

PROJECT TECHNICAL REPORT NO. 67



SOCIOLOGICAL EVALUATION OF THE ON-FARM
IRRIGATION PRACTICES INTRODUCED IN
KAFR EL-SHEIKH

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November 1984

EGYPT WATER USE AND MANAGEMENT PROJECT

22 El Galaa St., Bulak, Cairo, Egypt

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Prepared under support of

**WATER DISTRIBUTION RESEARCH INSTITUTE, WATER RESEARCH CENTER
MINISTRY OF IRRIGATION, GOVERNMENT OF EGYPT**

Contracting agencies

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Engineering Research Center
Ft. Collins, Colorado 80521
USA**

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Development
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**All reported opinions, conclusions or
recommendations are those of the writers
and not those of the supporting or contracting agencies.**

ABSTRACT

One of the major objectives of the Egypt Water Use and Management Project (EWUP) has been to experiment with various on-farm practices to see how the irrigation management activities of the farmers may be improved. The practices tested were precision land leveling, irrigation system design (long furrows and border irrigation), irrigation scheduling, field drain elimination, marwa improvement techniques, and specific plant and crop practices. The purpose of this report is to present the farmers' evaluation of each of these practices. Fifty-four farmer programs were conducted in a six season time span beginning in summer season 1980 to winter season 1983. The package of practices introduced generally provided an increase in crop yield for the farmers but the farmers have not accepted the total number of practices. Some practices are too expensive and cannot be supported by the existing institutional setting, some are not field applicable, and other are not seen as appropriate by the farmers to their present situations. While the practices themselves have demonstrated a positive effect on the yields for the farmers, the questions as to the ability of the farmers to adopt the practices as presented by EWUP still remains to be pursued.

تنبذة

أهدف الأساسى لمشروع تطوير الري هو العمل التجريبي في الحقل للوصول الى كيفية تطوير نظام الري للفلاحين وتضمنت هذه التجارب أساسا نظام التسوية السطحية للتربة وتصميم نظام الري بطريقة الأحواض والمخطوط وذلك بمجدولة الري وتقليل كمية المياه المفقدة في الصرف وتطوير المساقى وزراعة نبات ومحصول معين.

يقدم هذا التقرير تقييم الفلاحين لعدد ٥٤ تجربة أجريت على ٦ دورات محصولية في لفترة من بداية صيف ١٩٨٠ الى شتاء ١٩٨٤.

أظهرت هذه التجارب زيادة ملحوظة في الإنتاجية المحصولية للفلاح ومع ذلك لم يقبل الفلاحون على كل هذه التجارب لأن بعضها مرتفع التكاليف ولم يلقي دعم المؤسسات الحالية وبعضها لم يكن تطبيقه عمليا في الحقل والبعض الآخر لم يفهمه الفلاحون بطريقة الحالية.

بالرغم من أن تطبيق هذه التجارب أدى الى زيادة المحاصيل إلا أنه لا يزال السؤال مطروحا عن مدى تبني الفلاحون لهذه التجارب بالطريقة التي عرضت بها.

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ACKNOWLEDGEMENTS

The authors wish to express their thanks and appreciation for the contributions made to this paper by the staff of the Egypt Water Use and Management Project, and to the field teams at Mansuriya, Kafr El Sheikh and El Minya.

The Project is funded jointly by the Arab Republic of Egypt, and by the United States Agency for International Development. The United States Agency for International Development in Egypt is under the directorship of Mr. Michael P. W. Stone. Mr. John Foster is the United States Agency for International Development Project Officer for the Egypt Water Use and Management Project.

The Egypt Water Use and Management Project is implemented under the auspices of the Ministry of Irrigation's Water Management and Irrigation Technologies Research Institute and in collaboration with both the Ministry of Irrigation and the Ministry of Agriculture through the Soil and Water Research Institute and the Agriculture Economics Institute, which provide the Project with personnel and services.

The Consortium for International Development, with executive offices in Tucson, Arizona, is the United States Agency for International Development Contractor for the Project. American Project personnel are drawn from the faculties of Colorado State University, the lead American university taking part in the Project, Oregon State University, New Mexico State University, and Montana State University. The Project Director is Dr. Hassan Wahby and the Project Technical Director is Dr. Eugene Quenemoen. Dr. E. V. Richardson is the Campus Project Coordinator.

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INTRODUCTION

One of the major objectives of the Egypt Water Use and Management Project (EWUP) has been to experiment with various on-farm practices to see how the irrigation management activities of the farmers may be improved. Various types of activities including the improvement of the physical system, irrigation scheduling, and the application of selected agronomic practices were introduced to a number of farmers and the results of those activities were evaluated by EWUP. While the general results of the seasonal evaluations are presented in the Kafr El Sheikh pilot program reports, what will be presented in this report is the evaluation of the various activities by the farmers themselves.

A total of fifty-four farmer programs were conducted by EWUP in a six season time span beginning in the summer season of 1980 and continuing to the summer season of 1983. Of these fifty-four programs, only about ten percent of the farmers participated in more than one year. The basic assumption governing the selection of farmers was the need to diffuse the new techniques to as many farmers in the project area as possible. During the seven seasons, EWUP worked with nine, five, twelve, seven, fifteen, nine and two farmers respectively and experimented on parcels ranging from 10 kerats to more than 5 feddans.

As stated before, the purpose of the report is to describe the farmers' reactions to the various activities. The reactions will be categorized into the following areas of thought. First, there will be a discussion of how well the farmers thought that the purposes of the various activities as explained by EWUP were actually achieved. Next, the positive and negative evaluations of each activity will be presented. Finally, some general comments as to perceived yield differences resulting from the various activities will be presented as well as the farmers' opinions as to which activity they will continue to use. Basically, this report wishes to emphasize the

notion that despite all the perceived advantages of a particular activity as viewed by a change agent, the ultimate test of whether or not that activity will be adopted by the farmers is what those farmers think about the respective activity. What the farmers look at in terms of various innovations is described in the following discussion.

THE EWUP EXPERIMENTAL ACTIVITIES

The pilot programs of EWUP occurred during both the summer and winter cropping seasons. For the summer season, the activities were introduced with the crops of rice, cotton, and maize. During the winter season, the programs included wheat, broadbeans, and sugar beets. For each activity the farmers worked with EWUP by providing their labor as well as their cooperation in terms of following EWUP's instructions in managing each practice. The practices introduced were precision land leveling, irrigation system design, irrigation scheduling, field drain elimination, marwa improvement procedures, and specific plant and crop practices. All of the practices were introduced as a package on a field with only the marwa improvement and the field drain elimination practices being designated for a restricted area.

Regarding the introduction of precision land leveling, the practice was designed to demonstrate the techniques and benefits of this particular activity. The farmer was told by EWUP that the following results would occur.

1. eliminate high and low spots in the fields,
2. establish an easy advance for the water,
3. allow farmers to use less water for irrigating,
4. create good water distribution,
5. improve the quality of the land,
6. remove the need for excess drainage,
7. decrease irrigation time, and
8. decrease labor necessary to irrigate.

The irrigation system design aspect of the pilot project included the introduction of long furrows or of border irrigation when applicable. Again, EWUP listed a number of results which were to occur and they include:

1. saving water,
2. saving time for irrigation,
3. saving effort irrigating,
4. decreasing the need for drainage, and,
5. improving the water distribution.

Irrigation scheduling includes two phases. The first phase is the recommendation by EWUP to individual farmers as to the amount and timing required for each irrigation, and the second phase shifted to the improvement of coordination of irrigations among the farmers on a single sajia. For scheduling, EWUP stated that the following results would occur.

1. save time,
2. save water,
3. decrease the necessity for drainage,
4. lower the water table, and
5. get information to farmers about when and how much to irrigate.

Elimination of field drains was an activity performed only on a few sites. The purposes of this activity, as stated by EWUP, were to demonstrate that some of the existing drains were not necessary, and that the land saved could result in an increase in cropping area and make it easier for land leveling to occur.

In addition, some specific marwa improvement practices were introduced to a few sites. The practices performed included the lining of marwas by plastic sheets and the use of better turnout methods in the form of plastic pipe and gated pipe. Also the farmers were shown some improved plant and crop practices focusing on improved varieties, the use of fertilizers, and types of pest control. Early in the project, a mechanical rice transplanter was demonstrated to the farmers.

All of the practices demonstrated were selected because it was felt that using them in the combinations presented would improve the farmers' ability to manage their irrigation. Almost all of the farmers expressed a degree of satisfaction with the existing way in which they performed their respective farming tasks because they have been performing this type of work for many years and were therefore familiar with such practices. The farmers realized that in order to change their particular practices, they would have to improve their knowledge of a particular practice and would have to have the institutional support to make the new practice successful. There was a concern, however, over the future of the labor supply in the area and the effect that it would have on the existing practices. What will now be presented is how the farmers perceived whether or not the results of the practices, as explained by EWUP, actually occurred.

Regarding land leveling, the group of farmers in the winter of 1980-1981 stated that the two most observable results of this practice were the saving of water and the saving of time for irrigating their respective fields. Only a few farmers said anything about better distribution of the water over the field and the reduction of

the amount of drainage water. In the summer of 1981 the farmers seemed most impressed with the land leveling in terms of acknowledging that the high and low spots were eliminated so that the water did advance through their fields more easily. A third of those farmers also stated that less water was used in irrigation. An additional point was brought up in that a number of farmers stated that the leveling improved the texture of the soil which in turn helped in reducing weeds.

The issues in the winter of 1981-82 regarding land leveling focused on the improvement of the field by eliminating cracks in the soil and also because of the elimination of the high and low spots, the water advanced more easily down the field. During this season, the first complaints about the work of EWUP evolved. One farmer stated that high spots remained in the center of the field while another farmer complained about high spots at the end of the field. The farmer with the problem in the center of the field will lower the small spot himself, while the problems with the farmer who has high spots in the corners of his field is due to the inability of the machines to reach that area.

In the summer of 1982, eight of the fifteen farmers stated that all of the results of the land leveling practices occurred without any qualifications. Five farmers had areas in their fields which were not completely leveled. Two of these farmers had low spots in about one Kirat at the head of their fields because the leveling equipment could not enter these respective areas. Two other farmers had one Kirat in their fields which was still high and the fifth farmer ended up having three Kirats in the middle of his field which were high. The two remaining farmers stated that there were a couple of the other results which were not accomplished. Both said that they did not use less water in irrigating, and while one said he did not save time the other did not notice any change in the drainage of his land.

For the most part, the recipient farmers in the winter of 1982-83 stated that the expected results for each practice were achieved. One farmer did not allow EWUP to complete a land leveling job; and therefore, irrigation problems developed almost immediately. As EWUP was about to work with the farmer, the chosen field was flooded when the mesqa was full of water. This farmer was in a hurry to plant and therefore pushed the Project to work in the field without allowing the field to completely dry. The result of this action led to a poor land leveling job which was never completely finished because of the farmer's insistence to hurry so that he may plant his crop. Therefore, the head of the field received too much water and the end of the field did not receive any amount. Erosion within the field resulted from

the poor land leveling job. As a result, this farmer stated that none of the expected results occurred. Other than this one farmer's remarks, there were only three points questioned by the farmers. One other farmers also had a few low spots in his fields after the completion of the work and this affected the proper distribution of water. This farmer simply stated that there were problems in the distribution of his water in the field, and the land leveling and the long furrow design did not help. One point which at least 50% of the farmers did not agree with was that land leveling saved labor in irrigation.

In terms of the irrigation system design, the farmers in the different seasons generally agreed that the results stated by EWUP did occur. The point where the greatest consensus resulted is that the border design did allow for greater control of water in the rice fields. However, some farmers qualified the statement in that the greater control was true more with small basins than with large basins.

For irrigation scheduling, the farmers throughout the different seasons agreed with the stated results given by EWUP with the exception of the lowering of the water table. A couple of farmers in the winter season of 1982-83 stated that they measured the water table depth and found no depletion. However, the remaining farmers questioned the water table statement because they had no knowledge of what was actually happening to the water table. While EWUP was making numerous measurements throughout the seasons, they never informed the farmers and as a result, the farmers could not verify the result which EWUP said would occur.

The farmers who eliminated their field drains did acknowledge that in so doing, the area of land saved could be used for extra crops and that it was easier for land leveling to occur in the field. One farmer in 1981 was impressed with the savings of labor for cleaning the drain which resulted when the drain was removed.

EWUP did not specify any concrete results which would occur in the marwa improvement activities and in the improved agronomic practices. The farmers' evaluation of these practices as well as the ones previously mentioned will now be presented.

THE FARMERS' EVALUATION OF EWUP'S ON-FARM PRACTICES

Even though the farmers generally acknowledged that specific results did occur when the farmers used the package of improvements introduced by EWUP, they did not necessarily agree that all of the practices were that beneficial. The farmers presented to EWUP both positive and negative evaluations concerning each

practice. In fact, the farmers were able to disaggregate the "package" of improvements and tell EWUP which individual practices did what. The evaluations which they did give are presented now.

Land Leveling:

In the summer of 1981, the farmers were most impressed with the fact that leveling helped the farmer to irrigate the land all at one time with a uniform distribution of water, and that leveling improves the texture of the land. One farmer in Manshiya expressed the view that leveling was disadvantageous to his fields because the Project had not planed his land this past season, since they had already planed it the previous winter. The majority of farmers stated that land leveling was beneficial to them.

The complaints about land leveling during this season focused on the consequences of a poor job. One farmer complained about the low yield in the low spots in his field and another farmer said that with the higher spots drying out faster, the rats congregated at that spot and ate the crop. The necessity of doing the land leveling job correctly cannot be overstated. The farmers who had the major complaints believed that the poor land leveling effort was the cause of the problems, not the notion of land leveling itself.

In the winter of 1982-83, another issue was raised. There was a difference of opinion among farmers as to the labor requirements needed for irrigating land that has been leveled. One side stated that the only labor required was that of operating the sagia while the other farmers stated that laborers in the field were still needed. Only one farmer stated that the actual effort of men and animals was saved with land leveling. The saving of time was between 45 minutes to two hours. One farmer believed that the savings of water occurred in the long basins only and not in the long furrow. Due to the leveled land, all the areas of the field produced a crop instead of having bare spots present as a result of excess water. One farmer said that the weeds in his field were decreased due to land leveling and another farmer stated that the leveling smoothed his soil to allow for better germination of some crops. This, however, could have also been accomplished by puddling according to the farmer.

Irrigation System Design:

The farmers in the summer of 1981 discussed the benefits of the irrigation system design in terms of flooding. Three farmers from Manshiya stated that there had been no flooding during the irrigations with this system, so that the drainage

problem was improved. These same farmers said that water was saved, and one gave a figure of 33%. A few farmers from both Manshiya and Hammad, however, experienced difficulties with the practice. One farmer still contends that a marwa in the middle of the field is necessary in order to have good control over irrigation. A second farmer had problems with flooding in three out of every twenty furrows. The border design users all said that borders saved water and time.

A majority of the farmers in the winter of 1981-82 stated that there were three major benefits from the different irrigation system design: (1) time was saved in irrigating, (2) there was good distribution of water, and (3) the drainage problems were reduced. Regarding the time factor, one farmer stated that his irrigations were reduced from five hours to three hours because of the new designs. About half of the farmers stated that there was no flooding on their fields, water was saved, the animals were being used more sparingly, and the farmers' labor was being saved. A couple of farmers specifically stated that working with the water in the field was definitely easier than before the new design.

The benefits stated by the farmers in the summer of 1982 concerned themselves with the saving of time, the saving of human effort, and the saving of animal effort. One of the benefits resulting from the savings of time is that farmers may then use the extra time for other activities. A couple of farmers stated that they had the opportunity to work more in their other fields while a couple of others stated that they spend the extra time doing things at home. Another benefit stated by three farmers is that they were able to irrigate anywhere from eight to fifteen furrows at the same time. With this ability, the farmers said that they saved both time and effort. One additional farmer stated that this new design saved the amount of effort in irrigating because it eliminated the constant opening and closing of basins. Also one farmer stated that his effort in cultivation was reduced.

Comments in the winter of 1982-83 associated with the irrigation design practices were from two separate farmers regarding modifications of the design operations. One farmer preferred to irrigate ten furrows at a time rather than six furrows because irrigating six furrows caused flooding in the furrows. A second farmer believed that the furrows in his field were not that long and longer furrows would not be beneficial. The third farmer believed that the borders could have been constructed stronger.

Irrigation Scheduling:

The irrigation scheduling program in the summer of 1981 was seen by a majority of farmers as generally advantageous. There were three specific responses given by farmers: the practice saved time, it saved on the amount of water used, and -- according to two farmers -- it gave them information on how much water should be used and when it should be applied. An additional response was that scheduling reduced the amount of energy required from the animals who turned the sagia, since it saved water and thus work to turn the sagia.

For the farmers working in the winter season of 1981-82, two major benefits were seen by the majority of them: (1) water was saved and (2) the time for irrigating was reduced. Half of the farmers focused on another benefit, the drainage problem was reduced. A couple of farmers stated that the water table was lowered due to scheduling and one farmer pointed out that proper scheduling allowed for the soil to dry and thus the crop yield improved. Three farmers in the winter of 1982-83 associated the savings of both animal and human effort in irrigating with irrigation scheduling. One farmer stated that with scheduling, there was not excess water present to carry the fertilizer on the field to the drain, thus it maximizes the use of the fertilizer. One of the two farmers who stated that the water table did not become lower with scheduling believed that the reason for this situation was that excess water from the surrounding fields came onto his land, thus negating any benefits from scheduling.

Field Drain Elimination:

Comments regarding the elimination of field drains in the summer season of 1981 were divided according to area. The farmers along the Hammad Canal had a generally positive view of the practice, and said that the results were approximately in line with EWUP's predictions. Two Manshiya farmers, on the otherhand, did not like the practice.

One reason they give for the impracticality of eliminating drains was that the planting of different crops like rice and cotton or corn in adjacent fields at different times meant that their irrigation turns would be different. There needs to be, therefore, a mechanism for draining the excess water. Another reason given was that the land has low fertility and requires drainage through a field drain.

This debate among farmers continued throughout the other seasons. Farmers liked the increased area in which they could raise a crops and they all saw the possibility of using machinery much better without the drains. In addition, some of the farmers stated that the labor needed to clean the field drains was eliminated,

thus saving some effort and money. But the notion of the need for the drains continued to emerge. One farmer believed that there would be no need for drains during the first season, after land leveling, because the soil will still be porous. In the second season, the soil will be compacted and then drains will be needed. Other farmers still believed that with separate crops like rice and cotton being grown in the same area, the need for drains still exists because each crop demands a different amount of water and the drains make sure that the excess of water from rice will not effect the other crops.

Marwa Improvement Practices:

A few farmers were introduced to new marwa improvement measures. These measures include the use of plastic lining, the use of gated pipe, and the use of plastic pipe. All of the farmers using the plastic lining said that the lining did eliminate the seepage from the marwas and one farmer added that it reduced the weeds and thus all the work necessary to eliminate them. The disadvantages of the lining were that it was easy to cut and it lasted only for one season. Some farmers also said that because the plastic was so thin, water would enter underneath the plastic and then return back to the saqia. One farmer preferred the marwa to be lined with cement because it will save the field drain beside the marwa and also save land. This farmer was aware of the high costs of cement lining.

The farmer using the gated pipe believed that with the pipe, the management of the irrigation from basin to basin was easier. However, he listed three disadvantages of the pipe: (1) it needs a pump in order to operate, (2) it takes more time to install, and (3) the pipe can be stolen. Farmer using the plastic pipe were unanimous in their belief that they did not want to work with it. The major reason is, like the plastic lining, it is much too easy to damage. In fact, many of the children of the village would cut out pieces of the pipe and use these pieces in their various games. The plastic pipe did not last more than two seasons.

Improved Agronomic Practices:

The responses regarding advice given by EWUP on agronomic practices in the summer of 1981 suggest that the farmers were basically receptive, for they asked for more advice and recommendations. Three farmers saw the result of zinc spraying and liked it, and all the farmers agreed that this kind of recommendation was valuable. One farmer wanted recommendations particularly in regard to his vegetable crop, and other farmers asked for suggestions concerning all of their farm activities. The only negative aspect of this work cited by the farmers was the difficulty in obtaining inputs from the Cooperative, both in quantity and in quality.

In the winter of 1981-82, the new practices also included the use of a new variety of wheat seed (Sakha 8), and information on the proper time of planting, the use of proper seeding rates, proper cultivation practices, proper plant density requirements, and the proper use of fertilizer and insecticide. All of the farmers said that this help did increase their yield and did so by improving the soil, preventing plant diseases, eliminating weeds, improving planting methods, and improving the effectiveness of the fertilizer used. EWUP did perform a service by helping one farmer obtain the Sakha 8 seeds and the proper amount of fertilizer. What the farmers were also concerned about was the labor requirements necessary to perform the proper cultivation practices at the correct time.

In the winter season of 1982-83 only three farmers experimented with three agronomic practices. One farmer used a grain drill to plant, one farmer added zinc to his crop, and two farmers added urea prior to planting. The farmer using the grain drill said that it saved time and effort in planting, but he felt it did not do anything to increase the yield. For the zinc application practice, the farmer stated that the leaves of the crop turned yellow but after fifteen days returned to normal. EWUP measured the yield of farmers and never told him what were the results of the measurements. Therefore, he does not know what the effect was on the crop. Both farmers using urea attributed a higher yield to its application. EWUP gave the farmers experimenting with zinc, the necessary amount to conduct the test. One farmer had to purchase urea from the market at a higher price because the cooperative did not have the urea in stock.

Along with the specific irrigation practices introduced in the summer of 1982, EWUP also introduced a number of agronomic practices. Some of the practices introduced were for cotton while others were specific to rice and to corn. The major practices introduced were as follows:

1. For cotton: adding urea before furrowing and planting cotton by the dry method (10 farmers); i.e., there was no pre-planting irrigation in the fields.
2. For rice: using zinc sulphate in the nursery and using urea in the fields before planting (6 farmers)

In addition, four farmers were selected for work in using the proper amount of fertilizer for their crops (cotton, rice, and corn) and one farmer was shown how to use the proper amount of seed in planting.

With regard to the application of urea, the results for cotton are mixed while for rice the farmers are positive in their evaluation of it. The farmers on the Hammad mesqa viewed the urea as helping to improve their cotton yield while four

of the five farmers who expressed negative opinions about the urea, that it did not help their yield at all, irrigated from the Dakalt Canal. Those individuals who used the urea in their rice fields all said that it helped to increase their yield.

The practice of planting the cotton without a pre-irrigation was supported by four of the ten farmers who used the practice while the other six did not like the practice. The crucial issue was whether the soil was of such a texture as to allow it to cling to the seed. The farmers who like the method said that the condition of the soil was adequate. Only two of the six farmers against the method argued that the soil was not appropriately conditioned while the other farmers stated that they were used to the dams method. One of the proponents of the dry method also stated that he was able to obtain one more cut of berseem because he did not have to irrigate. Again, there was a split in where people lived. Those farmers who irrigated from Hammad supported the new method, those who irrigated from Dakalt did not like the method.

For the few special practices pertaining to fertilizer use and the application of zinc sulphate, the zinc work received the most positive reaction from the farmers. The ones who used the zinc said that it reduced the time of the rice in the nursery from 40 days to 20-30 days. Proper application of fertilizer, on the other hand, helped increase the yield of the cotton. but nothing for the rice. One major point that was brought out was that the farmers had no problems using the zinc because EWUP delivered it to the farmers.

In the summer of 1980 a mechanical rice transplanter was tested in a few farmers fields. Here is their evaluation of the machine. One farmer said it has no advantages while the other two farmers saw that this machine could save time, save water, save land, and solve the problem of an acute shortage of labor present in the area. For the rice package of practices, most of the farmers agreed that the major advantages resulted in helping to solve the labor shortage problems and they allowed the farmer to save time in his operation.

The farmers also presented some disadvantages related to the mechanical rice transplanter. The major concern centered on the fact that no one had any experience in using the machine and a need existed for training farmers on how to use the transplanter. Another point of focus was that the farmers expressed a concern on what would happen if the transplanter become inoperable at a crucial time. One farmer was very critical of the transplanter and stated the following complaints: the size of the rice used is too short to make the transplanter effective, the distance between the rows of rice is too wide, the plant density is less than desirable, and the machine causes a compaction of the soil.

Yield Results:

The most telling evaluation of these practices is what was the result of these practices in terms of crop yield for the farmers. Measurements began during the winter season of 1980-81 and the results are as follows.

In the winter season of 1980-81 the wheat yield was measured. All the farmers in Hammed except one farmer said that they had an improvement in their yield. Farmer "A" said his yield improved from 8 to 10-12 ardab while Farmer "B" said his yield increased 70%. In Manshiya, the farmers said they were now getting a yield of 11 to 12 ardab - an increase over last year. They all mentioned land leveling, the border irrigation, the irrigation scheduling, and the dry method of planting as reasons for the increase. The farmer in Hammad who did not have an increase said that the recommendations by the Project in terms of chemicals and other inputs were not supported in terms of actual allocation by EWUP. In other words, the amount recommended by EWUP was not available to the farmer.

The yields of seven of the twelve farmers who worked with EWUP in the summer of 1981, had increased this past year. One farmer increased his yield in cotton, but not in rice. Two farmers said that their yield was the same, but that water had been saved and their irrigation time had been reduced. Two farmers, one in Hammad and one in Manshiya, said that their yield of cotton was less than before. One farmer said that he had suffered a decrease from 40 qintar to only 15 qintar. The other dissatisfied farmers said that his yield had been 19 qintar, which was not satisfactory. This farmer, however, attributed his poor results to labor shortages, poor quality labor, and lack of control of weeds in the field.

For the farmers working with EWUP in the winter season of 1981-82, six of the seven farmers showed an increase in their yield from the previous year. The increases ranged from 30% to 100%. The farmer who did suffer a decrease attributed the result to birds eating the seed instead of EWUP's practices. Regarding which practices influenced the yield increase, the three farmers in Hammad mentioned that all of the practices had some influence. The farmers in Manshiya focused on land leveling, irrigation scheduling, and the irrigation system design.

According to the yield information provided by the farmers in the summer, 1982 season, only two of the fifteen farmers did not record a yield increase. One of those farmers lost his increase when he could not find labor for cultivating the crop. He also blamed the practice of planting cotton by the dry method as a contributing factor. For those who did record a yield increase attributed the increase to land

leveling. One farmer did mention the elimination of the field drain, and thus allowing for an increase area to plant. The farmers pointed out land leveling because it eliminated the high and low spots in the field and this significantly contributed to the yield increase. No other irrigation practice was mentioned. In addition, no agronomic practice was mentioned because the farmers stated that they already had some experience with all of the practices and so they saw the land leveling as the only real new intervention which caused the increase in yield this last season.

Four of the nine experiment farmers in the winter season of 1981-83 increased their yield this season while four decreased their and a ninth farmer had one of his crops increase its yield while the other decreased. The increases ranged from 39% to 50% while the decrease in yields ranged from 43% to 67%. The practices which the farmers thought were the cause of the increases included the following: four farmers stated land leveling, one farmer said adding urea, another farmer believed that irrigation scheduling was the cause, and one other farmer stated that the changing of his fields was the reason. The farmer's explanation for the decrease in yield centered around non EWUP interventions: the cold weather, shortage of water in the canals, birds eating the grain, and the prevalence of weeds in the fields. The only farmer who directly referred to an EWUP practice decreasing his yield was the farmer who would not allow EWUP to finish the land leveling operation. In the summer season of 1983 the yield of one farmer increased from 33 to 41 ardab, while the other farmer's yield decreased from 17 to 11.2 qintar. No reasons were given as to the results of each change.

The general evaluations of farmers concerning the various on-farm practices have been presented. The next question which was asked of the farmers is which of the new practices will they continue to use.

All except one of the farmers who used long furrows in the summer season of 1981 liked the method and stated that they would continue to use it. The farmer who did not like the method, in Manshiya, will put a marwa in the middle of his field for drainage.

For the farmers of the winter season of 1981-82, there were two practices which will not be used again. The first was the plastic pipe. This pipe was too easily damaged and the farmers stated they they would prefer the plastic lining of the mesqas. The second practice which will be changed is that of eliminating the field drains. Both farmers stated that when they grow two different crops side by side, they will use the field drain to keep the quantity of water at the appropriate level for each crop.

Despite the fact that land leveling was seen as the most significant factor in the yield increase by the farmers in the summer 1982 season, the practice which most of the farmers will continue to use is the long furrows, six of fourteen farmers. Four out of the four farmers who used the zinc will continue to do so, making this practice the most successful in the percentage of the recipients continuing with the practice. Three farmers will continue to work with irrigation scheduling while two farmers will continue to use the field drain elimination program. Two other farmers will continue to add urea, and one said he would continue with all the practices except for land leveling. No farmer stated he will continue with the land leveling because of the cost and lack of available equipment. Five farmers will put the field drains back in for the next season while one farmer said he would use a dike instead. Again, no farmer has stated he will continue with the dry method of planting cotton.

Five of the seven farmers working with EWUP in the winter season of 1982-83 using long furrows will continue with that practice. The farmers who will continue to level land (50% of the group), qualified their support of the practice by saying they will level land with whatever means available. There is a concern about how to implement a program as conducted by EWUP. Two farmers will continue to schedule irrigations, one will still use urea, and one farmer will still eliminate his field drains. The other four farmers who had their field drains eliminated will put them back. One farmer using the border system will not continue because there is no equipment to make the borders. Also one farmer out of four said he would not continue to put plastic lining in his marwa.

Concerning the farmers who worked with EWUP during the summer of 1983, the one farmer using long furrows believed that a marwa should be used to divide the furrow in half and so he will not continue to use long furrows. He will, however, put fifteen furrows inside his basins instead of the original eight. The rice farmer will eliminate his field drain for rice but will dig another drain for his winter crops to separate wheat and berseem. One of the farmers also said that he will not continue the mechanized land leveling procedures due to a lack of equipment.

CONCLUSION

In introducing any new technique to a group of individuals, whether they be farmers or other types of persons, the critical concern is that the receiving group adopts the innovation and integrates that new technique in introducing the previously described irrigation practices was to show the farmers ways to improve the control over their irrigation practices which in turn would improve the yield of their crops. Various practices were introduced as a "package" because it was felt that the package approach would be most effective in meeting the objectives. While many farmers who participated in EWUP's programs were generally positive about what transpired, the question as to whether they will integrate such programs in their farming practices remains to be seen.

One of the major goals of all the irrigation practices advocated by EWUP is to improve the farmers' control of irrigation water. From the interviews, it came out that farmers define "water control" as the ability to apply an appropriate amount of water in the field as quickly and with as little drainage as possible. The farmers acknowledged that EWUP's recommended practices did help control irrigation in one way or another. Land leveling eliminated high and low spots, and thus allowed the water to advance without hinderance. This reduced the time of irrigation and saved some water. The different irrigation designs helped to prevent flooding. The general advantages which occurred with the greater control include the saving of water, the saving of work for the animals on the sagja, a reduction of flooding, greater control of weeds, and savings of time.

While the major objective of the project seems to have been met by the introduction of the packages, the farmers still are not willing to integrate the total package with their present farm practices. Some practices are too expensive or cannot be supported by the existing institutional network (land leveling, delivery of some inputs), other cannot be satisfactorily applied to field situations (plastic pipe), and still other ideas are not seen as totally appropriate by the farmers (field drain elimination). The work in Kafr El-Sheikh has delineated the positive and negative aspects of each of the various practices and now the results of such findings needs to be explored to see what can be effectively done to further the farmers' ability to integrate such practices into his existing irrigation behavioral patterns.

The need to develop a means to provide the farmer with a capability to adopt the various packages of improve irrigation/agronomic techniques is a necessary consequence of the work done in Kafr El-Sheikh. Without this follow-up, the farmers will only perform the practices they are able to perform. In many cases, this type of partial adoption will not provide the means to achieve the intended objectives set out before the work of EWUP began. The techniques for improving a farmer's irrigation practice are there, but the questions now is how those techniques can be utilized?

AMERICAN EQUIVALENTS OF EGYPTIAN ARABIC
TERMS AND MEASURES COMMONLY USED
IN IRRIGATION WORK

<u>LAND AREA</u>	<u>IN SQ METERS</u>	<u>IN ACRES</u>	<u>IN FEDDANS</u>	<u>IN HECTARES</u>
1 acre	4,046.856	1.000	0.963	0.405
1 <u>feddan</u>	4,200.833	1.038	1.000	0.420
1 hectare (ha)	10,000.000	2.471	2.380	1.000
1 sq. kilometer	100 x 10 ⁴	247.105	238.048	100.000
1 sq. mile	259 x 10 ⁶	640.000	616.400	259.000

<u>WATER MEASUREMENTS</u>	<u>FEDDAN-CM</u>	<u>ACRE- FEET</u>	<u>ACRE- INCHES</u>
1 billion m ³	23,809,000.000	810,710.000	
1,000 m ³	23.809	0.811	9.728
1,000 m ³ /Feddan (= 238 mm rainfall)	23.809	0.781	9.372
420 m ³ /Feddan (= 100 mm rainfall)	10.00	0.328	3.936

OTHER CONVERSION

	<u>METRIC</u>	<u>U.S.</u>
1 <u>ardab</u>	= 198 liters	5.62 bushels
1 <u>ardab/feddan</u>	=	5.41 bushels/acre
1 <u>kg/feddan</u>	=	2.12 lb/acre
1 donkey load	= 100 kg	
1 camel load	= 250 kg	
1 donkey load of manure	= 0.1 m ³	
1 camel load of manure	= 0.25 m ³	

EGYPTIAN UNITS OF FIELD CROPS

<u>CROP</u>	<u>EG. UNIT</u>	<u>IN KG</u>	<u>IN LBS</u>	<u>IN</u>
<u>BUSHELS</u>				
Lentils	<u>ardeb</u>	160.0	352.42	5.87
Clover	<u>ardeb</u>	157.0	345.81	5.76
Broadbeans	<u>ardeb</u>	155.0	341.41	6.10
Wheat	<u>ardeb</u>	150.0	330.40	5.51
Maize, Sorghum	<u>ardeb</u>	140.0	308.37	5.51
Barley	<u>ardeb</u>	120.0	264.32	5.51
Cottonseed	<u>ardeb</u>	120.0	264.32	8.26
Sesame	<u>ardeb</u>	120.0	264.32	
Groundnut	<u>ardeb</u>	75.0	165.20	7.51
Rice	<u>dariba</u>	945.0	2081.50	46.26
Chick-peas	<u>ardeb</u>	150.0	330.40	
Lupine	<u>ardeb</u>	150.0	330.40	
Linseed	<u>ardeb</u>	122.0	268.72	
Fenugreek	<u>ardeb</u>	155.0	341.41	
Cotton (unginned)	<u>metric qintar</u>	157.5	346.92	
Cotton (lint or ginned)	<u>metric qintar</u>	50.0	110.13	

EGYPTIAN FARMING AND IRRIGATION TERMS

<u>fara</u>	= branch
<u>marwa</u>	= small distributer, irrigation ditch
<u>masraf</u>	= field drain
<u>mesqa</u>	= small canal feeding from 10 to 40 farms
<u>qirat</u>	= cf. English "karat", A land measure of 1/24 <u>feddan</u> , 175.03 m ²
<u>garia</u>	= village
<u>sahm</u>	= 1/24th of a qirat, 7.29 m ²
<u>saqia</u>	= animal powered water wheel
<u>sarf</u>	= drain (vb.), or drainage. See also <u>masraf</u> , (n.)

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