Evaluation of USAID Project for Development

of

Faculty of Agriculture

Jordan University

by

Glenn Beck
Russell O. Olson
John S. Robins

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INTRODUCTION

Team members arrived in Amman on June 24 and proceeded during the period of June 25 to July 2 to perform the review and prepare a preliminary report. Following a briefing session with Mission staff on June 25, the review included interviews and in-depth discussions with a variety of agency, institutional and organizational representatives; review of an array of documents, mainly those of AID and the Faculty of Agriculture; and two field trips, one to the Jordan Valley and one to the north of the country.

In addition to the Faculty of Agriculture, AID and Contractor representatives, we spent considerable time with governmental and quasi-governmental agency people including the National Planning Council, the Jordan Valley Authority, the Ministry of Agriculture and the Jordan Cooperative Organization. Thrust of the discussions with the latter groups was to identify as best we could both their perceptions of the Faculty of Agriculture--what it is and where it is in development--and more importantly the degree to which its role and functions in the agricultural system of the country had been worked out and were understood. Our report will reflect significantly on these points. Interactions with the Faculty, other University officials and AID addressed these points as well but also dealt more in depth with progress to date and future goals and plans for development of the Faculty and its programs.

We hope this report will be responsive to concerns of AID at all levels and that it will be useful to the Contractor and especially to the Faculty of Agriculture as they look ahead.

A. Examination of the Faculty

The Faculty had not prepared any formal documentation specific to this review as suggested in the TR. Two other recent activities--an internal all-University evaluation on their 15th anniversary and a government-wide review of agricultural programs with special attention to research and extension--had produced documentation that was illuminating and useful in our discussions.

We were generally pleased at the attention given by the Faculty to definition of their mission, their efforts to put in place the resources needed to respond to it, the manner in which they had organized in a very short time period and the progress made in managing their resources to get programs underway and to show accomplishment.

In research, we found in place not only a substantial long-range plan for each Department and for the Faculty (copies appended) identifying areas of needed research and priorities and areas of physical and financial resource requirements, but a quite sophisticated project planning and reporting system. Centrally in the Faculty there is also a well-documented fiscal accounting program that clearly identifies inputs to programs of teaching and research. About 60 per cent of the Faculty's resources were in research in 1976-77.

In the research project system, each member of the Faculty prepares one or more project plans each year following a well-designed format that includes financial as well as technical elements. The plans are critiqued and approved in the Department and at the Faculty level prior to allocation of resources and initiation of work. Some of the plans are submitted to the Dean for Research for possible funding from Central University sources. In fact, last year the Faculty's projects received support in an amount of 60,000 JD's which is 60 per cent of the funds available for project funding at the University level.

For each project, the faculty member is required to submit a report of progress each semester and a more complete annual report. It is known and understood that these documents are used by Faculty and University administration in evaluating performance.

Time did not permit in-depth review with each faculty member so we are not equipped to assess individual competencies or productivity. Given the rapidity with which the Faculty has been assembled (beginning with none in 1972 and increasing to 28 at present) it would be surprising to find good research competence and productivity in each. The problem has been exacerbated up until this past year by very low salaries compared to Universities in neighboring countries. Leverage in recruiting and retaining faculty was improved dramatically last year through a large salary increase.

As to dissemination of research results, matters are less well defined. Some elements will lend themselves to reports in international journals but the bulk will not due to the problem-solving nature of most projects. Specific attention to this aspect is now in progress (see Extension section).

In teaching, progress has been most acceptable and generally follows the PROP. The curriculum is quite rigorous academically (e.g., 154 credit hours required compared to 128 to 136 elsewhere in the University), All students are required in excess of 40 credits in the sciences including 8 in Biology, 14 in Chemistry, 4 in Physics, and 6 in Mathematics (calculus), but also incorporates a great deal of practical, hands-on activity. Of special interest in the latter is a requirement to spend one semester at the Jordan Valley station in a mix of academic and very practical field endeavors.

Up to now, three Departments are fully operational at the B.Sc. level (Plant Production and Protection with 11 faculty, Animal Production and Protection with 8 faculty, and Soils and Irrigation with 7 faculty). The fourth department (Agricultural Economics and Extension) has but 2 faculty and thus cannot offer a viable curriculum.

The Plant and Animal Departments have petitioned for and received approval to offer the M.Sc. degree, largely in response to the obvious needs of professionals in the Ministry and elsewhere. Although it may be a bit premature to initiate these, it appears that the minimal needed resources are or will become available over the next year or two for these programs to succeed. A potential significant benefit to research exists in this development, both in terms of student involvement in research and the leverage on recruitment and retention of competent faculty to be involved in graduate rather than solely undergraduate teaching.

One element that is not yet clear is the impact on the Faculty of Agriculture of a University decision to increase student population from about 5,000 to near 10,000. Whether this translates to a Faculty student body of 400 instead of 200 is not known at this point. With a student body of near 6,000 in 1976-77 (1st year of the growth policy) the entering class of the Faculty included applicants of which about 110 were finally admitted as Agriculture or Nutrition majors. When the fourth Department becomes operational and assuming a 30 to 40 per cent attrition rate, one might then assume about 300 in the future. We believe that the presently projected Faculty of 40 can handle this load with perhaps greater efficiency than the past projection of 200 unless space for laboratory sections becomes limiting.

The appended table shows limited statistics on the mix of students and where they came from. The first year students show a higher proportion of female students and of students of Urban and East Bank origin than was the case for those graduating in 1977, which by-the-way was the first class of the Faculty. These data should not be taken as a conclusive trend, however, since the mix in the first year class could change with expected attrition. The 4th year class began in 1973 with more than 40 students but graduated 27. No data were presented to address whether the attrition was greater or less for females or for students of Urban or East Bank origin.

No data on pre-University educational experience (private or public) nor on career goals were presented. Such data should be collected along with performance during and following the academic experience and other statistics as a basis for design or redesign of courses. curricular change, or special needs programs. In terms of major fields of study, of the 27 graduates in 1977, 12 were in Animal Production and Protection, 11 were in Plant Production and Protection, 4 were in Soils and Irrigation.

The picture in extension is much less well defined at this point than in research and teaching. A process is now underway to help resolve the nature and extent of involvement. It consists of a Faculty committee study and report to the Dean which is now under review by the full Faculty.

The report (in Arabic and not translated to English) addresses a wide range of potential involvement from conferences to training to field days and demonstrations to both informational and more technical communication and makes definitive recommendations in each area.

It is quite clear that the Faculty correctly perceives that they have neither the personnel nor physical resources to engage in any major off-campus farmer education and service (county agent type) programs. They do see opportunity, need and capacity to deliver technical and practical information and education to extension agents in the Ministry, employees of the Cooperative Organization and other agencies and organizations, to colleagues in the Research section of the Ministry and to farmers and agri-business representatives directly through a variety of written devices; through conferences, workshops and training activities; and through field days and demonstrations as their research efforts present opportunities for such. The matter of direct involvement with farmers and farm organizations is a point of controversy with the Ministry and will be dealt with in a later section.

Finally, we would offer the judgment that there is quite good popular and governmental support for the Faculty's development but that neither their role nor their programs are well understood outside the University (and perhaps inside, as well, to some extent). Clearly, the best understood and generally appreciated function is teaching and there the support and understanding are uniformly good. In research, there begins to become mixed perceptions and views and in extension the attitudes and understanding are even more muddled. The Faculty has a clear mandate for both research and extension. But so does the Ministry. And the Royal Scientific Society theoretically could engage in agricultural research as they started to at one time. The farming and agri-business communities are searching for the best help they can find, help which all agree has not been all that good out of the Ministry's research and extension programs. So the upshot is the need for clear definition and understanding of what roles the University and the Ministry can play, separately and together, to best serve Jordan's agriculture. Those roles will likely best be worked out (sometimes painfully) over time. We would encourage that these roles not be prematurely or precipitiously "cast in concrete." Both institutions are young and emerging and to establish fixed roles, especially exclusive ones, would be shortsighted and could be damaging to the longer-term interests of the country.

B. Progress to Date

The previous section addresses in substance the progress to date. In summary, we believe that progress toward the stated objectives has equalled the most optimistic projections. There has been some delay in completion of certain physical facilities beyond projected dates and the normal frustration in equipment and supplies acquisition have been encountered, but neither of these are surprising, and in fact, have been minimal compared to many such efforts. The brightest light has been the putting in place of a Faculty of sufficient competence and well enough equipped to successfully deliver a rather diverse and taxing curriculum and at the same time embark on significant research and planning for the future.

Both U.S. and Jordanian inputs have been well placed in our judgment and are beginning to produce useful outputs. Both the long- and short-term contractor participants have played important roles in stimulating Faculty and facility development and in organizing resources in teaching and in research. Especially significant has been the influence of the Senior Agriculturalist in the Animal area, the Irrigation Specialist, and the Virologist in focusing on research and development. The Engineering Specialist made significant contribution in teaching and in organization and acquisition of equipment and facilities and the Extension Specialist made great contributions in teaching and in helping to organize the thinking of the Faculty on what extension is and what it takes to succeed in that arena.

Short-term assignment of selected faculty to the U.S. has likewise been productive. Not only have these people profited in terms of knowledge acquired and techniques learned, but more importantly, they have developed contacts with colleagues in U. S. universities that will be rewarding for the indefinite future. The University of Jordan is an intellectual island and without communication and colleagial linkage such as are developed through such participation with counterpart scientists around the world, will drift to mediocre.

Estimation of the impact of external assistance is difficult to measure in terms of progress in development since provision of financial and other forms of assistance might have increased or decreased the local or other inputs supplied to the development task. Given the commitment displayed and the leadership at hand, it is likely that some of the progress "purchased" with AID funds would have been funded from other sources--external and internal to the Country and/or the University. Nonetheless, it is readily apparent that the Faculty would have been much less well equipped physically and philosophically and in a much weaker position in terms of organization for research had the Contractor and funding not been present. There is no question but that the current state of Faculty development, equipping for research and teaching, and progress in research would have been delayed by several years had the project not been in place. It is doubtful, in fact, that a first successful graduation could have occurred for some years in absence of the assistance, particularly if quality of teaching is taken into account.

So we do consider the project a substantial success up to this time as measured against the goals set forth in the PROP and we believe that the goals and objectives set forth will be fully achieved by the conclusion of the contract period. This is not to suggest that the Faculty will be "mature" at that time and free from need of further developmental assistance. This matter will be addressed later in this report.

GOALS OF THE FACULTY FOR THE NEXT 5 YEARS

A. Teaching

The size of the student body studying Agriculture is largely set by the University. The University initially set a limit of 5,000 students for the entire student body, with 200 of that number allocated for Agriculture.

Because a very large proportion of Jordanian youth complete their secondary education and aspire to a college education, the University of Jordan has been unable to accomodate many of those who are interested and qualified to go on to college. Large numbers are going abroad for higher education. There is therefore strong pressure for enlarging the intake of student and the University has expanded its maximum for the student body to 10,000. Agriculture's share will, presumably, also be increased.

The Faculty of Agriculture also intends to undertake a program for graduate studies for the master of science degree in the next few years. The faculty sees itself as a strongly research oriented faculty and as such feels it should include programs for research training not possible at the BSc level. The faculty also feels that graduate level training is one of the services it can and should provide for upgrading the staff of the Ministry of Agriculture and other agencies. These agencies now send large numbers abroad for graduate studies.

B. Research

The faculty places strong emphasis on research in its plans for the future. The departments have proposed a comprehensive list of research projects in crop production, crop protection, mechanization, animal production and protection, soils and fertilizers, irrigation, agricultural economics, nutrition and agricultural industry.

The faculty feels that a function of the University, as spelled out in a policy paper in early 1970, was that the University was to be non-traditional, that it should be concerned with development problems and bridge the gap between what is known and what is in practice. For the Agriculture faculty this means involvement in applied research in Agriculture.

The fact that the Ministry of Agriculture is also charged with doing applied research presents problems of coordination which were recognized from the start but which have not up to now been dealt with. It is recognized by the faculty, by the Minister of Agriculture and others in the Government that some

mechanism for coordinating the research of the two organizations or of defining more clearly their respective roles must be found.

C. Extension

Recently a committee was set up in the faculty of Agriculture to advise on what the university should be doing in Agricultural extension. The report of the committee is still under review and no decisions have yet been taken. The predominant role of the Ministry of Agriculture in Agricultural extension is recognized. The paper does not propose to duplicate field staff of the Ministry but to work with and through the Ministry's extensive service, strenthening it and providing information for extending to farmers. The faculty, on the other hand, feels that it must have ample opportunities to interact directly with farmers. This is seen as vital in order to insure that their research focuses on the genuine problems of farmers.

ASSESSMENT OF FACULTY RESOURCES TO MEET GOALS

A. Teaching

The Faculty now has 28 staff members in place and 11 now studying abroad with commitments to return. Even with the expanded enrollment total members of staff should be adequate though it is not apparent that this will provide the overall balance desired. For example, of the present staff 12 are in the Department of Plant Production and Protection, 8 are in the Department of Soils and Irrigation, 7 are in the Department of Animal Production and Production and only 2 are in the Department of Agriculture Economics and Extension.

The University's experience in employing qualified teaching staff during the past four years indicates that it can attract needed personnel in most of the needed disciplines (agricultural economics is the exception).

The Faculty has more attractive salaries and other incentives than the Ministry of Agriculture.

Physical facilities for the expanded teaching program appear to be adequate. Present and planned classroom space and laboratory facilities are well above requirements for the present size of student body and will be adequate for a considerably larger number of students, including master's degree students.

B. Research

The University's budget for the Faculty of Agriculture has a strong research bias. Of the more than one million JD invested in facilities during the past four years 62% was for research. Plans for the second phase - through 1980 - include an additional nearly one million JD, 60% of which will be for research equipment and facilities. This and present facilities will probably be adequate for the on-campus research projected. Present off-campus facilities are extremely limited, primarily a still to be developed research farm of 100 dunum in the Jordan Valley.

The relationships between the Ministry of Agriculture and the Faculty of Agriculture with respect to agricultural research are not well defined. Problems of coordination to avoid duplications and conflict are recognized. Some form of cooperation with the Ministry is essential. Some way should be found to utilize the resources (personnel as well as facilities) of both the Ministry and the Faculty to full advantage.

C. Extension

The Faculty has very little resources, either personnel or facilities, for extension. The best way for it to use its resources so as to effectively get the results of its research to the users and to get sufficient interaction with farmers and agriculturally related industries is the subject of an internal study by the Faculty. The report of the committee appointed for this task is now under review. Our understanding is that the Faculty will not propose a large expansion in staff or facilities for extension and will attempt, instead, to find more effective ways of working with and through the Ministry of Agriculture.

ADDITIONAL RESOURCES NEEDED

The above assessment suggests that the Faculty has made substantial progress during the first 2 years, both in its physical and human resource development and in its operational development. Included is a reasonable balance between attention to current activities and to planning for the future. It seems reasonably certain that the goals established for the project will be substantially met and in some respects exceeded by the termination date of 1979 (ex: implementation of graduate level training was not expected during the project period but is now in progress, albeit perhaps prematurely, and the newly established inter-Faculty program in Nutrition was not visualized at the outset).

As indicated earlier, however, the achievement of original project goals does not suggest that the Faculty will be mature at that point and thus able to sustain its development without further assistance. For the undergraduate teaching element, it is likely that only nominal outside assistance will be needed, such assistance being largely continued opportunity for individual faculty to interact with peers from U.S. and other developed country universities. Such opportunities include attendance at professional society meetings, short-term training visits to other universities, etc. Such activities should not require large financial commitments and should not be beyond the likely resources available from Jordanian sources.

In research, however, there will be substantial need for further assistance both in terms of continued study and exposure of faculty to successful research outside the country and especially in terms of continuing backstopping by experienced researchers from other universities or agencies. Most of the members of the faculty are young and inexperienced in research and it will be 5 to 10 years beyond the project before there develops sufficient local research leadership in the Faculty to sustain viability in that endeavor.

It seems quite clear that the long-term and continuous inter-action needed to mature the Faculty as a research establishment is beyond the capacity of the country - financially and most surely in terms of human resources. Whether such support is labeled as "institutional development assistance" or whether it is structured as one or a series of targeted research projects or programs is immaterial. What is evident is that support will be needed to assure successful development of a continuing solid research capability. Their goal is clearly to develop that capability and they need help to achieve it. And such a research base is essential to successful long-term development of the country's agriculture.

And closely related to the research development are the present and projected graduate educational programs. These are in most respects mutually supportive activities -- graduate programs require a research base and research generally benefits from graduate programs. So development of research capacity will clearly benefit graduate program development.

The linkages developed with the present contractor and with other U.S. universities through the participant training element are important to the future development of the faculty and should be continued and strengthened in future projects or programs. In addition, opportunities to link with other institutions such as the International Research Centers or to participate in collaborative research with other institutions, either under AID or other sponsorship, should be sought.

As indicated elsewhere, the extension picture is somewhat less clear. It is apparent that both the government and the Faculty are seriously addressing the question of roles and responsibilities and that the matter of the faculty's involvement will come to some resolution soon. Whatever that resolution is with respect to direct delivery of extension information and services, it seems clear that the Faculty resource can make a substantial contribution to the extension function through (1) generation and synthesis of technical information, (2) education of potential extension employees, and (3) education and training of extension workers. In effect, the Faculty resides as a potentially useful technical resource that can and should be utilized as a minimum in support of the extension program.

To deliver on this role, the Faculty will need continuing assistance in developing and maturing an informational and specialized training capacity somewhat different than that for undergraduate or graduate education. And it will need sustained help in achieving that capacity, again with significant elements from sources outside the country.

In terms of facilities and equipment, the present project along with University resources will build the minimum base for ultimate developments. Obviously, further strengthening and development of research and graduate programs will necessitate acquisition and/or development of additional specialized equipment and facilities. The extent or nature of such needs are difficult to predict at this point and we, in our brief visit, were unable to explore the question sufficiently to respond intelligently. Nor can we guess as to potential availability of domestic financial resources to meet the need.

It seems appropriate that the Mission proceed with necessary dialogue with the Host Government, the University, and others in projecting future support. In that planning activity we believe that a collaborative approach such as envisioned under Title XII should be used, i.e. involve either the present contractor or other U.S. universities in the planning process. The opportunity exists to bring a Title XII model into being and we urge that the opportunity not be lost. In such forward planning of technical assistance, the special problems emanating from the Ghor Valley development should not be neglected. Whether structured as a part of further Faculty development or treated as a separate related activity, the ultimate success of that endeavor will require continuing technical support such as now being provided by Dr. Jensen.

FUTURE ORIENTATION OF THE FACULTY OF AGRICULTURE

A. General Philosophy Within Which Goals are Established

Government and University officials in Jordan have under consideration a crucially important decision relating to the scope and role of the Faculty of Agriculture in the future development of the agricultural sector of this country. This is a new venture since Jordan has formerly sent aspiring agricultural students out-of-country for professional training. As a consequence there is a transition period in which the more traditional forms of agricultural institutions and services must adjust to the presence of an additional potentially powerful institutional arrangement. Obviously there is a tendency on the part of some to feel threatened by this new presence. Yet there is recognized need for Jordan to develop its own competent, strong Faculty of Agriculture.

For this decision making process it should be recognized that a Faculty of Agriculture may be developed along the lines of the older, more traditional European ivory tower approach wherein there is a cloistered assembly of scholars. Or there is a newer approach, initiated and developed primarily during the past century that expands the involvement of a university faculty in its developmental role. This concept eliminates the boundaries around a campus, extending the university to all of the public. It involves an interplay between faculty members and the public to identify the needs to be served. As a consequence the approach is much more practically oriented and the graduates become more useful in a developmental sense.

Jordan must choose which of these approaches it wishes to emphasize. If it chooses the more practical approach it will be necessary for the Faculty of Agriculture to have contact with farmers and others who serve agriculture. This is not to imply that the faculty should take over the Ministry extension and public service functions. There is room for both institutions to interface with the agricultural public and both will be strengthened in the process. If properly coordinated there are many areas of complementarity which may be developed, yet avoid needless duplication of effort.

To serve this decision making process it might be useful to identify several options that could be considered. It is not the purpose of this review team to fully develop any of these options. Obviously this would require a more detailed study and full discussion with the various groups

affected. Furthermore, it is emphasized that the final plan must be evolved within Jordan, and not by an outside group with limited knowledge about the social and cultural values and relationships of Jordanians.

B. Options for Developing the Faculty of Agriculture

Option A - Teaching Faculty Only

This option has already been discarded by the University of Jordan, as it should be. It is satisfactory for intermediate level training but does not attract a strong university faculty.

Option B - Teaching plus the Freedom to do Academic Research

This is more in the mode of the traditional European University where the intent was to emphasize scholarly activities with little accountability as to the practical application of their research and teaching. Such research is seldom problem oriented but is left entirely to the whims of the individual scientist. Some universities of this type are needed to advance the general state of our knowledge and develop new concepts. However, they do not fit the more urgent immediate needs of a developing country.

Option C - Teaching plus problem Oriented Research

At least two variations of this could be examined for possible application in Jordan at this time.

These possibilities are mentioned below:

1. Assign the teaching and research functions to the University of Jordan, leaving the extension services in the Ministry of Agriculture. A possible model to look at is Ahmadu Bello University in Nigeria where this has been done successfully. Two features of that institutional arrangement are especially note-worthy, An Extension-Research Liaison Unit has been attached to the University to transmit information to the Ministry operated Extension Service. In essence this is done through extension specialists attached to the University, and a strong information department. The other feature is that Ministry officials serve on an Advisory Council to help guide the University Research program into problem solving efforts.

2. Another alternative would be to continue the Ministry of Agriculture research program at its present locations. Additionally the Faculty of Agriculture would develop a well rounded central research function in Amman, involving each of its departments. A branch experiment station would be established in the Ghor Valley as is now being planned. It would concentrate on problems associated with irrigation techniques and the introduction of new crops for that area that could be grown under irrigation. Later on a second branch station might be established to serve the needs of the arid to semi-arid regions of Jordan.

Under the second alternative it would be useful to establish a coordinating mechanism to avoid needless duplication of research between the Ministry and the Faculty. This could be done through a Research Council or a Research Institute. Joint involvement of scientists at each research location should be encouraged. (Similar to the U.S. system of having ARS and ERS personnel stationed on the campus.)

Option D - Combining all three functions (Teaching, Research and Extension in the Faculty

This would follow the pattern of the Land Grant University in the United States. It would probably represent a departure from tradition that would not be politically acceptable in Jordan. Perhaps a more reasonable and workable system would be for the Extension Services to remain as a function of the Ministry of Agriculture. The Faculty could then function by (a) training manpower for the extension service, (b) up-grading the existing extension agents by providing refresher courses and (c) developing a system for providing information to the extension agents on a continuing basis.

This should not foreclose the possibility of the Faculty having direct contact with farm groups. Joint efforts with the Extension agents should be encouraged.

APPENDIX A

Jordan University

Research Plan for Faculty of Agriculture

The different departments in the Faculty of Agriculture have suggested research projects to be carried out in the future and therefore to staff the departments accordingly.

I- Crop Production

A- To find out an optimum package of practices to maximize yield of the important crops. These practices include:

1- Develop or introduce high yield varieties suitable for different rainfall zones.
2- Fertilizers needed: What, How much, and when.
3- Pest control
4- Mechanization
5- Economics of the different practices
6- Handling and processing of different crops.

The priorities will be given to the following crops arranged according to their importance. (The first being the most important) a) wheat b) tomatoes c) olives d) citrus e) barley f) cucurbits g) legumes h)egg-plants & pepper i) bananas j) prunes k) grapes l) crucifers.

B- Studies on the introductions of the following crops

1- Corn into irrigated land.
2- Oil crops to Badiah (desert areas).
3- Legumes and grass crops to the range.
4- Flower plants into the irrigated area.

C- Define a package of practices for the high cash crops under the controlled environmental conditions (example-under plastic in the Jordan Valley).

II- Crop Protection

A- Survey of plant disease (caused by fungi, bacteria, nematodes, viruses) to identify the important diseases on the crops of Jordan.
B- Survey of insects and mites.
C- To find out integrated program to control plant pests in Jordan which include:

1- Nematode diseases on tomato in Jordan Valley;
2- Virus diseases on tomato in Jordan Valley;
3- Orobanche on tomatoes in Jordan Valley;

4- Wilt diseases & root rot in the irrigated areas;
5- Powdery mildew on grapes & cucurbits;
6- Mites on vegetables in Jordan Valley;
7- Cutworms on vegetables;
8- Insects of Olive trees;
9- Scale insects on citrus;
10- Aphids on vegetable & fruit trees;
11- White fly on vegetable;
12- Weed control especially mustard & wild oats in cereal fields and perenials in citrus orchard.

III- Mechanization

1- Lentils and olive mechanized harvesting.
2- Methods and equipment for optimum seedbed preparation and soil moisture conservation.
3- Increase efficiency of tractors in Ag. Production

IV- Animal Production and Protection

1- Utilization of wastes in animal production.
2- Find out best poultry houses.
3- Most economic practices to fatten sheep.
4- Study of factors affecting milk production in dairy.
5- Survey of parasites and viral diseases of animals and poultry.
6- Integrated program to produce fish.
7- Find out integrated program to control diseases of digestive and respiratory systems of poultry.

V- Soil and Fertilizers

1- Soil Classification.
2- Fertilizer of different crops; what, how much and when.
3- Soil fertility maps in Jordan Valley.
4- Factors affecting soil salinity and alkalinity and finding out solutions to this problem.
5- Studies on absorption and mobility of different elements.

VI- Irrigation

1- Identify optimum irrigation designs for the crops in Jordan Valley.
2- Studies of the effect of the different systems of irrigation on the biological aspects of crops and soil whichinclude diseases, insects and soil salinity.
3- Optimum amount of water and time of irrigation.

VII- Ag. Economics

1- Analysis of agriculture systems.
2- Studies of the economics of using different practices
3- Find out factors that limit adoption of modern Ag. practices.
4- Find out the best dairy and poultry farms in Jordan.
5- Find out alternative to utilization of ag. systems.

VIII- Nutrition

1- Identifying and analyzing poor nutrition habits in Jordan.
2- Defining the best foods for different age groups.

IX- Agriculture Industry

1- The specification to make pickles of olives, cucumber, etc.
2- Improve and define specification for dairy products in Jordan.
3- Define and improve on specification of tomato paste.

APPENDIX B

Fourth year and first year students enrolled in the Faculty of Agriculture University of Jordan

	Fourth year						First year					
	Male	Female	From		West Bank	East Bank	Male	Female	From		West Bank	East Bank
			Rural	Urban					Rural	Urban		
	24	3	11	16	14	13	102	29	41	90	60	71
%	89	11	41	59	52	48	78	22	31	69	46	54