing industry is developed to a greater degree than at present. Because of this, the programme of the Food Science Department should be first developed at the research and postgraduate levels, and teaching at the undergraduate level delayed until the food processing industries reach a stage of development that requires the employment of personnel trained to the B. Sc. level.

The training of students in the art of food processing and preservation should not be the primary objective of a department of food science in a university setting. The objective should be to engage in advanced training and research programmes which will stimulate the development of a thriving food processing industry. Once this stage is reached there will be

employment opportunities for food technologists trained to the B. Sc level.

The College of Basic Sciences and Humanities

When the Punjab Agricultural College was transferred to the newly founded Punjab Agricultural University, certain elements of the College dealing with basic subjects such as languages, mathematics and basic sciences were transferred to a School of Basic Sciences and Humanities. In June 1964 the decision was made to establish a College of Basic Sciences and Humanities in the Punjab Agricultural University. The newly created college, with a dean as administrative head, was organized which now has the following departments: Botany and Plant Pathology; Chemistry and Biochemistry: Economics and Sociology; Genetics; Languages and Culture; Mathematics and Statistics; Microbiology; and Zoology and Entomology. A statement regarding each of these departments is included on the pages immediately following. The decision was taken when the College of Agriculture was founded at Hissar that the professors of Genetics, Microbiology, Botany and Plant Pathology would be posted at the Hissar Campus, while the professors of other departments would be posted at Ludhiana. At that time, there was only one professor in a department. The professor was also the department head.

A strong College of Basic Sciences and Humanities is an essential component of an agricultural university. Since it makes a basic and significant contribution to the education of students in all the other colleges of the university the quality of its faculty and its educational programme should be equal or superior to that of any other administrative segment of the university.

It is estimated that the degree of adequacy of the various departments in programme, personnel and financial support varies from 25 per cent to 70 per cent.

At present this College is essentially a teaching service college; however, highly significant research and extension programmes are carried out by the faculties of the departments in this College. No undergraduate students are admitted to the College but students from all other colleges of the University are taught subjects in basic sciences and humanities which are required in their degree programmes. In addition elective courses are offered in a number of subjects.

Postgraduate students are admitted for studies leading to both the M.Sc. and Ph.D. degrees in certain subjects.

To support the administrative responsibility with necessary authority regarding the administration and control of the college budget, it is suggested that the University administration consider the transfer of the portion

of the General College Budget which supports programmes of the College of Basic Sciences and Humanities to this College.

The College of Basic Sciences and Humanities is not a fully developed college in the sense that it does not offer programmes of study leading to a baccalaureate degree in its own right. Over the year it has served a needed and most useful purpose in providing the basic education required for the degree programmes of the other constituent colleges of the university. The courses offered to meet these requirements have been largely of a technical nature.

As to the future the following quotation from the Resident Instruction Bulletin (1969) will provide some insight: "Because of the development of food and allied industries in the country, a keen need is being felt for graduates with specialized knowledge of Chemistry, Biochemistry, Microbiology and Genetics. Greater emphasis will, therefore, be laid on developing these areas in the immediate future.

"So far, we do not have any liberal education in the Punjab Agricultural University that is not technical. In due course, when the resources of the agricultural university expand, a few courses in liberal education such as Philosophy, Psychology, History and Political Science may be introduced which may not be hundred per cent technical but help the University student fully appreciate the complexion of modern life."

Department of Botany and Plant Pathology. Prior to the bifurcation of the Punjab Agricultural University the Head of the Department of Botany and Plant Pathology was posted at the Hissar Campus. As the process of bifurcation took place the post of Professor and Head was created at the Ludhiana Campus. The present head has had full responsibility for the Department for only a short time. A strong Department of Botany and Plant Pathology is basic to the effective development of all the applied plant sciences. Strong basic research programmes in sub-disciplines such as plant physiology provide the scientific background for new applications and innovations. The present status of the Department is not impressive and careful thought should be given to help this Department develop its teaching and research programmes along modern lines.

Since courses taught by this Department are required in the curricula of students in several colleges the teaching load is quite heavy. Sixty-seven per cent of the resources of the Department are devoted to teaching, 25 per cent to research, 5 per cent to extension and 3 per cent to administration. At present there are 22 staff members with the ranks of lecturer and above and 5 research assistants.

Thirteen and one half acres of research land at the Ludhiana Campus and 4 acres at substations have been assigned to this Department, all of

which are now in use. It is estimated that in 3 years an additional four acres at Ludhiana and one acre at substations will be needed, and in 6 years another additional four acres at Ludhiana and an additional one acre at substations will be needed. Thus the estimated land needs for research purposes in 1976 are 21.5 acres at Ludhiana and six acres at off-campus substations.

Several of the subdisciplines within the Department are not adequately covered. Plant virology needs to be strengthened and nematology as related to plant diseases needs to be developed.

Five joint research projects are being carried on with departments of Plant Breeding and Horticulture. Interdepartmental collaboration needs to be strengthened and relationships with professional societies and other colleges and universities developed or strengthened.

Department of Chemistry and Biochemistry. The primary responsibilities of this Department are teaching and research. Since courses taught are required in the educational programmes of all of the undergraduate students of the University, with the possible exception of those in Veterinary Medicine, the teaching load is quite heavy. There are 24 staff members with the ranks of lecturer and above, 12 research assistants and several supporting personnel now posted in the Department.

Thirty-three per cent of the resources are devoted to teaching, 64 per cent to research and 3 per cent to administration. Five members of the teaching and research staff devote some time to extension.

An area of 14 acres is now assigned to this Department for research, all of which is being used. The emphasis of research has shifted somewhat from the animal to the plant side during recent years, and a research area of 14 acres is considered adequate for the next 6 years.

Chemistry and Biochemistry are basic subjects in the foundation of science of practically all the undergraduates of the University. It is estimated that all of the sub-disciplines in both Chemistry and Biochemistry are inadequately covered at the present time. The degree of adequacy ranges from 70 per cent in the case of plant biochemistry to 20 per cent in the case of molecular biochemistry.

Among the handicaps are the lack of essential equipment, inadequate laboratory space, and an inadequate number of properly trained personnel particularly at the associate professor's level. Some of these problems, particularly that of space will ease when the new basic science building is completed. Block grants for the purchase of laboratory equipment and an increase in contingency funds should be given consideration.

In departments as large as this one with heavy responsibilities for both teaching and research, consideration should be given to the

development of depth in leadership to lighten the burden of the Department Head.

This Department is highly regarded by other research and educational institutions; potential is promising.

Department of Economics and Sociology. To be most effective within an agricultural university, the social science fields must be closely linked with the physical and biological sciences. A Department of Economics and Sociology is just as essential as any of the departments traditionally associated with colleges of Basic Sciences or Agriculture. The establishing of Department of Economics and Sociology was not given a high priority in some of the agricultural universities. At Ludhiana, however, this area of study and research was recognized as important in the Punjab Agricultural College before the University came into being. Consequently a Department has existed in the Punjab Agricultural University from the date the University was founded. This early beginning and sustained support over the years has resulted in a department that has attained wide recognition.

At the Punjab Agricultural University this Department has the responsibility for teaching economics and sociology on a University-wide basis, and for research and extension programmes of particular interest in the economic and social development of rural people. The sub-disciplines in the field of economics have reached a higher stage of development than those in sociology. A number of the sub-disciplines are not fully developed, rural sociology and agricultural cooperation being particularly deficient.

It is estimated that some 30 per cent of the resources of the Department are devoted to teaching at both the undergraduate level and postgraduate to the Ph. D. level. About 50 per cent of the resources are devoted to research and nearly 20 per cent to extension. At present there are 17 members of the faculty in the ranks of lecturer and above and 14 research assistants posted in the Department.

Leadership within the Department is excellent; however, the development of greater depth of leadership would further strengthen the department.

Three joint research projects are now under way with the departments of Electrical Engineering, Horticulture and Animal Science. There is some evidence that other departments, particularly those in agriculture, are not fully aware of the benefits that can come from studies of economics of new innovations and practices developed in their disciplines. Innovations and practices must be economically sound to be widely accepted and adopted.

This Department has developed strong linkages with outside groups and organizations, and is highly regarded by other research and educational

institutions. Prospects for future growth and development of this Department are excellent.

Department of Genetics. Prior to the bifurcation of the University, the Head of the Department of Genetics was posted at Hissar, and the responsibilities of the faculty members posted on the Ludhiana Campus were almost exclusively that of teaching undergraduate courses. In the process of bifurcation a Department Head position was created on the Ludhiana Campus, where the process of developing depth and strength in education and research is now under way.

The Department has the responsibility of teaching undergraduate courses in basic genetics as a service to other colleges and postgraduates to the Ph. D. level. There are now five staff members in the ranks of lecturer and above. About two-thirds of the departmental resources are devoted to teaching and one-third to research. The Department is handicapped by a lack of adequate equipment and space. Additional specialists trained in population genetics, physiological genetics, and molecular genetics are needed to develop research and postgraduate programmes in these subdisciplines.

Because of the relatively short time this Department has been functioning on the Ludhiana Campus plus the fact that it is still quite small, internal relationships are yet to be developed. The land area for research is considered inadequate and should be expanded from the present 2½ acres to 5 acres.

Interdepartmental relationships are developing. There are at present 8 research projects being carried on jointly with departments of Botany and Plant Pathology and Plant Breeding.

The development of this Department to a level that will gain favourable recognition by other research and educational institutions is yet to be attained. The prospects for this are rated as good.

Department of Languages and Culture. The teaching of languages and culture is essential in the educational programme of all university students. To be effective in any field of learning the facility of communication in both the written and spoken word is of primary importance. Too frequently, the development of scholarship in language and cultural subjects is not given as high a priority as warranted.

The Department of Languages and Culture at the Punjab Agricultural University is primarily an undergraduate teaching department. Language instruction is also given to postgraduate students to enable them to meet the language requirements for the advanced degree being sought.

The faculty of this Department consists of 3 lecturers and 7 assistant professors. The importance of the contribution that this Department can

make to the educational programme of the University would justify the appointment of some faculty members at higher ranks. Twelve posts in the Department are now sanctioned.

Modern teaching equipment for the teaching of languages and linguistics is needed.

The talents of this Department could be effectively used to improve the language quality of publications of other departments of the University.

Department of Mathematics and Statistics. During the past several decades the nature of scientific thought and study has moved steadily from the descriptive to a quantitative basis. This shift has increased the importance of mathematics and statistics as scientific tools in practically all areas of research. Quite aside from the utility of this discipline in research, it is an important discipline in the development of logical reasoning and the habit of precision.

The Department of Mathematics and Statistics at the Punjab Agricultural University is primarily a teaching department and teaches mathematics, statistics and physics on a University-wide basis. The staff strength of the Department at present is 16 in the ranks of lecturer and above. The limited research programme of the Department is supported by funds allocated for teaching. A research project is being carried out jointly with the Department of Horticulture.

Members of the departmental faculty cooperate with other departments in the improvement of statistical methodology related to the research work of their departments. In addition, this Department prepares research data by card punch and verifier for computer processing at the I.C.A.R. (I.A.R.S.), New Delhi. Monthly seminars are well attended by research workers from other departments in the University.

The Department is in need of additional equipment and personnel. One of the handicaps is the difficulty of attracting competent statisticians to join the faculties of agricultural universities. There is also a feeling in the Department that electives in mathematics, physics and statistics should be permitted at the undergraduate level. The physics programme should be strengthened and biostatistics should be developed.

This Department is making a good contribution to the University and is reasonably well regarded by other research and educational institutions.

Department of Microbiology. Prior to 1967 there was no Microbiology Department at the Ludhiana Campus. A small department had been organized some time previously at the Hissar Campus. In preparation for the impending bifurcation one post in Microbiology was authorized at the Ludhiana Campus in March 1968. At present this is a small department with a faculty of two assistant professors.

This Department is understaffed, under-equipped and needs more space for teaching and research laboratories. Posts at the level of both the professor and associate professor have been authorized and advertised, but at present there are no specialized personnel to cover any of the sub-disciplines of microbiology.

This Department has been organized too recently to have established a reputation or to have gained recognition among contemporary institutions. Microbiology has an important part to play in an agricultural university and the development of this field is fully justified.

Department of Zoology and Entomology. Just as Botany and Plant Pathology are basic to the applied plant science field, so is Zoology and Entomology basic to the allied animal science fields. Although the study of entomology is usually considered important because of its application in plant protection, this subject is of much wider significance. In addition to being an important basic science in its own right there are important applications in the animal and medical fields.

Since instruction and research in Zoology and Entomology were carried on in the Government Agricultural College, the Department came into existence as such when the University was founded. The Department has well developed teaching, research and extension functions. Some 50 per cent of the resources of the department are devoted to research and about 25 per cent each to teaching and extension. The staff strength is 25 in ranks of lecturer and above. There are 18 research assistants.

The sub-disciplines of veterinary entomology, insect pathology and ornithology are still to be developed in the Department and several of the existing sub-disciplines need strengthening.

Nine acres of land has been assigned to the Department for research purposes although it is reported that 17 acres are now in use. An allocation of a total of 20 acres is an immediate need. It is estimated that a total of 20 acres will be adequate for the research needs for the next 6 years.

Linkages with other segments of the University are quite well developed. Similarly, linkages with other institutions and with outside organizations and industries are well developed.

Among the critical factors limiting the effective growth and development of the department are laboratory space, seminar and committee rooms, inadequacy of contingent funds, and inadequate faculty personnel to effectively handle some of the sub-disciplines.

Eleven joint research projects with other departments are now being carried out. These departments are Plant Breeding, Horticulture, Agricultural Engineering, Chemistry and Biochemistry, and Microbiology.

This Department is highly regarded by other research and educational institutions and is well on its way to the attainment of an outstanding position among its contemporaries.

College of Agricultural Engineering

Prior to the founding of the Punjab Agricultural University, instruction in agricultural engineering was included in the teaching programme of the Punjab Agricultural College. This continued for several years after the University was founded. In November 1964 a Dean of the College of Agricultural Engineering was appointed. He immediately set about the employment of a faculty and the planning of a building to house the College. The College began functioning in July 1965 when the first class of students took up their studies. At first, space to accommodate the faculty and instructional needs was provided in the Agriculture Building. The College occupied its new building in 1967.

In the beginning both 4-year and 5-year programmes were offered. Students were admitted to the 4-year programme after Pre-Engineering and to the 5-year programme after Higher Secondary or equivalent. This continued until July 1967 when the 5-year programme was discontinued. The first class of 53 students graduated in 1969.

As the development of agriculture moves ahead the importance of mechanization of agriculture takes on added significance. The use of machines to accomplish agricultural tasks efficiently and in less time permits the adoption of practices which otherwise would be impossible. Therefore, a strong programme in agricultural engineering is an essential element of an agricultural university. The essential supporting disciplines for a sound training in agricultural engineering are found in the engineering and biological sciences.

Although the College is organized in four departments, namely, Agricultural Engineering, Civil Engineering, Electrical Engineering and Mechanical Engineering, the only degree programme offered is that of Bachelor of Agricultural Engineering. Postgraduate degree programmes at the M.Sc. level are offered by other departments as well as by Agricultural Engineering, although the degree research is problem-oriented toward agriculture. Eventually a department of chemical engineering will be added.

The College has the responsibility for teaching, research and extension, although at the present time the extension function is the least well developed. There are committees at the college level on teaching, research and extension. The membership of these committees is drawn from all the departments.

The Dean holds meetings with the department heads twice each month to discuss problems concerning the College and to keep all departments informed regarding development in the University.

The spirit of the College is illustrated by the response of the Dean when asked what measure would be taken to alleviate impediments to growth. He replied: "Try Still Harder. "

Department of Agricultural Engineering. The Department of Agricultural Engineering is the focal point of the College. Students are admitted to the undergraduate degree course in this Department only and the B.Sc. Agricultural Engineering is the only undergraduate degree offered. Although this Department has responsibilities for teaching, research and extension, the programmes on teaching and research are better developed at this time. The prospects for an expanded programme in extension are good. Postgraduate education to the M.Sc. level is now being offered and it is anticipated that programmes leading to the Ph.D. degree will be started in 1971.

The distribution of resources are approximately as follows: 31 per cent for teaching, 57 per cent for research, and 12 per cent for extension. There are 34 staff members with the rank of lecturer and above. An area of 85 acres on the Ludhiana Campus is now assigned to this Department, of which 60 acres are used for agricultural engineering research. It is estimated that the land needs in 3 years will be 85 acres at Ludhiana and 100 acres at regional substations. By 6 years it is estimated that the on-campus requirement will be 100 acres and the substation requirement 250 acres.

Some of the sub-disciplines represented in the Department are not fully developed and the area of land development engineering is particularly weak.

There is need for better interdepartmental relations with segments of the University outside the College of Agricultural Engineering. Joint research projects are being carried out with the departments of Soils, Agronomy, and Zoology and Entomology. The linkages with industry, State Government and the professional engineering association are good.

While this Department is quite young it is reasonably well regarded by other research and educational institutions. The Department has recently been inspected by an accreditation team. A favourable report is expected. If full accreditation is given, it will increase the employment opportunities and should ease the employment situation which has been a bit troublesome. The Department has excellent prospects.

Departments of Civil, Electrical and Mechanical Engineering. The proper education of agricultural engineers is supported by other divisions of engineering, particularly civil, electrical and mechanical engineering.

Since these three departments serve a similar function, that of supporting agricultural engineering in the College of Agricultural Engineering, they will be treated together. The combined staff strength of the three departments is 20, all in the ranks of assistant and associate professors.

At the undergraduate level they teach their specialized subjects to the students of agricultural engineering. Where applicable the basic engineering principles of these disciplines are illustrated by examples drawn from agricultural problems, agricultural machines or agricultural practices. These departments understand the philosophy and objectives of the College of Agricultural Engineering and participate with energy and enthusiasm.

In order to attract highly trained and competent engineers to join these departments opportunities for research and postgraduate education to the Master's level are provided. The instructional staff of these departments also serve on the postgraduate committees of students in agricultural engineering. They are also represented on college-wide commmittees on teaching, research, publications, extension, and projects review.

All of these departments devote a portion of their time and resources to research. The research projects have an agricultural bias. For example the mechanical engineers carry out research on farm machinery design and the electrical engineers carry out research on the farm use of electrical equipment.

The prospects for these departments to contribute significantly to the development of a strong programme in agricultural engineering are excellent.

The College of Home Science

Although the Punjab Agricultural University Act, 1961 makes specific provision for a College of Home Science as a constituent college for the University, the beginning of this College was delayed until July 1966 when a class of 25 students was selected.

A well planned building programme was undertaken to provide classrooms and laboratories and hostel facilities to accommodate an undergraduate enrolment of 400 to 500 when the College is fully developed. For about three years, while the buildings were coming up, the students were housed in quarters built for faculty residences and used teaching and laboratory space in the College of Agriculture building. In May 1969 the laboratories and some of the hostels were occupied. The building programme estimated to cost 40 lakh of rupees is now nearing completion.

The problems confronted in the development of the Home Science College are quite different from those experienced by other segments of the

University. The number of qualified personnel from which senior faculty and administrative staff may be recruited is quite small and as a result many posts remain vacant for long periods even though the posts are advertised repeatedly. The same may also be said of posts at lower academic ranks; however, the inability to fill positions at the higher levels is more critical during the early developmental years.

Another problem which is not totally unrelated is the short tenure of professional home economists; in most instances marriage and home-making have a much higher priority among young women than a professional career. The same can be said about women students, a much higher proportion of them drop out of college than is the case among male students.

Since the present total staff strength of the College is 13 at the ranks of lecturer through associate professor plus two research assistants and one sports assistant no attempt is made to deal specifically with individual departments as was done in the case of all other colleges, except the College of Veterinary Medicine.

The College of Home Science is informally organized on a departmental basis. It is planned that the College will have the following departments: Child Development; Clothing and Textiles; Food and Nutrition; Home Management; and Home Science Education and Extension. At present there are no college nor departmental committees. The interaction between the College administration and the staff is on an informal basis.

The programme of study for the B. Sc. in Home Science includes 100 trimester credits of Home Science subjects required of all students plus 30 credits of electives in Home Science. The Home Science College being relatively new needs to identify itself in the University structure rather than moving toward a self-contained and independent unit. Until such time as the subject matter areas of the Home Science College are well developed and adequately staffed, perhaps the curriculum should be revised to include more than 76 credits from outside the College. With all four years of study now represented in the Home Science student body the teaching load is extremely heavy for a faculty of 13. Therefore, the time for research or extension is extremely limited.

Although a desire to develop both research and extension programmes in Home Science does exist there are many serious handicaps. By far the greatest handicap is the shortage of personnel with experience and competence in research and extension. The University Library needs to increase its holdings in books and journals dealing with Home Science subjects; the pre ent book collection in the College should be indexed and catalogued by the University Library. Like other college collections, existing or planned, the Home Science collection should be a part of the University Library even though it may be housed in the Home Science building.

Some of the research laboratories are still to be fitted, furnished and equipped.

An extension programme needs to be worked out in cooperation with the Extension Directorate. An extension worker is a change agent and the first step in developing an extension programme is to determine the problems faced by the farm family, rate them on a priority basis, and then develop an education programme to solve the highest priority problems. Once a programme is developed which is satisfactory to all concerned the support for the request for facilities and equipment such as transport will be greatly strengthened.

Similarly the research programme needs to be developed in cooperation with the Research Directorate. Here again, thought should be given to determining the priority problems that can be effectively undertaken. In selecting the problem, consideration should be given to the prospects of quick research results which have a good chance of widespread adoption when carried to the field through the extension programme.

It is through research and extension programmes organized along these general lines that the College of Home Science will become recognized throughout the State for the good it is doing in bringing about desirable changes in rural family life in pace with the rapidly moving economic advancement.

The College of Veterinary Medicine

Near the close of the first trimester of the July 1969—June 1970 academic year and with the final date for the bifurcation of the University approaching, a decision was made to establish a College of Veterinary Medicine on the Ludhiana Campus. Prior to this time the existing College of Veterinary Medicine was located on the Hissar Campus of the University. When the decision to establish a new veterinary college on the Ludhiana Campus was made, 25 regular staff members and 13 temporary or substitute staff members migrated to the Ludhiana Campus along with 133 undergraduate and 19 postgraduate students. Some additional posts have been advertised.

Instruction began in November 1969 with the opening of the second trimester. Temporary quarters were arranged for classrooms, laboratories and office accommodations. Building plans for housing the new college are now under consideration.

The essential instructional units are now being covered in the following departments: Bacteriology and Parasitology; Pathology; Pharmacology and Medicine; Physiology; and Surgery and Gynaecology.

This College is still less than 6 months old. Other than to say that the infant seems to be healthy and vigorous, a detailed evaluation of the College and its departments at this time would be premature.

In view of the need for livestock health control programmes which are basic to livestock improvement it would seem that this newly developing college has an excellent opportunity to introduce some new innovations in teaching, research and extension.

CHAPTER 10

The University Library

Staff, Resources, Services

Prior to the bifurcation of the Punjab Agricultural University the University Librarian had the overall responsibility for the development of the libraries and library services on all of the constituent campuses. In view of the bifurcation this Report treats the Punjab Agricultural University Library as it exists on the Ludhiana Campus.

The University Library on the Ludhiana Campus has made significant progress over the past several years particularly since 1965-66 under the able leadership of the present Librarian. He is now assisted in his work by four Assistant Librarians and 55 subordinate employees. The Assistant Librarians as well as the Librarian are adequately trained in Library Science. The Librarian, who has the status of a faculty member of professional rank, is guided in his work by a Library Advisory Committee. This Committee now under the Chairmanship of the Vice-Chancellor, who has had a long standing interest in library development, has recently been expanded. The following P.A.U. staff members serve on the Committee: Librarian, Dean of Post-Graduate Studies, Deans of Colleges, Director of Research, Director of Extension, Registrar, Comptroller, and Professor of Economics and Sociology. In addition two senior students and the Librarian, Punjab University, Chandigarh, and the Librarian, Punjab University Extension Library, Ludhiana, are members.

The library staff strength for the six years period 1964-69 is shown in Table 10.1.

The library is presently housed in the space provided for the Agricultural College library in the main Agriculture building which was constructed in the late 1950's. With the growth of the University, additional makeshift space has been arranged by enclosing 260 square metres in the adjacent corridor and using available space in the College of Agricultural Engineering Building.

The library budget for 1964-65, 1966-67 and 1968-69 is given in Table 10.2. The budget increased ten-fold from 1964-65 to 1968-69. With the improvements in the physical facilities, there will be a need to augment the library budget consistent with the recommendations of the Indo-American Library Study Team.

Table 10.1. Punjab Agricultural University library staff strength, annually as of June 30, 1964 to 1969

Staff	1964	1965	1966	1967	1968	1969
Librarian	—	1	1	1	1	1
Deputy Librarian	—	—	—	—	—	—
Assistant Librarians	2	2	2	3	4	4
Senior Library Assistants	—	—	1	4	5	8
Junior Library Assistants	5	5	6	7	8	12
Senior Scale Stenographer	—	—	1	1	1	1
Office Assistant	—	—	—	—	—	1
Clerk/Typists	1	1	4	5	5	5
Accountants	—	—	—	—	1	2
Bindery Foreman	—	—	1	1	1	1
Binders	2	2	2	4	3	3
Attendants	3	3	9	10	10	11
Messengers	1	1	1	1	1	5
Cyclostyle Operator	—	—	—	—	—	1
Senior Technical Assistants	—	—	—	—	—	3
Reprod. Lab. Assistant	—	—	—	—	—	1
Gate Keeper	—	—	1	1	1	1
Total	14	15	29	38	41	60

The extent to which the library has expanded its holdings and services is summarized in Table 10.3. An examination of the data in this Table explains how a library becomes cramped in space for books storage and readers in a very short span of years. The makeshift arrangements now serving this library will be relieved in the foreseeable future.

The Report of the Indo-American Study Team on I.C.A.R. Institutes and Agricultural University Libraries, January 1968, is being used as a guide for library development.

Table 10.2. Punjab Agricultural University library budget 1964-65, 1966-67, and 1968-69

Budget Category	Year		
	1964-65	1966-67	1968-69
	Rs.	Rs.	Rs.
Recurring budget on staff	24,256	88,522	168,950
Recurring budget on journals	N.A.	160,215	160,920
Budget for books	47,981*	168,132	227,325
Budget for equipment	—	—	206,110
Total annual budget†	72,237	416,869	763,305

* Includes expenditure for periodical subscriptions.

† Expenditures may be either higher or lower than the budget depending upon subsequent modifications of the budget.

A New Library

The foundation of a new library for the University was laid on February 26, 1969. This new library building will have a floor area of 7,500 sq. metres and will provide seating accommodations for 760 readers and space for 300,000 books. The floor arrangements provided will take into consideration the needs of the students. One floor is set aside for undergraduates. The other floors are to be divided subject-wise, each dealing with a major field of study. The present plans are to air-condition the reading rooms to provide better reading conditions for the students and faculty. It is expected that this building will be completed during the 1971-72 academic year.

Library Services

The statistical data in Table 10.3 do not fully cover the library services which make the library useful to the faculty and student body. These are briefly reviewed in the following paragraphs

Memorial Volume Section. A new section designated as the Memorial Volume Section was set up. This section consists of the papers and reprints of outstanding scholars. Included in this section are the works of Vice-Chancellor Randhawa. Many of the holdings in this section were provided by the authors as gifts. Some of these are rare and unobtainable from other sources.

Table 10.3. Punjab Agricultural University Library additions, resources, use, book and budget, 1962-63 to 1968-69

	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
Additions							
Books	2,083	1,170	4,861	3,928	10,085	7,145	7,693
Dissertations	—	—	—	52	233	129	372
Bound periodicals	—	—	955	—	3,050	1,721	726
Micro/documents	—	—	—	—	15	32	27
Total	2,083	1,170	5,816	3,980	13,383	9,027	8,818
Resources							
Books	17,375	18,545	19,462	23,390	33,475	40,620	48,306
Dissertations	—	—	—	445	680	809	1,180
Bound periodicals	—	7,516	—	5,948	8,998	10,719	11,445
Micro/documents	—	—	—	500	515	547	574
Total	—	—	—	30,283	43,668	52,695	61,506
Current periodicals	427	497	500	515	760	1,000	1,317
Library Use							
Books issued	22,879	56,627	64,860	37,293	59,768	161,401	215,369
Books consulted	NA	NA	NA	NA	354,452	820,652	854,711
Readers	52,391	96,519	105,411	64,032	153,484	204,185	209,413
Book budget (Rs.)	25,879	41,981	174,623	143,461	588,350	771,222	632,680

Book Procurement Policy. Book procurement policies were revised to permit the purchase of books covering a wide spectrum of learning. Publications in fine arts, literature, and cultural history are being procured in significant numbers and more attention is being given to books written in the Punjabi language.

Exchange Relations. Exchange relations are established with over 25 universities, colleges and institutions, both domestic and foreign.

Cataloguing and Classification. There were 8,335 books classified and 9,384 books were catalogued and 70,598 index cards were procured and filed. The Dewey Decimal Classification system is being used and the catalogue cards reproduced on the high speed, tape-operated 'Flexowriter' on the unit-card system.

The re-classification and cataloguing of earlier holdings is being done side by side with current arrivals, and there is still an arrear of about 3,000 books.

Bindery. The binding of 3,764 items consisting of 2,397 volumes of periodicals and 1,367 books was completed during the year. In addition the bindery collated, stapled, cut and wrapped the various publications issued by the library.

Reprography and Documentation. A reprographic and documentation unit was established during the 1968-69 academic year. A Rank-Xerox standard 1385 Camera was acquired in February 1969 and a Czech Romayor offset machine in March 1969. Over 1,600 exposures were taken during the first four months when the machine was in use. Requests for Xerographic copies were received from agricultural universities all over India and one from as far away as the University of Queensland, West Australia.

A microfilm camera was put in service in November 1968 and a Carl Zeiss microfilm enlarger was ordered.

Service to Faculty. The University Faculty is regularly kept up-to-date by two library publications. The "Monthly Book Sampler" published monthly since May 1966 lists the books received by the library during the month. "Periodicals Received This Week" published weekly since January 1968 lists the periodicals received during the week.

Contents of the Month. As a part of the current awareness service of the library, it is now proposed that the table of contents of scientific and learned periodicals will be reproduced by Xerox or offset process and distributed to the faculty. This will be a boon to all research workers and particularly to those who are posted at a regional or substation at some distance from Ludhiana. When titles of interest in connection with the particular research being done are noted from these tables of contents the library can be requested to reproduce the entire article and send it to the research worker.

Circulation of Books. With a total of 2,145 registered borrowers in 1968-69 and a circulation of 215,000 volumes the work of circulation control became extremely heavy. Consequently plans were made to switch over to Hollerith punch cards in collaboration with the data processing centre. Special cards were made to order by the I.B.M.Co. The switch to this system enables the circulation section of the library to locate books loaned and check "over dues" more speedily and accurately.

Inter-Library Loans. This library has cooperated with other University and research libraries in inter-library loaning of library materials. Although increasing use is now made of photocopies, 101 publications were loaned and 80 borrowed by this library during the 1968-69 academic year.

Textbook Loan. The library operates a textbook programme and a textbook section, but because of the book-keeping involved no rental programme as such. Books have been loaned out in bulk to some departments (particularly in the Agricultural Engineering collection) who rent them out to students.

Multiple copies of textbooks have been procured, half of them are released for circulation and half can be studied in the library only.

Expanding Facilities and Services

The Fourth Five-Year Plan submitted to the Comptroller gives in detail the anticipated programme for expanding the library facilities and services. The main points are briefly stated as follows:

Expansion of the Documentation Activities. This section has been set up but its services need to be expanded.

Expansion of Undergraduate Facilities. In the upcoming new library one entire floor is provided for undergraduate students.

Develop Special Collections. For example, Punjab collection, Map collection, Reprints and pamphlets collection.

Procurement of Official Reprints and early papers on agriculture and related subjects.

Procurement of Books and Journals on Veterinary Medicine. A new college has been started and there will be considerable demand for veterinary books and journals.

Strengthening Facilities and Services for Postgraduate Students.

More Reader and Book Space. Finally more space for readers and more space for books until the new library is ready to be occupied is an urgent need.

Faculty and Student Evaluation

Of the faculty responding to the questionnaire, 57 per cent agreed with the statement: "The Library resources of this University are adequate for my teaching, research and extension education programme" and 38 per cent disagreed. Of the faculty of the College of Agriculture responding, 61 per cent agreed with the statement and only 10 per cent strongly disagreed. This library was first established as an Agricultural Library and until very recently most of the additions were on agricultural or related science subjects. This, no doubt, is reflected in the faculty response.

Sixty-two per cent of the University faculty and 73 per cent of the Agriculture College faculty agreed that the system of ordering and obtaining additions to the library was satisfactory. Only 49 per cent of the faculty of the College of Basic Sciences and Humanities considered the method satisfactory.

The students of the University as a whole rated the library books and reference materials between good and fair (2.41). The students of the College of Agriculture gave the highest rating (2.59) and those from the College of Veterinary Medicine the lowest (1.57), about midway between poor and fair. This is understandable because of the recent founding of the Veterinary College at P.A.U., Ludhiana.

The students rated the assistance given by the library staff as fair to good (2.75), but gave the lowest rating to the seating capacity (2.18). The postgraduate students as a group gave the lowest rating to the seating capacity (1.96).

The use of the library has increased tremendously during recent years but still is much below what it should be. Table 5.2 (Chapter 5) indicates that the average undergraduate student studies in the library for only 6 hours a week while the average postgraduate studies for only 12 hours per week in the library. It is interesting also to note from Table 5.3 (Chapter 5) that undergraduates spent 8 per cent of their study time on library books, while postgraduates spent 16 per cent of their study time on library materials. The library remains open for 12 hours daily while the University is in session. With the increasing pressure on seating space perhaps the open hours should be extended to 14.

During the course of this study some criticism of the library and its services were recorded. Students complained most frequently of the shortage of seating space in the reading room. Department heads and faculty expressed some dissatisfaction with the departmental collection and particularly because of the lack of suitable space for housing the collection and at the same time sufficient seating space for readers. The College of Home

Science pointed out that the stock of books and periodicals in their College library was particularly deficient. It was noted that the books in the Home Science Library were not classified and catalogued.

A Guiding Philosophy

It is the view of those conducting this study that there *should be one* university library and that college libraries and departmental collections should be classified and catalogued and card indexed in the University Library. The University Librarian should have supervision over all library materials purchased by the University. The departmental and college collections are no substitute for a comprehensive university library the use of which has to be actively promoted.

Some criticism is perhaps a healthy sign in that it stimulates improvement. If one heard no complaints one might conclude that there was little or no interest in the library or the library services.

Elsewhere in this Report it is stated that the University Library provides the lifeblood of research and academic scholarship. It is our view that the University Library can act as a powerful unifying agent. All colleges, departments, faculty and students have a common interest in an excellent library and effective library services. No other segment of the university shares an equal unanimity of interest.

In responding to the question "From the point of view of the Librarian, what are the key indicators in assessing the effectiveness of library services ?", the Punjab Agricultural University Librarian made an astute response : "Effectiveness of library services can best be indicated by assessing the quality of research, teaching and education in the University because these are dependent on the potential of the library to respond."

CHAPTER 11

Students Welfare

The objectives and philosophy of the Directorate of Students Welfare at P.A.U. are embodied in a recent statement regarding its services and activities:

> "..such activities keep the students physically fit, mentally alert and ultimately help them to become good citizens. The importance of this aspect of students' life is therefore self-explanatory and needs no special emphasis. A University is worth its name only if it provides its students with all the above mentioned facilities so as to give professionally efficient, decent, civilized, physically and mentally sound citizens to the Nation. An educational institution or a University which fails to provide all the above mentioned amenities to the students, is cheating them of their right to academic maturity."[1]

Student Housing and Messing

P.A.U. has seven hostels (6 for boys and 1 for girls) now in use with accommodation for about 1,350 and with cubicles as well as dormitories in each hostel. Each dormitory accommodates 3 students; all post-graduate students and prefects are in single rooms. Each hostel has a Warden and an Assistant Warden who are usually experienced teachers.

Messes are run by the students on a co-operative basis through Mess Committees elected by hostel residents; thus mess management has been made the responsibility of the students themselves. The management of the mess money is the responsibility of the hostel Warden.

In general the students at P.A.U. rate the hostel accommodations and messing facilities to be very good (Table 11.1).

Some students complain of crowding, particularly when four students occupy a dormitory. A number of student criticisms centre around lack of student self-discipline: too much noise, inconsiderate treatment of fellow students, failure to follow hostel rules and regulations, etc. Some would like lower hostel charges although they seem to be reasonable. The per trimester hostel charges are Rs. 34/- for cubicle or Rs. 16/- for dormitory plus Rs. 4/- for common room fund and Rs 8/- for electricity fund. There

[1] Prithipal Singh, "Problems of Students' Welfare and Discipline", Paper presented at the First Convention of the Association of Agricultural Universities in India, P.A.U., Ludhiana, February, 1970.

are additional monthly charges for fans at the student's option. There is some concern among students over food quality but the quantity seems to be adequate.

Table 11.1. Student ratings of hostels and messing services at P.A.U.*

Item	All Students	Undergraduates	Postgraduates
Hostel comfort	3·21	3·05	3·31
Hostels as a place to study	3·10	2·85	3·37
Hostel rules and regulations	3·14	3·05	3·23
Hostel charges	3·08	2·97	3·26
Food quantity and quality	3·21	2·97	3·49

* Average ratings on scale of: Outstanding=5; Excellent=4; Good=3; Fair=2; Poor=1.

Faculty members feel that the hostels are adequate for student study with 89 per cent agreeing with the statement: "The hostels of this University provide a satisfactory environment for student study."

Sports and Co-curricular Activities

The sports activities of P.A.U. are governed by a Sports Council of which the Vice-Chancellor is the Chairman. There is also a Campus Sports Committee and a Sports Committee in each college. University teams are selected for intervarsity competition matches following inter-class and inter-college matches. Since 1965-66, P.A.U. has annually had several teams in inter-university tournaments. P.A.U. served as host to the First All-India Agricultural Universities Athletic Meet on February 26, 1970.

There are several co-curricular activities at P.A.U.: debates and declamation contests, dramas, dancing, music, mountaineering, hiking and trekking, and photography and fine arts. A Film Club has been constituted which sponsors films for the entertainment of students, staff and families. The working of the Club is entirely in the hands of students and the money realized is contributed to the Students Aid Fund, a fund to help the needy students on campus.

In general students rate the athletic and co-curricular activities of P.A.U. as good (Table 11·2).

The sports and athletic programme is better organized and involves more students than the other co-curricular activities, and hence is rated higher.

Table 11.2. Student ratings of athletic and co-curricular activities at P.A.U.

Item	All Students	Undergraduates	Postgraduates
Organized athletic programme	3·28	3·34	3·20
Music and drama	2·89	2·90	2·88
Entertainment and recreation	3·12	3·12	3·08

The P.A.U. faculty also regards the sports and athletic programme highly with 86 per cent agreeing with the statement: "The sports and athletic programme adds significantly to recreational needs and contributes to the spirit of the students body." At the same time, 38 per cent of the faculty thinks that "the sports and athletic programme provides undue competition for the time of students needed for their academic work." There is need for improvement of the policies and procedures regarding student absence from classes and examinations because of off-campus sports events.

Medical Services

P.A.U. has three Medical Officers, two male and one female, with supporting personnel of nurses, dispensers and other staff to service students, University staff and families. The hospital has about 11,000 square feet of space. There were 140,160 patients attended during the 19 month period from June 1968 to December 1969.

Students rate the medical facilities and services as less than "good" (2.75) with over one-third rating them as "fair" or "poor". They point to deficiencies such as nonavailability of prescribed, medicines, prescription of same medicines for different ailments, senior medical personnel not visit the hospital and waiting at the hospital for service for a long time.

Shopping Services

Students rate the shopping centre, banking and postal services as good to excellent (3.44). The shopping centre has the following services and shops: banking and postal services and shops for food items, laundry and dry cleaning, stationery supplies and sundry items and barber services. There is also a University seed store and a shoe store.

Conduct Probation System

The conduct probation system provides that a student involved in violation of rules or regulations or in acts of indiscipline may be placed

on conduct probation. Such students shall not represent P.A.U. on a team and loses any office held in any student organization. A student who commits an act of indiscipline after being on probation two times is dropped from College rolls. In general this system is well accepted by P.A.U. students with it being rated "good-plus" (3.13).

General Campus Environment

P.A.U. student rating of the general campus environment is a good overall measure of student welfare. Their rating is good to excellent (3.52) with undergraduates giving a rating of 3.37 and postgraduates 3.72. Undergraduate students in Home Science and Agricultural Engineering give lower ratings than students in Agriculture and Veterinary Medicine. These student ratings speak well for the leadership of P.A.U. in providing a highly acceptable physical and academic environment.

CHAPTER 12

Faculty Development and Welfare

Faculty Planning

Since the agricultural universities of India are of recent origin and several new universities are still to come up, there is and there will be a shortage of faculty members with requisite training, experience and understanding. This shortage is more acute in certain specialized faculties and fields than in others. The need for faculty planning and programmes for faculty development is more urgent in developing institutions and countries. If an undergraduate is to be selected and given postgraduate training in a new field of specialization before being recruited to a department, a decision has to be made four to five years in advance of the recruitment. If the number of undergraduates required for postgraduate training is large in order to provide for a needed expansion of faculty as in the case for home science, the production of undergraduates has to be planned. The University's plan for development of faculties and departments should be for a period of ten years at least.

When the P.A.U. started there were only a few agricultural universities in India, and the P.A.U. was able to secure the pick of the staff as its salaries then were most attractive. Now there are twelve universities and three are in the process of gestation and all have adopted the same or similar scales of pay as the P.A.U. It is, therefore, necessary for the P.A.U. to reconsider whether its present policy of a five-year plan is looking far enough ahead to meet the expected needs. The University is experiencing difficulty in finding suitable staff members for the College of Home Science, and the Department of Food Processing and Technology. There are other areas for example veterinary anatomy, virology, and floriculture which experience similar difficulties. What new colleges and departments are to be set up during the Fifth Five-Year Plan needs to be decided now, so that faculty training programmes can be developed. The existing departments which propose considerable expansion during the Five-Year Plan should move now.

Rank and Salary Structure

The P.A.U. has adopted the ranks and the salary structure as recommended by the University Grants Commission.

Lecturer:	Rs. 300-25-600. At least second class both at the Bachelor's and Master's level.

Assistant Professor:	Rs. 400-40-800-50-950. The minimum qualifications are the same as for the lecturer plus three years experience or Ph.D. degree.
Associate Professor:	Rs. 700-50-1250. The candidates should have a second class at Bachelor's level, and should have obtained Ph.D. in the field, or allied field and five years' experience in the field or allied field.
Professor:	Rs. 1100-50-1300-60-1600. The qualifications are the same as for the Associate Professor and the experience of 10 years in the field or allied field is required.
Senior Professor:	Rs. 1600-100-1800. The procedure for appointing Senior Professors remains to be developed.
Head of Departments:	No special pay.
Deans and Directors:	Rs. 1600-100-2000. Academic qualifications as for Professors with experience in respective fields and organizing ability and leadership.

The superior faculty member soon establishes a reputation which extends beyond the boundaries of the State where he is located or even his country. These are the faculty members who bring distinction and prestige to the university where they are working. Consequently, there will be strong competition for their services. To strengthen the competitive strength of the University and to retain the superior staff members it is suggested that the ceilings be removed from the salary ranges of the top academic ranks.

Merit Basis for Selection and Promotion

The P.A.U. at the time of its formation had wisely arranged with the State Government that along with the transfer of colleges, institutions and research stations, it would not automatically accept the staff but would screen according to the University standards, each member of the staff to determine his suitability for a particular post in the University. Those who were not considered suitable remained with the Government if permanent, and the services of temporary staff not wanted by the University were terminated. For filling vacancies and newly created posts in the ranks of Professors, Associate Professors, Assistant Professors and Lecturers, the posts were advertised in all-India newspapers and recruitment was not confined to residents of the Punjab.

The following quotation from the First Annual Report of the P.A.U. for 1962-63 is significant:

> "The University can also view with pride the fact that all appointments are now being made strictly on merit by open competition on the basis of applications invited through public advertisements covering the whole of India. The University has been acting as its own Public Service Commission, and high-level committees have been constituted for making recommendations for filling the various categories of posts. Eminent scientists from outside have been invited to participate on these committees and so far about 300 posts on the teaching, research and extension education sides have been filled. In a short period, the University has earned a reputation for open-door recruitment based on merit and is beginning to attract good candidates from well-established institutions even from other states."

Dr. P.N. Thapar, the then Vice-Chancellor saw to it that the selection committees, in their composition and working, not only remained impartial but also gave an impression that regional or sectarian considerations did not prevail and merit was the sole basis of selection. This fine tradition should not be allowed to fade. In response to a faculty questionnaire, 62 per cent felt that appointments at the P.A.U. are made on the basis of merit (Table 2.1). There are always some who doubt the impartiality, but 26 per cent being not sure of merit being the main consideration is rather disturbing (the other 12 per cent were undecided). The P.A.U. has to harness the best of brains in the country for the solution of the State's agricultural problems, and this is a difficult task when regionalism is unfortunately growing in the country.

Recognition for Achievement

To recognize outstanding work, there is a scheme for granting one or two advance increments on the basis of a candidate's performance. Recently a scheme for placing plaques of honour with names of outstanding staff members has been started. This scheme has not worked long enough for its effectiveness to be judged, but the scheme for granting advance increments was started much earlier.

The staff questionnaire reveals that 70 per cent of the staff members regard these two schemes for rewarding outstanding work as being satisfactory. Only 47 per cent of faculty members were fully satisfied with the mechanism for selecting those who are to receive advance increments. A sub-committee of the postgraduate faculty which met on 3rd April 1969 concluded that the basis for these awards did not clearly establish merit as

the sole criterion. To eliminate a feeling of arbitrariness, improvements in making these decisions were considered necessary.

Table 12.1. Faculty attitudes toward salary and advancements, merit appointments and merit awards at P.A.U.

Questionnaire Statement	Per cent Agreeing	Per cent Undecided	Per cent Disagreeing
Salary levels and other benefits are fully comparable to that of educators with like training and experience could expect to obtain in other employment in India.	66	2	32
The opportunity for advancement within this University is an incentive for me to do excellent work.	70	4	26
Appointments at this University are made on the basis of merit.	62	12	26
The University has an adequate scheme for rewarding outstanding work with special awards and recognitions.	70	15	15
There is a satisfactory mechanism for selecting those who are to receive special awards and recognitions as rewards for outstanding work.	47	19	34

This problem of recognition of merit and achievement is a country-wide problem. Because of the prevailing social traditions in the country some even argue that merit should not be the sole basis: the experience—the years of pedestrian service—should count and that a scientist who once enters the service, should be automatically allowed to reach the top of a consolidated single salary scale, there being no other scales. Some argue that confidential records are unreliable and others say that their superiors cannot be always impartial in their observations, recommendations or in selection and promotion committees.

The sub-committee referred to earlier drew attention to : (*a*) reluctance of heads of departments who are professors to allow others to occupy the same rank of professor; (*b*) reluctance of a head of department to recommend any one for an award; (*c*) vague condemnatory endorsements such as "not yet mature", "not enough justification", "too early", etc.; (*d*) need for taking into consideration the output including research publications at the P.A.U.; and (*e*) attaching importance to extra duty work or work involving responsibilities beyond that normally borne by the ranks. These significant observations deserve careful consideration.

While there is some substance in various points of view, it has to be borne in mind that both the University's and the staff members' interest should receive consideration in evolving policies and procedures which are conducive to good output and staff morale. Only mature and balanced superiors can write balanced confidential reports. The university needs discriminating and usable confidential reports, and officers should not shirk their responsibility by giving only good chits and refusing to record adverse comments. It takes a mature person to accept criticism and assessment made by another.

Deans of colleges and heads of departments need to develop procedures which inspire confidence of the staff. They should consult a sufficient number of the staff of different ranks individually or through really representative committees. On important matters, such as identification of merit and recognition for achievement, there should be more than one channel through which the nominations and recommendations are received and similarly, opinions of several persons in close touch with the candidate's work should be obtained so that decisions become well-considered. The criterion of merit and achievement should be elaborated so that applicants and recommending authorities are made better aware of the considerations which will weigh in arriving at the final decision. A detailed statement of achievement should be prepared by the candidate himself. A statement should be submitted by the Head of the Department mentioning: (*a*) the names of all those who are also considered and a brief account of achievement of each; (*b*) the procedure followed for informing staff members of all ranks and the method adopted for securing the nominations for the award; (*c*) the consultations carried out for assessing the worth of the achievement of all candidates; and (*d*) the reasons for recommending a particular candidate or not recommending any one.

The judging committee unless it has a fairly detailed statement on the lines mentioned above from each department, cannot discharge its duty well.

The P.A.U. may well consider the feasibility of allowing all lecturers to become automatically assistant professors provided they have put in prescribed years of good service and have the requisite qualifications for the higher post. This should be the only stage when minimum standards need to be satisfied; in all the higher ranks there should be an open competition and the job should go to the most meritorious and if a candidate well above the minimum standards is not available the post may not be filled or filled in an *ad hoc* manner. In the companion publication of this Report, the framing and circulation of policy on staff promotion and merit recognition has been advocated.[1]

[1]See *A Method of Assessing Progress of Agricultural Universities in India*, Chapter 2.

Faculty Voice in Academic Affairs

Consultation with the faculty members is essential in the process of policy making, so that administrators while taking a decision are aware of the view point of the faculty and the latter have a sense of participation. Committees can assist in staff development and by promoting understanding reduce the area of conflict. Some departments operate the system of committees quite well, while others do not seem to believe in this method. Each department which is not too small can have committees on administration, teaching, and students, research, and extention. As many different persons as possible may participate in these committees and the Head of the Department should, as far as possible, allow his colleagues to be the Chairmen of most of these committees so that initiative and responsibility develop. The college committees in their composition and working need to provide better satisfaction in the colleges of Agriculture and Basic Sciences and Humanities.

From the faculty questionnaire it appears that it is not customary to consult staff members in framing the budget (Table 12.2). In most faculties (excepting perhaps Agricultural Engineering) the staff members are not consulted when a search is to be made for new staff. Experienced members may be aware of the persons elsewhere in their field who should be asked to apply or be called for interview.

There is low satisfaction regarding the representation of the academic staff on the Board of Studies of the Colleges of Agriculture and Basic Sciences and Humanities. Academic staff members did not consider either their representation or voice on the Academic Council or in academic affairs as adequate. Even students are pressing for representation in the academic bodies of Indian universities. The Academic Council might consider whether it can frame certain issues concerning academic affairs, including students, and refer them to appropriate departmental committees for elucidating their opinion. Similarly the Board of Studies may refer issues concerning curricula, courses, etc. to the teaching and students committees in the departments. The fact that in these matters there is relatively better satisfaction in certain institutions than in others points to the need for better working procedures rather than major structural changes.

Orientation and Training

A growing university needs to plan its higher training programme well ahead so that trained specialists become available according to the university's time-table for development. A good portion of this training has necessarily to be from abroad. In this respect the U.S.A.I.D. programme in conjunction with the Ohio State University has made the most significant contribution. A sum of $311,632 + Rs. 148,813 has been

spent since 1 November 1964 through June 1969. On training fellowships for the erstwhile P.A.U. staff members, a total of 65 staff members have received training since the beginning of the programme in 1955. Of these 26 are now on the faculty of P.A.U., Ludhiana. The Ford Foundation and the Rockefeller Foundation have also provided fellowships. A much smaller number was trained under the aid programmes of other countries.

Table 12.2. Faculty attitudes toward participation in university affairs, P.A.U.

Questionnaire Statement	Per cent Agreeing	Per cent Undecided	Per cent Disagreeing
There is adequate representation of non-administrative staff members on the Academic Council of this University.	38	32	30
There is adequate representation of non-administrative staff members on the Board of Studies of my College.	46	29	25
In my Department, there is adequate participation of non-administrative staff members in the selection of new Department staff members.	51	12	37
In my Department, non-administrative staff members participate in the development of the annual Department budget.	46	20	34
Staff members at my level have an adequate voice in the academic affairs of this University.	27	5	68
College committees, meetings and other means provide for adequate communication within my College.	56	18	26

In addition a number of staff members received postgraduate training at the two premier agricultural institutions in India, viz. Indian Agricultural Research Institute, New Delhi, and Indian Veterinary Research Institute, Izatnagar.

Short study-cum-observation trips abroad as well as in India are provided. Attendance at seminars, workshops and conferences within the country is generally promoted.

The University should arrange regular orientation courses for its newly recruited staff on the lines indicated in the Report parallel to this one.[1] There is a need for regular planning of seminars on methods of

[1] *Ibid*

teaching and grading, research and extension so that staff members become improvement minded.

Selected departmental heads, deans, and directors can profit by attending short administrative courses which deal with human relations and personnel management. This mixing of academic personnel with business and administrative groups will prove mutually rewarding. Such courses are run by the Institute of Management and Staff Administrative College, Hyderabad.

Each department should draw up an annual programme for organizing seminars and workshop singly or jointly with other departments and choose participants for attending orientation courses, short study-cum-observation tours and training programmes of the various agencies. The Dean of the College may coordinate and forward them to the Director of Instruction who should be in charge of the various staff training programmes.

Developing Depth of Leadership

The colleges and departments have to make a deliberate effort to develop depth of leadership in each department of the institution so that a strong second line is built up for manning all posts which require leadership. By permitting deputies to assume responsibility, exercise initiative and sending them for training, second and third lines can be developed. This task is often neglected.

Staff Amenities and Environment

There are 319 staff quarters on the P.A.U. campus and it is proposed to build 116 additional houses in the near future which will accommodate about one-third of the University's staff. The provision of a good house on a rent not exceeding 10 per cent of salary, which amounts to subsidized housing, is a blessing which is often lost sight of when computing emoluments. The faculty questionnaire reveals that 72 per cent of entire staff were satisfied with housing, living conditions and general environment. This was 88 per cent for associate professors and professors, 72 per cent for assistant professors and 53 per cent for lecturers. As regards schooling facilities only 55 per cent of the academic staff felt satisfied with the existing arrangements. There are good primary and secondary schools within a mile of the campus. The salary level and other benefits were regarded as comparable with those available elsewhere in India particularly by the senior staff. A similar reaction was noted concerning the opportunities for advancement which were regarded somewhat better in newly set up colleges such as Agricultural Engineering and Home Science than in the older Colleges.

In many of the answers to the faculty questionnaires, the young staff members, i.e. lecturers, revealed less satisfaction, as compared with their seniors. This may be partly due to somewhat better provisions for higher ranks and higher expectations of the younger generation.

CHAPTER 13

Communications and Printing

Before new knowledge, new techniques or new scientific discoveries can be useful in promoting human welfare, they must be brought to the attention of the persons or groups of persons who can use them. Thus, the art and science of communication becomes an important link in the chain which extends from the research scientist to the farmer. Merely to bring new techniques or applicable knowledge to the attention of the person who can use it usually is not enough. The *new* must be presented in such a way that it is understood and the desire to put it into use is stimulated. Effective communication, like any form of teaching, is an art that usually is acquired through experience and conscious effort.

In an agricultural university the art of communication must be developed at three levels: among scientists, to the extension educator, and from the extension educator to the farmer and home-maker.

Scientists must communicate with each other within the University and with other scientists throughout the world. It has been said that a good scientist is really a world citizen. His ideas receive world-wide attention through one of the communication media commonly used by the scientist (the scientific journal or the scientific meetings). Thus new scientific knowledge quickly moves around the world and may find world-wide application in a relatively short time.

The scientist in an agricultural university must be able to communicate with the extension specialist so that he can carry the new discovery or technique to the field extension worker in an understandable form.

Finally the field extension worker must communicate the new discovery or technique to farmers and rural women in such a way that they will be interested in trying it on the farm and in the home.

The communication media commonly used to promote the adoption of something new are the press, the radio, the demonstration and the personal contact in groups or between individuals. At the Punjab Agricultural University all of these media have been developed to a fairly high degree during the relatively short period of its existence. The magnitude of the press operation is reported in Table 13.1.

Scientific articles are published as research bulletins or in the *P.A.U. Journal of Research*. Popular articles are published as farm bulletins or in the periodical *Progressive Farming* which is published every two months in English, Punjabi and Hindi. At present, mechanical composing is

in English only; however, additional equipment which will permit mechanical composing in Punjabi and Hindi has been ordered.

Table 13.1. University Printing Press, P.A.U., Ludhiana, 1964-65 to 1968-69

	1964-65	1965-66	1966-67	1967-68	1968-69
Staff					
Press Manager	1	1	1	1	1
Foreman	1	1	1	1	1
Technical staff	9	21	30	36	40
Ministerial staff	2	4	4	7	7
Total staff	13	27	36	45	49
Value of Machines					
Lakh Rs.	1·5	2·0	3·0	3·6	3·6
Number of colours	4	4	4	4	4
Number of Farm Bulletins	16	14	7	12	16
Number of Research Bulletins	4	4	3	5	5
Periodicals (Number of Issues)					
Progressive Farming (English)	6	6	6	6	6
Changi Kheti (Punjabi)	6	6	6	6	6
Unnat Kheti (Hindi)	6	6	6	6	6
P.A.U. News	8	12	12	12	12
Journal of Research	4	4	4	4	4
Campus Magazine*	0	2	1	1	2
Total sheets printed, lakhs	NA	NA	60	70	90
Average daily outturn	NA	NA	22,000	28,000	29,000

*Student magazine, sponsored by the office of the Director of Students Welfare.

In addition to the publications listed in Table 13.1, the University Press prints a large number of miscellaneous pieces which range from annual reports and course bulletins which are several hundred pages in

length to registers and stationery items. Of special interest in promoting agricultural development are timely leaflets and circulars on agricultural subjects and the package practices recommended for the kharif and rabi seasons. The number of copies of periodical publications now printed is over 120,000.

The Communications Building has approximately 6,725 square feet of floor space. Table 13.2 provides data on the major machines now installed in this building and the additional equipment needed.

Table 13.2. Major machines and equipment and needs, P.A.U. Press, January 1, 1970

Major Machines and Equipment	Cost (Rs.)	Condition
OM I Printing Machine	36,515	Good
OM II Printing Machine	64,000	Good
Victoria DF Cylinder Printing Machine	69,105	Fair
Perfecta Cutting Machine	34,170	Good
Book Sewing Machine	14,390	Good
Monotype (composing and operating)	89,000	Good
Machines and equipment needed	*Estimated cost*	
Folding Machine	Rs. 60,000	
Monotype Caster (composing)	Rs. 80,000	

In addition to the press media for communication, material for radio roadcast is regularly supplied to the Jullundur Station of All-India Radio. A photography wing has also been developed to provide a visual record of events and to record experimental trials, plant disease symptoms, etc. for visual presentation in research and extension publications. The photographers and graphic artists also collaborate in preparing attractive and impressive educational exhibits and displays for field days, Kisan melas, and numerous other events which provide such communication opportunities. News items, frequently with photographs, are supplied to newspapers and press representatives are invited to all noteworthy events at the University and regional research stations.

The record of performance of the communications facility of the Punjab Agricultural University is impressive.

CHAPTER 14

The Physical Plant

Introduction

The responsibility for the physical plant of the Punjab Agricultural University rests with the Estate Officer-cum-Chief Engineer. The statutes provide that under the control and supervision of the Vice-Chancellor, the Estate Officer-cum-Chief Engineer shall be responsible for:

"(*a*) maintenance of the University buildings, roads, fencing, playgrounds, parks and lands other than the land comprising the agricultural farms;

(*b*) construction and maintenance of utility services;

(*c*) maintenance of fire protection services;

(*d*) maintenance of architectural and construction services of the University;

(*e*) all University construction;

(*f*) preparation of the construction and maintenance budget of the University, and a periodic report showing the progress on works under construction; and

(*g*) maintenance of accounts relating to the works in his charge on forms prescribed by the Comptroller".

The following brief account of the land and building under the supervision of the Estate Officer-cum-Chief Engineer will help visualize the magnitude of his responsibilities.

The Campus

The main campus of the Punjab Agricultural University is located about three miles from the Ludhiana Railway Station along the Ferozepur road. It consists of 1,203 acres of land of which approximately 750 acres have been allotted to the various departments for research purposes and about 450 acres are reserved for University buildings and student and staff housing. Of the land area allotted for University buildings, approximately 260 acres are now occupied, leaving only about 90 acres for future growth. Of the land reserved for housing approximately 50 acres are now occupied, allowing 60 acres for future expansion.

The campus is serviced by 12 miles of all-weather roads and 4 miles of *kutcha* roads. There are 2 tubewells for providing water to the University buildings and residences and 5 tubewells for irrigating the research farm area. Electric current is available in 440 and 220 volts.

Ample playgrounds for the students, a small shopping centre, banking and postal facilities are available on the campus. The University telephone exchange handles both local and long-distance calls and an inter-office telephone communications system is being developed. The planting of trees, shrubs, grass and flowers have been arranged with a view to improve the landscape and natural beauty of the campus.

The Buildings

The Agricultural College building, the Workshop building, two Warden Residence buildings and a few ancillary structures were already on the campus at the time the University was founded. Consequently, the campus plan had to be developed with these building in place, which placed some restriction on the overall plan. Shortly after the University was founded an independent Engineering and Architectural Unit was set up and from that time onward a harmonizing style of modern architecture has been followed in developing the building programme.

Table 14.1 provides information regarding the number and capacity of the major buildings now on the campus and Table 14.2 indicates the capacity and expected dates of completion of the major buildings now under construction. The building programme which, to date, has cost Rs. 3.69 crores is quite impressive.

In addition to the buildings included in Tables 14.1 and 14.2, it has been decided to construct buildings for the College of Veterinary Medicine at a cost of Rs. 40 lakhs. A livestock unit for housing an animal research scheme is also being planned.

Table 14.3 provides data for some of the classrooms and laboratories on efficiency of space utilization. As is expected the efficiency of laboratory utilization is much lower than that of lecture rooms because of the more specialized nature of the facilities and equipment required by the various disciplines. This limited data suggests good efficiency of lecture and laboratory space utilization; however there is need for a better system to ensure university-wide use of space at a high level of efficiency. The allocation of space in University buildings is not now a function of a centralized University office but is handled at the college level.

The Long Range Plan

The Punjab Agricultural University has a proposed master plan for developing the University Campus, which was prepared and is periodically

reviewed by a Building Committee. This plan provides space and indicates location of a considerable number of buildings and outdoor facilities which are yet to be planned and constructed. A careful study of the plan reveals that in a number of instances the commonly accepted concepts of University planning have not been followed.

Table 14.1. Physical facilities, Ludhiana Campus, P.A.U., January 1 of selected years

	1963	1965	1967	1969	1970
Hostel Capacity					
Undergraduate men	232	436	640	864	1,088
Undergraduate women	—	—	—	150	176
Postgraduate men	88	88	88	88	88
Teachers' Home (bed capacity)	—	—	72	72	72
Farmers' Home (capacity)	70	70	70	70	184[a]
Number of Staff Quarters	18	120	319	319	319
Space Assigned (Sq. ft.)					
University Administration	—	—	26,448	40,116	40,116
Colleges					
Agriculture	109,211	109,211	113,695	113,695	113,695
Basic Sciences and Humanities	—	—	—	—	—[b]
Agricultural Engineering	—	—	108,637	108,637	108,637
Home Science	—	—	—	—	45,056
Veterinary Medicine	—	—	—	—	—[c]
Library	—	—	—	—	—[d]
Hospital	—	—	11,013	11,013	11,013
Printing Press	—	—	6,765	6,765	6,765
Shopping Centre	—	—	—	6,525	6,525

[a]A new building which will accommodate 184 farmers was completed about March 15, 1970.

[b]The College of Basic Sciences and Humanities is temporarily housed in the College of Agriculture until a building of 62,014 sq. ft. floor space is completed.

[c]Temporarily housed in buildings of other colleges.

[d]Temporarily housed in college buildings until a new building of 78,176 sq. ft. floor space is completed.

Table 14.2. Building under construction, P.A.U., January 1, 1970

Purpose	Capacity (Sq. ft.)	Expected date of completion
Isotope Laboratory	9,054	31. 3.1970
College of Basic Sciences	62,014	31.12.1971
Library	78,176	31. 3.1972
Farmers' Home	34,370	15. 3.1970
Home Science College Hostel Block for 75 Girls (C_1)	13,231	31. 3.1970
Glass-house	13,440	30. 6.1970
Food and Dairy Science Technology	11,618	30. 6.1970
Sub-station for Grain Storage Institute	12,568	31.12.1970
Field Stores and Field Laboratories	9,639	31. 3.1970
Students Home	6,350	31. 3.1971
12 Nos. IX Type Faculty Houses	24,660	31. 3.1971
12 Nos. X Type Faculty Houses	14,976	31. 3.1971

Table 14.3. Efficiency of selected classrooms and laboratories, P.A.U.

Lecture Room No.	Efficiency* %	Laboratory Designation	Efficiency* %
1	68	Chemistry and Biochemistry	51
2	80	Botany and Plant Pathology	38
3	82	Mathematics, Statistics, Physics	68
4	80	Zoology and Entomology	42
5	68	Genetics	43
6	58	Horticulture	50
7	75	Animal Science	32
8	80	Soils	40
9	68	Plant Breeding	30
—	—	Extension	40
Average	73	Average	44

$$*\text{Efficiency} = \frac{\text{Hours used}}{\text{Hours available}} \times 100$$

Maintenance, Housekeeping and Appearance

As one arrives on the campus of the Punjab Agricultural University the impression of neatness, tidiness and generally good maintenance meets the eye. Upon a more detailed inspection some unsightly spots are found which could be removed or screened from view by planting of trees and shrubbery. However, on any campus where a large scale building programme is underway some unsightly areas around the building sites and the area to which building materials are delivered are to be expected. On the other hand, unsightly areas either around or within buildings that have been occupied for some time should not be condoned.

The University buildings are regularly painted from both inside and out side and the housekeeping both internally and in the surrounding area is quite good. Day to day housekeeping and maintenance requires constant vigilance, and laxity in supervision breeds carelessness and untidy habits.

Years ago under the leadership of Vice-Chancellor P.N. Thapar the ideals of cleanliness, tidiness and appearances were publicly stated in the following paragraphs quoted from his introduction to the Third Annual Report of the University.

> "A very famous physician is reported to have said that the essence of sanitation is aesthetics. There are others who would consider a sense of beauty to be the basis of even ethics and morality. But this much has to be admitted that one of the main causes of the carelessness, slovenliness and untidiness that we find in our people is the unclean, untidy and often positively ugly environment in which they have grown up. An artistic refinement in our surroundings is bound to have a healthy effect on our physical, mental and intellectual development. Well laid out, well-kept lawns and colourful flower-bearing trees and shrubs should, therefore, have an important place in the planning of any university campus and doubly so in an Agricultural University where landscape gardening is a part of the course work of many students majoring in Horticulture.
>
> "A special feature of landscape work carried out in the University is that all the plant material required has been raised in the ornamental nursery of the Ludhiana Campus under the most favourable conditions and three-to five-year old trees are lifted and planted at the site as soon as the buildings are ready. While the effect is the same as what would be obtained, had the trees been transplanted many years before, the task of caring for the trees becomes very much easier.
>
> "Rows of trees planted on the periphery will serve as wind-breakers and will protect the experimental crops from the ravages of the hot dry winds. Generally the emphasis is on the more permanent plants

and the use of hedges and seasonal plants is being reduced to the minimum. All along the roads are planted beautiful ornamental trees which will flower at different times of the year, and this will make the campus colourful all the year round and also provide shade to the passer-by. During the year under review (1964-65) about five thousand Eucalyptus and Sissoo trees were planted along the periphery, about five hundred ornamental trees along the roads and about five thousand trees, shrubs and climbers in the residential quarters."

This beautification plan has been followed and expanded under the present administration.

CHAPTER 15

The Linkages to Other Institutions

An attitude to 'reach-out' and to keep the door open for others to 'reach-in' is characteristic of a progressive democratic institution. Tribal organizations, however, shun contacts with outsiders. The distinguishing character of an agricultural university is its ability to be responsive to collaborative needs and cooperate freely and fully. The P.A.U. Act enjoins the University to cooperate with other universities and authorities in such manner and for such purposes as the University may determine. To study this aspect, information regarding the relationships of the department and colleges with other organizations was obtained through questionnaires. The following responses reveal a variety of attitudes concerning the linkages to be developed. "The Department is open to other Universities on reciprocal basis." "Help whom we can but no special relationship." "Co-operation is always promoted."

To a question how have relationships with other organizations and groups been strengthened in the past two years, the responses were few in number.

Linkages With Research Agencies

Relationships with other research institutions are inadequately developed, except for the coordinated schemes of research fostered by the I.C.A.R. In the case of coordinated schemes continuous and sustained interest and exchange of information are promoted through links of co-ordinators. A relationship has been developed with the Indian Agricultural Research Institute, Statistics Section, New Delhi, for the use of its computers. Similar linkages have been developed in library services. The Department of Veterinary Medicine look to the Indian Veterinary Research Institute, Izatnagar, and National Dairy Research Institute, Karnal, for leadership and assistance.

The Department of Zoology and Entomology has good linkages with the Central Rice Research Institute, Cuttack; Indian Institute of Sugarcane Research, Lucknow; Forest Research Institute, Dehradun; and Zoological Survey of India. The Chemistry and Biochemistry Department has liaison with the Central Food Technological Research Institute, Mysore. The Department of Botany and Plant Pathology has linkages with the Indian Agricultural Research Institute, New Delhi.

State Agricultural Agencies

Satisfactory linkages have been developed with the State Government Department by the University. The Directors of Research and Extension Education, heads of departments of Plant Breeding, Soils, Botany and Plant Pathology, Zoology and Entomology, Extension Education, Economics and Sociology, Agricultural Engineering and Animal Sciences, have working contacts with the concerned State departments. These officers are associated with the framing of the State's development and research projects and in training State Extension officers and farmers; they also function as expert advisors on State committees. The relationship between the University and the State departments of Agriculture and Animal Husbandry could be strengthened by a carefully developed scheme of personnel exchange. Such a programme could bring the benefits of field experience to the University and the benefits of the most modern research and education techniques to the State departments.

There is collaboration with the State's agencies in implementing research recommendations, training of farmers, arranging exhibitions, e.g. family planning by the Home Science College. The University provides service in testing of soil and irrigation water samples, and analysing samples of food, feed and composts.

Modernizing Indian Agriculture, a 1969 report on the Intensive Agricultural District Programme (I.A.D.P.), observed that "no effective links between agricultural universities and the extension agency in the State Department of Agriculture has been developed." Though this observation does not apply to the P.A.U., there is need for a better integrated relationship with the subject matter specialists of the I.A.D.P. who are unlike other district State employees.

I.C.A.R., Universities and Colleges

Punjab Agricultural University's close contact and relationship with the I.C.A.R., which is also the coordinating body in the field of agricultural education in addition to agricultural research, provides it with an important linkage with other universities and institutions in the country. The contacts are mostly with agricultural universities, the Indian Agricultural Research Institute, New Delhi, and the Indian Institute of Veterinary Research, Izatnagar. These are in connection with recruitment of staff, examination of students, evaluation of theses, visits of students and teachers, courses and curricula, exchange of plant material and publications, seminars and workshops.

Links have been forged to permit graduate students to avail of research facilities at N.D.R.I., Karnal, for their degree programme. The Extension

Education Department circulates summaries of research of graduate students to sister departments of extension education. Similarly, the Department of Economics and Sociology shows initiative in making publications available to other institutions. Orientation courses in human nutrition were conducted at the P.A.U. for the teachers of Veterinary Medicine and agricultural colleges under the joint auspices of the I.C.A.R., U.N.I.C.E.F. and F.A.O. Specialized training is imparted in micronutrient analysis to workers from other universities. Summer institutes in soil science and water management have been conducted.

Association of Agricultural Universities

A Workshop for Agricultural Universities was staged at U.P.A.U., Pantnagar, in 1963. This occasion provided a useful forum for the exchange of ideas. In 1965 a second Workshop was held at P.A.U. At this time the formation of an Association of Indian Agricultural Universities was discussed and plans were tentatively agreed upon to move ahead with the formation of an Association. Because of some unfortunate circumstances the formation of an Association was delayed until October 1969 when the decision was taken at the Bangalore Conference on Agricultural Education to form an Association and officers were elected.

The First Convention of the Association of Agricultural Universities was held at the Punjab Agricultural University, Ludhiana, February 23-26, 1970. Every agricultural university should take an active part in the affairs of this Association. The benefits that can be derived from the exchange of ideas and a unified approach to the solution of problems of mutual concern are almost limitless. The Punjab Agricultural University should take pride in the part it has played in helping this organization get started.

Contacts with Graduates

Every agricultural university should maintain contact with its graduates through an active Alumni Association. A continuing relationship of this kind can be helpful to both the university and its Alumni. As time goes on, some of the Alumni will hold high positions in government, industry and education. If they are kept in touch with the university and are made aware of the problems and progress being made, they may be in a position to lend a helping hand. The university in turn can keep its Alumni informed of opportunities that may be open to them.

A strong and active Alumni Association can be one of the greatest asssets of any university. So far, the agricultural universities in India have been negligent in developing this asset.

Library Linkages

The P.A.U. Library is to be commended for keeping the windows of the University open to the outside world by developing a library exchange programme an inter-university loan programme, and for developing a reprographic section which can supply copies, xerographic or microfilm, upon request from anywhere in the world. It is significant also that the University Library Committee includes two librarians from other institutions as members.

Professional Societies and the Scientific Community

Though some of the faculty members are members of professional societies, there is need for a larger number to join and participate in the activities of scientific societies relating to their disciplines. A few local chapters of scientific societies have been established at Ludhiana. Some of the faculty members hold offices and serve as Executive Committee members, Editors and Vice-President of these local chapters. A number of faculty members are actively associated with the Indian Standards Association.

The I.C.A.R. should devise ways and means for promoting the publication of journals dealing with individual or related disciplines so as to discourage each university from publishing research journals covering all the disciplines. Publications of journals by professional societies is to be viewed as a measure for developing and strengthening the discipline.

Input and Output Firms and Credit Agencies

Representatives of input supply and output marketing firms and credit institutions contact the departments and colleges of the P.A.U. for testing of new inputs, uses and doses for inputs, securing recommendations about candidates for employment, grant of scholarships and for addressing their trainees. That this is an activity to be promoted is generally recognized.

The Department of Economics and Sociology conducts research for Hindustan Lever, Punjab Cooperative Union, D.C.M., and banks. Representatives of agricultural engineering industries are members of P.A.U.'s Committee on Agricultural Implements and Farm Machinery. The Department of Plant Breeding supplies foundation seed to the National Seeds Corporation. Collaboration with the Agro-Industries Corporation is under consideration. The departments and colleges should strengthen these linkages with these marketing and credit agencies and develop formal arrangements leading to mutual benefits.

Funding Agencies

Some regard the funding agencies merely as sources for procuring equipment, whereas others regard them as resources which the aggressive heads of departments tap for developing their disciplines and new lines of work. PL 480 funds finance a number of research schemes. The Ford Foundation has assisted in developing the College of Agricultural Engineering, equipping it and training its staff. It has financed a cooperative water-use management trial in Ludhiana. The Rockefeller Foundation has assisted in a number of coordinated programmes of crop improvement, development of the research farm, and in training of staff members. The Ohio State University/U.S.A.I.D. Programme has been a major contributor in training of staff members, providing equipment and books and the technical assistance of experienced teachers from the Ohio State University who have worked with their Indian counterparts in developing the P.A.U.

The building up and strengthening of relationships is a matter of personal initiative and contacts. It is by sharing work, experience and knowledge that linkages are forged by departmental heads and college deans. The fact that many countries provide 'knowledge' and share in India's developmental effort, should be an eye-opener to those who have been brought up in the exclusive tradition of keeping knowledge within the family.

CHAPTER 16

P.A.U. and Rural Welfare

Punjab Agricultural University is a young institution. There are as many students now enrolled as received degrees during the seven-year period from 1963 to 1969. A good share of the graduates have nearly full careers of service ahead of them. Much of the research has been but recently initiated, and the results are awaited. Research in Home Science is in its infancy and the College of Veterinary Medicine is hardly six months old on the Ludhiana Campus. The extension education programme continues to gain momentum. Thus, it is not possible to judge the full significance of P.A.U. either in terms of its actual or potential benefits to the rural society. At the same time, the new institution has made contributions that are clearly identifiable.

New and Adapted Varieties

Space does not permit even a brief comment regarding all of the new and adapted varieties which have been released for planting in the Punjab during recent years but they include high-yielding or improved varieties of wheat, bajra, sarson (mustard), til (sesame), rice, groundnut, maize, sugarcane and cotton. In all, since 1966, 17 new or adaptive varieties have been released.

Wheat. The development of new wheat varieties and the adaptive research on exotic varieties have received wide acclaim. The dwarf wheat varieties P.V. 18 (released in 1966-67) and Kalyan 227 (released in 1967-68) are widely grown in the Punjab and in other parts of India as well. These varieties were developed in cooperation with the Rockefeller Foundation from parent stocks imported from Mexico. These varieties along with irrigation, fertilization, and improvements in cultural practices have resulted in a virtual doubling of average Punjab wheat yields in less than a decade.

Bajra. Hybrid Bajra No. 1, developed at P.A.U., represents a scientific achievement which is recognized throughout the world. This variety is acclaimed to be "by far the best pearl millet that India had ever seen."[1] Farmers in other countries have also accepted this outstanding variety. In a series of demonstration plantings arranged by the Union Ministry of Agriculture, yields ranging from 3,500 to about 6,000 pounds per acre were achieved compared to the national average of 350 to 400 pounds per acre.

[1]Streeter, Carroll P., *A Partnership to Improve Food Production in India*, New York, The Rockfeller, Foundation, 1969, pp. 62-65.

The increase in bajra production in the southwestern districts of the Punjab and in Haryana since 1966 can, in a large measure, be attributed to the growing of this hybrid. Average yields in Punjab doubled in a period of three years.

Rice. The adaptive research on Norin 18 and IR. 8 rice which led to their release to Punjabi farmers in 1967-68 and 1968-69, respectively, played an important part in the increased rice production in the Punjab during recent years. Average yields have increased by one-third although less than 10 per cent of the rice area is sown to high-yielding varieties.

Other Crops. Crop improvement continues; 8 additional varieities have been approved by the Variety Evaluation Committee and are awaiting release. In addition to some of the crops mentioned above those awaiting release include: guar, cowpea, soybean, jowar, gram (varieties for both irrigated and rainfed areas) and B.P. type 3, an annual grass.

The work of the plant breeder never ends. At the Punjab Agricultural University work continues in the development of better high-yielding varieties, but in addition to this attention is now being given to improving the nutritive quality of the food-grains. If varieties of soybean could be developed which would be profitable in the Punjab, when combined with wheat in the cropping pattern, a more nearly balanced diet for the people of India would result.

New varieties of horicultural crops have been developed and cultural practices permitting the introduction of plants not commonly grown in the Punjab have been developed. For example, the cultivation of grapes and dates is increasing, particularly in the southwestern area of the State, which already has a well developed citrus industry. The Regional Research Station at Abohar has had a major impact in the development of the fruit and cotton industries of this area.

Production Research and Services

The testing of soils as a basis for sound fertilization treatment and ground water to determine its suitability for irrigation purposes have become quite popular in the Punjab. The magnitude of this service to farmers is recorded elsewhere in this Report. The significance of this service in the judicious use of fertilizers is obvious.

Deficiencies in certain minor elements, particularly zinc have been found in certain districts in the State; foliar sprays to overcome this deficiency have been successfully used in citrus growing area. Within the last year, zinc deficiency has been found to result in serious damage to the wheat crop in certain areas. If zinc sprays are applied when the deficiency symptoms first appear the recovery is reported to be dramatic and the loss of the crops prevented. With an effective system of extension education

to keep the farmer abreast of changing technologies it is safe to predict that the inclusion of trace mineral nutrients in the chemical fertilizer mixture will soon find wide acceptance.

Cultural practices adapted to the new varieties come under study and the improved practices are carried to the countryside by the Extension Service. Such things as depth and time of planting, rate of seeding, spacing density of plant population, amount and placement of fertilizer, time and amount of irrigation, and control of weeds are put under careful study and the optimum practice determined. Experience has shown that unless some of these optimum practices are followed within rather narrow limits the improved variety does not yield much better than the old.

When the optimum package of practices is developed and agreed upon by the researchers as sound and the extension specialists as applicable under farm conditions they are published and training schools are held at various levels to acquaint all of those in the Department of Agriculture and the Extension Field Service of the University, with the recommended package of practices. In this way the up-to-date recommendations for both the summer and winter crops are carried to the farmer on a State-wide basis and everyone is making the same recommendations.

Many segments of the University are making contributions to the "Green Revolution". The biochemists are producing inocula for leguminous seeds and testing the quality of the new varieties. The plant pathologists and entomologists are protecting the crops from plant diseases and insect pests, and the statisticians are improving the research design and the analysis of research data.

Advances in Agricultural Engineering

The agricultural engineers have developed seed and fertilizer drills, grain storage bins, grain harvesters, groundnut and potato diggers, and improved hand tools. They have also developed measures for draining water-logged land, lining irrigation water courses and the design of irrigation systems.

Farm mechanization in the Punjab has progressed at a very rapid rate. The use of tractors, mechanical threshers, tractor drawn field equipment, electrical and diesel powered pumping sets—to name a few of the major items—have increased by leaps and bounds during recent years. In fact the demand for some of these items has exceeded the supply and a black-market has developed.

Economics of A Changing Agriculture

Economic studies have been conducted to determine relative crop profitability, and the costs and returns from new varieties and other

practices. Procedures for farm business planning have been developed and farm record books have been introduced. Research in economics and sociology provides the basis for the University to advise the Government in agricultural policy matters such as procurement prices, agricultural taxation, marketing organization, and land reforms.

Role Played by Graduates

As many as 152 of the 341 graduates of the College of Agriculture in 1968-69 secured admission to Master's programmes at P.A.U. It is understandable that there should be a desire amongst graduates to improve their qualifications. Most of the postgraduate and graduate students after passing out from the P.A.U. secure service within the University or with the State Department of Agriculture. Recently the banks which advance credit to the farmers and fertilizers and pesticide manufacturers and distributors have employed some agricultural graduates. The opportunities for the employment of more graduates in the agro-industries sector should be explored. The impact of the products of the P.A.U. is largely felt by the farming community through the University or the State Department of Agriculture. The first class of Engineering graduates has recently been absorbed, mostly in services allied to agriculture. It is too early to determine the impact of graduates and postgraduates on the society and the agricultural economy.

Recognition of the University by Leaders

Owing to the conspicuous impact of the P.A.U. on the agricultural production in Punjab, the public leaders have a high regard for the University. Officials of Government as well as non-officials recognize publicly the contribution of the P.A.U. in solving the food problem. A large number of visitors from different parts of India and abroad are attracted to visit the P.A.U. because of its high reputation.

Farmer Recognition of University Role

The increasing numbers of farmers who attend Kisan Mela at the Ludhiana Campus, and field days at the regional research stations, the sustained interest in the training courses and camps conducted by the University and the calls that are made by the farmers on the P.A.U. staff are evidences of confidence of farmers that the University can teach them as well as solve their problems.

The large number of language copies that are sold of *Punjab Agricultural Hand Book, Package Practices for Kharif and Rabi Crops, Progressive*

Farming and of farm bulletins are indicative of the farmers' faith in the usefulness of the P.A.U.'s publications.

When one visits the farms surrounding the University, the farmers make you feel that their best blessing is the University. This confidence in the University's ability to manage well and deliver the goods leads some farmers to suggest that the University should be entrusted with the tasks of providing supplies and credit as well for research and education. That this would divert the University from its real role of a producer and distributor of knowledge is not generally recognized and therein lies the danger. For an agricultural university to be fully effective, there must also be other strong agricultural agencies and organizations to provide the necessary supplies and services.

The Diffusion of University Influence

The Ludhiana District of the Punjab, within which the University is located, is well known for the progress it has made. This is due, in part to its having been chosen as an Intensive Agricultural District at about the same time the University was founded. Other areas of the State are now not far behind. While the Ludhiana District has led the State in overall agricultural production other districts are rapidly catching up. Data on the changes in agricultural production and the use of inputs have been recorded in this report. There is no longer such a wide disparity between the food-grain production performance of the Ludhiana District and that of the more remote areas of the State. The research programme and the extension service of the University are paying off, the transfer of knowledge from the University laboratories and experimental fields to village farms will keep the "Green Revolution" rolling.

To determine just how much of the tremendous increase in food production can be attributed to the Punjab Agricultural University would be an impossible task. Without the necessary inputs of fertilizer, credit, plant protection chemicals, profitable prices, improved seeds and industrious farmers, the University could have little or no impact. Similarly without the output of the Punjab Agricultural University in terms of educated people, research results and the "know how" of extension education the use of the available inputs would go begging. But when all of the elements are assembled in a balanced programme effort the results are likely to exceed the expected.

Appendix

Appendix Table 1. Staff strength by Ranks, P.A.U. Colleges and Departments, 1963-64 to 1970

COLLEGE OF AGRICULTURE

Departments and Faculty Ranks	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Agronomy							
Professor or equivalent*	—	—	—	—	—	—	1
Associate Professor or equivalent	—	1	1	1	1	2	2
Assistant Professor or equivalent	2	2	3	3	4	4	3
Lecturer or equivalent	4	4	4	4	5	5	4
Research Assistant or equivalent	—	1	1	1	—	—	1
Animal Science							
Professor or equivalent	—	—	1	1	1	1	—
Associate Professor or equivalent	—	—	1	1	1	2	3
Assistant Professor or equivalent	—	—	5	7	7	8	5
Lecturer or equivalent	—	—	4	7	7	7	6
Research Assistant or equivalent	—	—	—	1	1	1	1
Extension Education							
Professor or equivalent	—	1	1	1	1	1	1
Associate Professor or equivalent	—	1	1	2	2	3	3
Assistant Professor or equivalent	—	21	24	23	27	29	34
Lecturer or equivalent	—	8	18	19	18	18	12
Research Assistant or equ valent	—	—	—	—	—	—	—

*Equivalent = Other professional personnel in the same salary range.

Appendix Table 1. Continued.

Departments and Faculty Ranks	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Food Science							
Assistant Professor or equivalent*	—	—	—	—	—	1	1
Lecturer or equivalent	—	—	—	—	—	2	2
Horticulture							
Professor or equivalent	1	1	1	1	1	1	3
Associate Professor or equivalent	3	3	2	3	5	6	7
Assistant Professor or equivalent	5	10	11	11	12	9	12
Lecturer or equivalent	2	2	5	5	6	5	6
Research Assistant or equivalent	11	13	15	18	19	22	25
Plant Breeding							
Professor or equivalent	1	1	1	2	2	2	2
Associate Professor or equivalent	8	7	10	7	9	11	12
Assistant Professor or equivalent	23	28	26	37	37	36	38
Lecturer or equivalent	—	1	1	—	—	2	3
Research Assistant or equivalent	66	58	59	48	57	65	63
Soils							
Professor or equivalent	—	—	—	—	—	1	2
Associate Professor or equivalent	—	2	2	2	2	3	4
Assistant Professor or equivalent	—	7	6	5	3	4	8
Lecturer or equivalent	—	7	7	7	—	4	3
Research Assistant or equivalent	—	—	—	—	3	—	15
Total Staff Strength of the COLLEGE OF AGRICULTURE:	126	179	212	217	231	255	282

*Equivalent=Other professional personnel in the same salary range.

Appendix Table 1. Continued.

COLLEGE OF BASIC SCIENCES AND HUMANITIES

Departments and Faculty Ranks	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Botany and Plant Pathology							
Professor or equivalent*	1	1	—	—	—	1	1
Associate Professor or equivalent	1	1	2	2	3	2	5
Assistant Professor or equivalent	3	6	4	6	7	7	8
Lecturer or equivalent	—	6	5	7	8	8	8
Research Assistant or equivalent	6	3	5	3	4	4	5
Chemistry and Biochemistry							
Professor or equivalent	1	1	2	2	2	2	2
Associate Professor or equivalent	1	6	5	4	7	5	4
Assistant Professor or equivalent	8	13	14	11	17	15	14
Lecturer or equivalent	—	5	5	4	8	5	4
Research Assistant or equivalent	7	8	8	9	11	12	12
Economics and Sociology							
Professor or equivalent	1	1	1	1	1	1	1
Associate Professor or equivalent	—	2	2	2	2	1	1
Assistant Professor or equivalent	1	9	9	7	5	10	12
Lecturer or equivalent	—	4	5	4	3	2	3
Research Assistant or equivalent	5	12	12	14	18	17	14
Genetics							
Professor or equivalent	—	—	—	—	—	—	—
Associate Professor or equivalent	—	1	1	1	1	—	2
Assistant Professor or equivalent	—	—	—	1	2	2	2
Lecturer or equivalent	—	1	1	1	2	1	1
Research Assistant or equivalent	—	—	—	—	—	—	—

*Equivalent = Other professional personnel in the same salary range.

Appendix Table 1. Continued.

Departments and Faculty Ranks	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Languages and Culture							
Professor or equivalent*	—	—	—	—	—	—	—
Associate Professor or equivalent	—	—	—	—	—	—	—
Assistant Professor or equivalent	2	3	5	5	4	5	7
Lecturer or equivalent	2	3	2	1	3	3	3
Research Assistant or equivalent	—	—	—	—	—	—	—
Mathematics and Statistics							
Professor or equivalent	—	1	1	1	1	1	1
Associate Professor or equivalent	—	1	1	1	1	2	2
Assistant Professor or equivalent	—	4	6	7	7	5	6
Lecturer or equivalent	—	3	4	5	6	8	7
Research Assistant or equivalent	—	—	—	—	—	—	—
Microbiology							
Professor or equivalent	—	—	—	—	—	—	—
Associate Professor or equivalent	—	—	—	—	—	—	—
Assistant Professor or equivalent	—	—	—	—	—	1	2
Lecturer or equivalent	—	—	—	—	—	—	—
Research Assistant or equivalent	—	—	—	—	—	—	—
Zoology and Entomology							
Professor or equivalent	1	1	1	1	1	1	1
Associate Professor or equivalent	2	4	4	5	5	5	5
Assistant Professor or equivalent	6	8	9	10	11	12	13
Lecturer or equivalent	5	6	7	6	4	6	6
Research Assistant or equivalent	13	18	19	19	17	18	18
Total Staff Strength of the COLLEGE OF BASIC SCIENCES AND HUMANITIES:	66	130	140	140	161	162	170

*Equivalent = Other professional personnel in the same salary range.

Appendix Table 1. Continued.

COLLEGE OF AGRICULTURAL ENGINEERING

Departments and Faculty Ranks**	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Agricultural Engineering							
Professors or equivalent*	1	1	—	1	1	1	1
Associate Professor or equivalent	2	3	7	8	8	7	9
Assistant Professor or equivalent	1	3	6	8	10	12	10
Lecturer or equivalent	2	2	2	3	2	2	14
Research Assistant or equivalent	—	—	—	—	—	—	—
Civil Engineering							
Professor or equivalent	—	—	—	—	1	1	—
Associate Professor or equivalent	—	—	—	2	3	3	3
Assistant Professor or equivalent	—	—	—	5	4	4	4
Lecturer or equivalent	—	—	—	—	—	—	—
Research Assistant or equivalent	—	—	—	—	—	—	—
Electrical Engineering							
Professor or equivalent	—	—	—	—	—	—	—
Associate Professor or equivalent	—	—	—	—	1	1	1
Assistant Professor or equivalent	—	—	—	4	4	4	4
Lecturer or equivalent	—	—	—	—	—	—	—
Research Assistant or equivalent	—	—	—	—	—	—	—

Appendix Table 1. Continued.

Departments and Faculty Ranks**	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Mechanical Engineering							
Professor or equivalent	—	—	—	—	—	—	—
Associate Professor or equivalent	—	—	1	2	3	3	3
Assistant Professor or equivalent	—	—	—	4	4	4	5
Lecturer or equivalent	—	—	—	—	—	—	—
Research Assistant or equivalent	—	—	—	—	—	—	—
Total Staff Strength of the COLLEGE OF AGRICULTURAL ENGINEERING:	6	9	16	37	41	42	54

*Equivalent=Other professional personnel in the same salary range.

**Departments of the College of Agricultural Engineering were not organized before 1966-67.

Appendix Table 1. Continued.

COLLEGE OF HOME SCIENCE

Faculty Ranks	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Professor or equivalent*	—	—	—	—	—	—	—
Associate Professor or equivalent	—	—	—	—	1	1	1
Assistant Professor or equivalent	—	—	—	2	4	6	6
Lecturer or equivalent	—	—	—	1	5	5+1†	6+1†
Research Assistant or equivalent	—	—	—	—	—	—	2
Total Staff Strength of the COLLEGE OF HOME SCIENCE:	—	—	—	3	10	13	16

*Equivalent = Other professional personnel in the same salary range.
†Sports Assistant.

Appendix Table 1. Continued.

COLLEGE OF VETERINARY MEDICINE

Departments and Faculty Ranks	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Anatomy and Histology							
Professor or equivalent*	—	—	—	—	—	—	1
Associate Professor or equivalent	—	—	—	—	—	—	—
Assistant Professor or equivalent	—	—	—	—	—	—	1
Lecturer or equivalent	—	—	—	—	—	—	2†
Bacteriology and Parasitology							
Professor or equivalent	—	—	—	—	—	—	—
Associate Professor or equivalent	—	—	—	—	—	—	2
Assistant Professor or equivalent	—	—	—	—	—	—	3
Lecturer or equivalent	—	—	—	—	—	—	4†
Veterinary Surgery and Gynaecology							
Professor or equivalent	—	—	—	—	—	—	—
Associate Professor or equivalent	—	—	—	—	—	—	2
Assistant Professor or equivalent	—	—	—	—	—	—	2
Lecturer or equivalent	—	—	—	—	—	—	2†
Pharmacology and Medicine							
Professor or equivalent	—	—	—	—	—	—	1
Associate Professor or equivalent	—	—	—	—	—	—	1
Assistant Professor or equivalent	—	—	—	—	—	—	2
Lecturer or equivalent	—	—	—	—	—	—	4†

*Equivalent = Other professional personnel in the same salary range.
†Of the 16 sanctioned posts of Lecturers 13 are now filled by substitute.

Appendix Table 1. Continued.

Departments and Faculty Ranks	June 1963-64	June 1964-65	June 1965-66	June 1966-67	June 1967-68	June 1968-69	Jan. 1, 1970
Pathology							
Professor or equivalent	—	—	—	—	—	—	—
Associate Professor or equivalent	—	—	—	—	—	—	2
Assistant Professor or equivalent	—	—	—	—	—	—	1
Lecturer or equivalent	—	—	—	—	—	—	2†
Veterinary Physiology							
Professor or equivalent	—	—	—	—	—	—	1
Associate Professor or equivalent	—	—	—	—	—	—	—
Assistant Professor or equivalent	—	—	—	—	—	—	3
Lecturer or equivalent	—	—	—	—	—	—	2†
Total Staff Strength of the COLLEGE OF VETERINARY MEDICINE:	—	—	—	—	—	—	38
TOTAL STAFF STRENGTH OF UNIVERSITY (Ludhiana: Punjab)	198	318	366	397	443	462	560

*Equivalent = Other professional personnel in the same salary range.

†Of the 16 sanctioned posts of Lecturers 13 are now filled by substitute.

Appendix Table 2. Distribution of Credits, Punjab Agricultural University Baccalaureate Degree Programmes

	Basic Sciences		Humanities		Core courses		Core courses, allied faculties		Elective
B.Sc. Agri. 4 year Programme	Bot. and Pl. Phys.	10	Econ. and Soc.	17	Agron.	26	Ag. Engg.	8	20
	Chem. and Biochem	18	Lang.	16	Pl. Path.	6	Ani. Sc.	12	
	Genetics	4			Ext.	8			
	Math. and Stat.	21			Hort.	12			
	Micro.	3			Pl. Br.	7			
	Zoology	9			Soils	15			
					Ent.	10			
(222 Credit hours. required)	Total	65		33		84		20	20
B.Sc. Agri. Engineering	Bot. and Pl. Phys.	5	Econ. and Soc.	10	Agr. Eng.	45	Agron.	5	—
	Chem. and Biochem	6	Lang.	8	Civil Engg.	32	Ani. Sc.	5	
	Math. and Stat.	25			Elect. Engg.	18	Ext.	3	
	Micro.	3			Mech. Engg.	39	Soils	8	
	Zoology	4					Ent.	4	
(220 Credit hours. required)	Total	43		18		134		25	—
B.Sc. Home Science	Bot.	5	Econ. and Soc.	16	App. and Fn. Art.	6	Ani. Sc.	4	30
	Chem. and Bio.	11					Hort.	6	
	Math. and Stat.	10			Child Develop.	20	Ent.	3	
	Micro.	3	Lang. and Cult.	13	Clothing and Text.	20			
	Zoology	9			Foods and Nutr.	20			
					Home Mgt.	20			
					H. Ext.	20			
(216 Credit hours. required)	Total	38		29		106		13	30

B. V. Sc.	Genet.	4	—	—	Anat.	27	Agron.	3	
	Stat.	3			V.B. and Hy.	22	Ani. Sc.	32	
					Vet Cli.	17	Ext.	7	
					Vet. Gyn. and Obs.	14			
					Vet. Med	23			
					Vet. Paras.	15			
					Vet. Path.	18			
					Vet. Phy.	40			
					Vet. Surg.	18			
(243 Credit hours. required)	Total	7		—		194		42	—
B.Sc. Ani. Science[a]	Bot. and Pl. Phys.	8	Econ. and Soc.	14	An. Br.	12	Agron	10	20
	Chem. and Biochem	14	Lang.	9	An. Nut	16	Ag. Eng.	3	
	Gent.	7			An. Pr. Phys	14	Ent.	5	
	Math and Stat	21					Soils	4	
	Micro	3			Lv. Prod. Manag.	23	Anat.	12	
	Phys. Chem	9					V. Bact.	3	
	Zool.	3					V. Med.	6	
(216 Credit hours. required)	Total	65		23		65		43	20

[a]Animal Science Curriculum. Haryana Agricultural University.

Appendix Table 3. Per cent of resources devoted to teaching, research, extension and administration by P.A.U. departments, 1969-70[a]

Department	Teaching	Research	Extension	Administration
College of Agriculture				
Agronomy	66	33	1	0
Animal Science	82	12	0	3
Extension Education	25	2	66	7
Horticulture	13	67	20	0
Plant Breeding	16	67	17	0
Soils	24	64	12	0
Food Science	NA	NA	NA	NA
College of Basic Science and Humanities				
Botany and Plant Pathology	67	25	5	3
Chemistry and Biochemistry	33	64	0	5
Economics and Sociology	31	51	18	0
Genetics	63	34	0	3
Languages and Culture	86	10	0	4
Mathematics and Statistics	92	1	0	7
Microbiology	99	0	0	1
Zoology and Entomology	27	54	13	6
College of Agricultural Engineering				
Agricultural Engineering	31	57	12	0
Civil Engineering	NA	NA	NA	NA
Electrical Engineering	65	10	15	10
Mechanical Engineering	60	15	20	5

[a]Estimates of department heads; administration includes only that not clearly associated with the teaching, research, and extension functions; NA = not available.

Appendix Table 3. (Continued)

Department	Teaching	Research	Extension	Administration
College of Home Science				
Child Development	90	5	5	0
Clothing and Textiles	100	0	0	0
Home Science Education and Extension	50	10	40	0
Home Management	100	0	0	0
College of Veterinary Medicine				
Anatomy and Histology	80	10	0	10
Veterinary Bacteriology	50	45	0	5
Veterinary Physiology	40	40	15	5
Veterinary pharmacology and Medicine	60	20	10	10
Veterinary Pathology	NA	NA	NA	NA
Veterinary Surgery and Gynaecology	80	0	10	10