# EWUP TECHNICAL REPORT No. 29 



IRRIGATIOIV PRACTICES REPORTED BY
EWUP FARM RECORD KEEPERS
ABYUHA AND ABL RAMA SITES
1979. 1980 a 1980.1981

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REPORTED BY
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ABYUHA AND ABU RAYA SITES
1979ـ1980 \& 1980.1981

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DECEMBER 1982

# gGYPT HATER USE AND MNAGEMENT PROJDCT 

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Prepared under aupport of
 NINISTRY OF IRRIGATION, GOVERNNENT OF EGYPT

UNITED STATES AGENCY FOR INTERNATIONAL DETKLOPNENT
Contract No. AID/NE-C-2352

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Abstract

The purpose of this report is to show the area of land under irrigation on EWUP study case sites in Abyuha (El-Minya Governorate) and Abu Raya (Kafr el-Sheikh Governorate). The data are divided into periods of 15 dajs. Working with the assumption of a winter closure period in the Delta runaing from January 15 to February 15, and in Upper Egypt from January 1 to January 31, these periods were eliminated from the analysis. Data for the study were abstracted from Farr Record books for 1979-1980 and for 1980-1981.

Results frem both sets of data were appioximately equal. The data analysis showed that the crop area under irrigation was largest at the beginning os the winter season, before and after the winter closure period, and at the beginning of the summer season. This was especially notable for the Abu Raya area, where the major crops are rice and cotton.

Comparing water discharge as measured for the Abyuha Canal for April 1 to December 31, 1080, with the amount of crop land under irrigation during the same period, we found that the line graphed for each was approximately equal.

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41 pages,10 figures, 8 tables
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هذه الـدراسه توغع الممساحـات المحصولـية الـمنـنـرع الـمروهة خلال كــــلـ










 نداعة الارز والـتطن كــا فى منـطتة ابو ربا بـعحاننة كغر الـشيخ •

ومن مقـارنـ تصرف كمـات الـمياه فى ترعه الــوبـا مع الـمــاحـات الـمنزرعة


^ جــــدول(1)

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## Acknowledgments

This report is based on Farm Record Data collected for years 1979-80 and 1980-81 and analyzed by EWUP economists:

| Gamal Ayad | David Martella |
| :--- | :--- |
| Elia Sorial | Nabil Farag |
| E1-Shinnawy Abdel Aty | Lotfi Nasr |
| Gamal Fawzi | Ragy Darwish |
| Sobhy Elewa | Magdy Badawy |

The water budget data werc prepared by Engs. Moh. Helal and Timothy Gates. The line graph was done on the Project computer using a program designed by David Martella.

The authors wish to state their thanks and appreciation for the contributions made to this paper by the Project Director, Di . Hassan Wahby, and the Project Technical Director, Dr. Eugene Quenemoen, and by all of the EWUP staff.

## INTRODUCTION

Irrigation scheduling requires matching the timing of water availability to meet the evapotranspiration needs of crops. Crop water demands can be estimated by consid ring the number of feddans and the planting dates for each crop, and applying the water consumpt ive use requirements for each of the major crops in Egypt which have recently been published $1 /$. There ure, however, two major problems invloved in the development of water schedules from crop consumptive use data. The first problem we have called "computational," and the second "operational".

Consumptive use requirements are based on the known rates for ... a crop at each stage of its growth (number of days from planting) and the potential evapotranspiration. Potential evapotranspiration is a function of climate. The "computational" difficulty in asjessing these requirements comes from the fact that the dates assumed for crop planting in Technical Report No. 17 do not correspond with plantirg dates reported by the 15 test farmers who supplied farm record data to EWUP at Abyuha for the 1980-31 crop year.

The following tatle shows the data discrepencies:
CROP DATE IN TECH. REPORT NO. 17 DATE FROM ABYUHA FARMERS
Cotton March i-15 April 16-30

May $15-\mathrm{Ni} 1 \mathrm{i}$
Maice July 15-Summer
June 10-20
Broad
Beans November 1-15 Novenber 1-15
Birseem November 1 Octoter 1
Wheat November 23
November 20-Dec. 10
As can be seen, the data for broad beans and wheat correspond. To correct the calcuiated rates, the El-Minya planting dates and the

1/ Master Plan for Water Resource Development and use. "Consumptive use of Water by Major Ficld Crops in Egypt", Ministry of Irrigation. Technical Report No. 17. UNDP-EGY 73/024. March 1981.
formula from Technical Report No. 17 were used to determine the water consumptive use requirements for each crop-a lengthy process at least.

The "operational" problem is more difficult. Water scheduling works best when only one crop with a given planting date is irrigated from the same source of water. Under Egyptian conditions, many crops with varied planting dates are irrigated from the same source. Scheduling can only be accomplished for the composite oi crops served by a common source. The composites are shown in Table 1 indicating the number of feddans of crops to be irrigated by irrigation period. :

It would be possible to form a weighted average water requirement from the consumptive use requirements for each crop in each irrigation period. The weights would become the proportion of land occupied by a given crop during the irrigation period in question as:
$C U_{i}=\sum_{j=1}^{n} P_{i j} \mathrm{Cu}_{\mathrm{ij}}$
$\mathrm{CU}_{\mathrm{i}}{ }^{\circ}=$ consumptive use requirements for all crops in the $i$-th irrigation period,
$p_{i j}=$ proportion of total crops irrigated during the i-th period represented by the $j$-th crop, and
$C U_{i j}=$ consumptive use requirement for the $j$-th crop during the $i-$ th period
Given the estimate of $\mathrm{CU}_{\mathrm{i}}$, it nay still be difficult to accomplish water scheduling. The amount of water delivered by the canal would have to be measured in each field according to the crop, its stage of growth, and potential evapotranspiration.

From the farm records the date on which each crop is irrigated is known along with the amount of land occupied by that crop. The crop year for purposes of the record system vegins on November 1 , and continues through the month of October in the subsequent year. . irrigation schedule was constructed by dividing each month into two periods; the first period is from :he first day to the fifteenth day and the second period is from day 16 to the end of the month. A total of 24 irrigation periods are defined. However, since no irrigations occurred during the 2 periods of winter closure, only irrigation pariods are..
considered in the study.

The information obtained from the farm records does not recognize differences in amount of water applied per irrigation (a) among different irrigations for a given crop or (b) between crops. By totaling the number of irrigations times the number of feddans of each crop, the total feddans irrigated of all crops during each period are determined.

The Table uses the schedule of actual irrigations by crop periods, a pattern of water demand among the irrigation periods defined. It only indicates the total number of feddans to be irrigated which can be disagaregated into number of feddans of each crop to be irrigated.

On the lane graphs pages this study tried to determine the preliminary relationship between the total area devoted to irrigated crops and the amount of water discharged from the Main Canals feeding in the areas. Such graphs might help in the irrigation schedules planning.

These analyses provide a method to determine when crop irrigation water demands are at a minimum, and during these times interventions can best be scheduled. For example, if land leveling or changing water distribution systems on fields are to be undertaken, scheduling of these interventions during low peak irrigation requirements will cause the least disruption to cropping activities. Of course, the specific crop: calendar for each crop can be followed to time the interventions on a particular field.

Before further work oncurs on these procedures to develop water scheduling information, agreements should be zeached between the disciplines on (a) the validity of the procedures, (b) the division of the crop year into irrigation periods. If it is decided to proceed with this approach, then the following should be provided by the different disciplines:

1. Economists - number of feddans of each crop, crop planting dates, and the time of each irrigation under present practices.
2. Agronomists - consumptive use requirements of each crop according to the planting dates practiced by farmers in the study sites.
3. Engineers - - definition of the appropriate irrigation periods as consistent with the rotation scheme and combine the information from the other disciplines into an irrigation schedule.
4. Sociologists - if a schedule is to be implemented in any area, work with the farmers to educate and inform them of the water scheduling procedure.

CONCLUSIONS

1. The Farm Records, which include information on planting dates, irrigation dates, and harvest dates include information useful to irrigation scheduling.
2. The Farm Records do not obtain a measure of the amount of water applied per irrigation.
3. The amount of land in each crop from the farm Records can be supplemented with consumptive use requirements for water to obtain water scheduling information.
4. The consumptive use of water estimates for Egypt included in Technical Report No. 17 cannot be used for the EWUP sites. Crop planting dates assumed in the roport do not correspond well the crop planting dates of EWUP study case farmers.
5. Even if good water consunuptive use estimates are made, the operational problem of water scheduling will remain so long as a number of crops, each at varied stages of growth, are served by the same water source.
6. If this procedure is followed, each discipline must become involved to provide its part of the required information.

Irrigation Schedule From Farm<br>Records Data At Abyuha Site.<br>1979-1980

The 1979-80 schedule of irrigations is based on aine farms for which Farm Records were kept. The farms include a total of 55.01 feddans. They range in size frolu 0.5 feddan to 14.67 feddans and average 6.11 feddans.

The following tables from 1979-80 Farm Records show the date on which each crop was irrigated, and the amount of land occupied by that crop. Since the hejght of the bar indicates the number of feddans irrigated during each period ( 15 days), we can figureout that during the period December 16 to December 31, $44^{\circ}$ feddans were irrigated. This was the largest number of feddans irrigated in any one winter period, and is the period immediately prior to the closure period. The irrigation schedule again places a large demand on water in early February after the closure period. Water demand was high agein during the second half of March, but then decreased before the high demand level was reached durir.f the summer months.

The demand for water in early October was to irrigate 5.05 feddans of Berseem, 7.87 feddans of Maize, 7.67 feddans of Sugarcane, 0.42 feddan of Tomato,a 0.5 feddar of Grapes.

During late December and immediately $b$ fore the closure period, 6.89 feddans of Berseem, 12.47 feddans of Wheat, 1.17 feddans of Sugarcane, 22.97 feddans of Broad beans, and 0.5 feddan of Grapes were irrigated.

After the winter closure period and the first half of February, 6.55 feddans of Berseem, 12.47 feddans of Wheat, 6.92 feddans of Sugarcane, and 24.0 feddans of Broad beanswere irrigated.

The demand for water in late June was to irrigate 17.01 feddans of Maize, 14.17 feddans of Sugarcane, 13.2 feddans of Cotton, 0.42 feddan of Tomato, 0.5 feddan of Grapes, and 1.04 feddans of Broad beans.

THE ABYUHA STTE.


TABLE 1 (coatinucd)


Abyutho 1979-1988


Figure 1. Histogram of the Irrigated Area at Abyuha Site, 1979-1930


Figure 2. Line Graph Snowing Land Irrigated at Abyuha Site, 1979-1980

Irrigation Schedule from Farm
Records Data at Abyuha Site
1980/1991

Records were kept for 15 fazms at Abyuha during the 1980-81 crop year. $A$ total of 65.84 feddans of land were farmed by these 15 farmers.

Farms range in size from 0.50 feddan to 14.42 feddans, the average peing 4.39 feddans. During the period Nov. 1 to Nov. .15, 44.47 feddans were irrigated. The largest number of feddans irrigated in any one winter period occurred between Dec. 16 and Dec. 31, immediately prior to closure. The irrigation schedule again places a large demand on water in early February (after closure).

Water demand is high during March and then decreases before the high demand levels during the summer months are reached. The demand for water reaches its lowest level in early October when the summer crops of corton and maize are harvested.

During the early Novenber period, 10.44 feddans of berseem are irrigated, 2.92 feddans of wheat, 22.28 feddans of broad beans, 7.67 feddans of sugarcane, and 1.17 feddans of tomatoes. Late November is also partitioned; all the crops irrigated are as defined above plus 0.5 feddan of grapes included.

The demand for water in late June includes that from 17.21 feddans of cotton, 20.32 feddans of maize, 6.71 feddans of soybeans, 15.01 feddans of sugarcane, one feddan of melons, and 0.5 feddan of grapes. The following tables show the figures of actual irrigations by crop for the 15 farmers included in the farm management record system during 1980-81.

Tabie 2. NURBER OF FEDDANS IRRIGATED BY IRRIGATION PERIOD BASED ON 1980-81 FARM RECORDS DATA FOR THE ABYUHA.SITE

| Camat's lode So and crop raised | 10/1- 10/15 | $10 / 16$ $10 / 31$ | 11/1- | $11 / 16$ $11 / 30$ | $12 / 1$ $12 / 15$ | $\left\lvert\, \begin{aligned} & 12 / 10 \\ & 12131\end{aligned}\right.$ | $\begin{aligned} & 2 / 1- \\ & 2 / 15 \end{aligned}$ | $\begin{aligned} & 2 / 16- \\ & 2 / 20 \end{aligned}$ | $\begin{aligned} & 3 / 1- \\ & 3 / 15 \end{aligned}$ | $\begin{aligned} & 5 / 16- \\ & 3 / 31 \end{aligned}$ | $\begin{aligned} & 1 / 1- \\ & 1 / 15 \end{aligned}$ | $\begin{aligned} & 1 / 16= \\ & 1 / 30 \end{aligned}$ | $\begin{aligned} & 5 / 1- \\ & 5 / 15 \end{aligned}$ | $\begin{aligned} & 5 / 16 \\ & 5 / 31 \end{aligned}$ | $\begin{aligned} & 6 / 1- \\ & 6 / 15 \end{aligned}$ | $\begin{aligned} & 6 / 16- \\ & 6 / 30 \end{aligned}$ | $\begin{aligned} & 7 / 1- \\ & 7 / 15 \end{aligned}$ | $\begin{aligned} & 7 / 100 \\ & 7 / 31 \end{aligned}$ | $\begin{aligned} & 1 / t- \\ & 8 / 1^{5} \end{aligned}$ | $\begin{aligned} & 1 / 16 \\ & 1 / 31 \end{aligned}$ | $\begin{aligned} & 9 / 1- \\ & 9 / 15 \end{aligned}$ | $9 / 10-$ $9 / 30$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - 8. Mhear |  |  |  |  |  | 2 | 2 | 2 | 2 | 2 |  |  |  | . |  |  |  |  |  |  |  |  |
| F. Cotzon |  |  |  |  |  |  |  |  |  | 1.75 | 1.75 | 2 | 1.75 | 2 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |  |
| 2. C. Maize | 1.83 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.83 | 2.83 | 1.83 | 1.83. | 1.88 | 1.13 |
| A. Berszex | . 5 | . 5 | . 5 | . 5 | . | . 5 |  | . 5 | . 5 | . 5 | . 5 |  |  |  |  |  |  |  |  |  |  |  |
| C. Broadbeans |  |  | . 5 | 1.08 |  | 1.54 | 2.54 |  | 1.54 | 1.54 |  |  | $\because$ |  |  |  |  |  |  |  |  |  |
| B. Mheat |  |  |  |  | . 5 | 1.58 | 1.04 |  | 1.04 |  | 2.04 |  | 1.04 |  |  |  |  |  |  |  |  |  |
| D. Sugarcane | . 75 | . 75 | . 75 | .. 75 | . 75 | . 75 |  |  |  |  | . 75 | . 75 | . 75 | . 75 | . 75 | . 75 | . 75 | . 75 | . 75 | . .75 | . 75 | 3 .75 |
| G. Maize |  |  | . |  |  | . |  |  |  | - |  |  |  |  | 3.12 | 3.12 | 3.12 | 3.12 | 3.12 | 3.12 | 3.12 | 3.12 |
| 3. H. Soybeans |  |  |  |  |  |  |  |  |  |  |  | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | . 3 |  |  |
| A. Bersees |  | . 25 | . 25 | . 25 | . 25 | . 5 |  | . 25 | . 25 | . 25 | . 25 | . 25 | . 25 |  |  |  |  |  |  |  |  |  |
| C. Broadbeans |  |  | 4.0 |  |  | 4.0 | 4.0 |  | 4.0 | 1.3 | 2.5 |  |  |  |  |  |  |  |  | . |  |  |
| B. Wheat |  |  |  | 2.5 | 2.92 | 5.42 | 5.42 | 2.42 | 3.5 | 2.92 | 3.5 | 3.5 | 1.92 |  |  |  |  |  |  |  |  |  |
| C. Haize |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5.0 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |  |
| 4. F. Cotion |  |  |  |  |  |  |  |  |  |  |  | 1.5 |  | 1.5 | 1.5 | 1.5 | 1.5 | 2.5 | 1.5 | 1.5 | 1.3 | 2.5 |
| A. Berseen | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | ¢.75 | 1.25 | . 75 | . 75 |  | . 75 |  |  |  |  |  |  | 1.25 |
| C. Broadbeans - |  | . 67 | 1.67 |  |  | 1.84 | 1.42 | . 92 | 1.42 | . 92 |  |  |  |  |  |  |  |  |  |  |  | 2.25 |
| B. Wheat |  |  |  |  | . 25 | . 25 | . 25 | . . 25 |  | . 25 | . 25 |  |  |  |  |  |  |  |  |  |  |  |
| G. Maize |  |  |  |  |  |  |  |  |  |  |  |  |  |  | . 75 | 2.0 | . 75 | 2.0 | 2.0 | ' 3.0 | 1.5 | . 75 |
| F. Cotton |  |  | - |  |  |  |  |  |  |  |  | 2.09 | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 | 1.09 |  |
| H. Soybeans |  |  |  |  |  |  |  |  |  |  |  |  | .75 | 1.50 |  | 1.50 | . 75 | . 75 | . 75 | . 75 |  |  |
| C. Broadbeans |  |  | . 83 |  |  | . .33 - | . 33 |  | . 83 | . 83 |  |  |  |  |  |  |  |  |  |  |  |  |
| E. Grapes | .5 | . 5 |  | . 5 |  |  |  |  | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 |  | ! . 5 | . 5 | . 5 |
| A. Berseem | .67 | . 67 | . 67 | . 67 | . 67 | . 67 | . 67 | . 67 | . 67 | : . 67 | . 67 | . 67 | . 67 | . .67 |  |  |  |  |  |  |  | . 23 |
| 3. Wheat |  |  |  |  |  | . 38 | . 38 |  | . 38 | . 38 | . 38 |  |  |  |  |  |  |  |  |  |  |  |
| :F. Cotton |  |  |  |  |  |  |  |  |  |  |  | . 83 |  | . 83 | . 13 | . 33 | . 83 | .13 | . 83 | . 23 | - |  |
| G. Maize |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .42 | 1.04 | 1.04 | 1.04 | . 1.04 | 1.24 | 1.04 |
| C. Eroadbeany |  |  | 7.94 |  |  | 7.94 | 7.94 |  | 7.94 | 7.94 |  |  |  |  | - |  |  |  |  |  |  |  |
| D. Sugarcane | 6.3 | 13.0 | 6.5 | 6.5 |  |  |  |  |  | 6.5 | - |  |  | 13.0 | . | 13.0 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 |
| H. Soybeans |  |  |  |  |  |  |  |  |  |  |  |  |  | 4.42 | 4.71. | 4.71 | 4.71 | 4.71 | 4.71 |  |  |  |

Table 2 (Continaed)

| Farter's Cole So, and crop raised | 10/1- 10/15 | 10/16- | $11 / 1-1$  <br> $11 / 15$ 1 | $11 / 16$ $11 / 30$ | $12 / 1-$ 1 <br> $12 / 15$ 1 | 12/16. | 2/1- $2 / 15$ | 1/16- 2/: | 3/1- $3 / 15$ | 5/16- | 1/1- | $1 / 16-$ $1 / 50$ | 5/1- <br> 5/15 | 5/16-1 | 6/1- | $6 / 16-1$ $6 / 30$ | 7/1- $7 / 15$ | $7 / 16$ $7 / 31$ | $\begin{aligned} & 3 / 1- \\ & 8 / 15 \end{aligned}$ | 8/16-1 | $\begin{aligned} & 9 / 1- \\ & 9 / 15 \end{aligned}$ | 9/16- |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F. Cotron |  |  |  |  |  |  |  |  |  |  |  |  | 3.21 | 3.21 | 3.21 | 3.21 | 3.21 | 3.21 | 3.21 | 3.21 | 3.21 |  |
| 7. |  |  |  |  |  | 2 | 2 | 2 | 2 |  | 2 |  |  |  |  |  |  |  |  |  |  |  |
| B. Wheat D. Sugarcane/braadbeans | . 63 | . 63 | 2 | . 63 |  |  | . 63 |  | .63 | . 63 |  | . 63 | . 63 | . 63 | . 63 | 1.26 | . 53 | . 63 | . 65 | . 63 | . 63 | . 33 |
| C. Broadbeans |  |  | . 63 |  |  | . 63 | . 63 |  | . 63 | . 63 |  |  |  |  |  |  |  |  |  |  |  |  |
| D. Sugarcane |  |  | . 42 | . 42 | . 42 | . 42 | . 42 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| A. Berseem |  |  | . 38 |  | . 38 | . 38 | . 38 | . 38 | . 38 | . 38 | . 39 | . 38 | . 38 | . 38 |  |  |  |  |  |  |  |  |
| G. Maize |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.05 | 3.05 | 3.43 | 3.43 | 3.43 | 4 | 5.43 | 80. |
| 8. |  | . 38 |  | . 38 | . 38 |  |  | . 38 | . 38 | . 38 | . 38 | . 38 | . 38 |  |  |  |  |  |  |  |  |  |
| A. Berseem |  | . 38 | .38 .54 | . 38 | . 38 | . 254 | . 54 | . 54 | . 54 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C. Broadbeans |  |  |  |  |  | $\because$ | 1 |  | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |
| B. Wheat G. Maize |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.84 | . 92 | . 92 | . 92 | . 92 |  |  |
| 9. |  |  | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| . C. Broadbeans | , |  | . 42 |  |  | . 28 | . 22 | . 08 | . 08 | . 08 |  |  |  |  |  |  |  |  |  |  |  |  |
| A. Berseem I. Melon | . 16 |  | . 08 | . 08 | . 08 |  |  |  |  |  | . 5 | . 5 |  | . 5 | . 5 | 1.0 |  |  |  |  |  |  |
| 10. |  |  | 75 |  |  |  | . 75 |  | . 75 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B. Kheat |  |  | . 75 |  |  | . 75 | . 75 |  | . 75 | ${ }^{.3}$ | $1^{.5}$ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |  |  |
| F. Cotton <br> G. Maize |  |  |  |  |  |  |  |  |  |  |  |  |  |  | . 75 | . 75 | . 75 | . 75 | . 75 | . 75 | . 75 | . 75 |
| C. Brozdbea |  |  |  | . 29 |  | . 29 | . 29 |  | . 29 | . 27 |  |  |  |  |  |  |  |  |  |  |  |  |
| C. Brozdeans | ! |  | . 13 |  | . 54 | . 71 | . 71 |  | . 71 | . 71 | . 71 |  |  |  |  |  |  |  |  |  |  |  |
| A. Berseem | . 42 | . 42 | . 41 | 2.42 | . 42 | . 42 | . 42 |  | . 42 | . 42 | . 42 | . 42 |  |  |  |  |  |  |  |  |  |  |
| F. cotton |  |  |  |  |  |  |  |  |  |  |  | . 29 | . 29 | . 29 | . 29 | . 29 | . 29 | . 29 | . 29 |  | . 29 |  |
| G. Maize |  |  |  |  |  |  |  |  |  |  |  |  |  |  | . 21 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 | 1.13 |  |
| 12. |  |  |  | 5 |  |  |  |  |  | . 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| C. Broadbeans |  |  |  | . 5 |  | ${ }^{.5}$ | .5 .67 |  | . 67 | . 67 | . 67 |  |  |  |  |  |  |  |  |  |  |  |
| B. Wheat | . 38 | . 38 | . 38 | . 38 | . 38 | . 68 | . 38 |  |  | . 38 | . 38 | . 38 | . 35 |  |  |  |  |  |  |  |  |  |
| F. Corton |  |  |  |  |  |  |  |  |  |  |  | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | . 5 | .5 | . 5 |  |  |
| G. Maize |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2.05 | 1.05 | 1.05 | 1.05 | 1.05 | 1.05 | 1.05 |  |
| 13. |  |  | 1.21 |  | . 92 | $2 . .29$ | . 1.21 |  | 1.21 | 1.21 |  |  |  |  |  |  |  |  |  |  |  |  |
| C. Browbeans |  |  | 1.16 | $6 \quad 2.16$ | 6 . 53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B. Wheat |  |  |  |  |  | 6.46 | . 46 |  | . 46 | . 46 |  |  |  |  |  |  |  |  |  |  |  |  |
| A. Berseen | . 67 | 7.67 | . 67 | 7. 67 |  | . 67 | . 67 | . 67 | . 67 | . 67 | . 67 | . 67 | . 67 | . 67 |  |  |  |  |  |  |  |  |

Table 2 (continued)


Abyuta 1988-1991


Figure 3. Histogram of the Irrigated Area at Abyuha Site, 1980-1981


Figure 4. Line Grapl. Showing Land Irrigated at Abvoha Site, 1989-1981.

## Irrigation Schedule from Farm Records Data At Abu Raya Site 1979/1980

The $1979 / 1980$ schedule of irrigations is based on seven farms for which Farm Records were kept. The farms include a total of 45.33 feddans. They range in size from 3.00 feddans to 10.75 feddans and average 6.47 feddans.

The following tables from 1979/80 Farm Records show the date on which each crop was irrigated, and the amount of land occupied by that crop.

The largest number of feddans irrigated in winter period was during the period November 1, to November 15.. Water demand was very high during the perird June 15, to September 1, because of the water applied for rice. The rice was irrigated 9 times during the period June 16 , to July 15,6 times through August, and four times during September.

The demand for water in early October was to irrigate 12.67 feddans of Berseem, 1.24 feddans of Tomato, and 1.0 feddan of Maize.

During late December and immediately before the winter closure period, 13.7 feddans of Berseem, 1.33 feddan of Broad beans, 11.21 feddans of Wheat, 0.91 feddan of Onion, anc 1.5 feddans of Flax were irrigated.

After winter closure period, and on the first half of February, 12.71 feddans of Berseem, 0.58 feddan of Broad beans, 6 feddans of Wheat, 2.41 feddans of Onion and 1.33 feddan of Flax were irrigated.

The demand of water in late June was to irrigate 9.54 feddans of cotton, 123.52 feddans of Rice, 7.12 feddans of Maize, 0.5 feddan of Water Mellon, 2 feddans of Cucumber, and 0.71 feddan of Trmato.

Table 3.
NUMGER OF, FEDDANS IRFIGATED BY IRRIGATION PERIOD BASEDON 1979_980 FARM RECORDS DATA FOR
THE ABU RAYA. SITE :

| Farmer's Code No and crop ralsed | $10 / 1$. $10 / 15$ | $10 / 16$ $10 / 31$ | $11 / 1-1$ $11 / 15$ | 11/16. | $12 / 1$ $12 / 15$ | $12 / 16$ <br> $12 / 31$ | $1 / 1$ $1 / 15$ | : $\begin{aligned} & \text { 210- } \\ & 2 / 25\end{aligned}$ | $3 / 1-$ $3 / 15$ | $3 / 16-$ $3 / 31$ | $1 / 1$. $1 / 15$ | $1 / 16$ $3 / 30$ | $\begin{aligned} & 5 / 1- \\ & 5 / 15 \end{aligned}$ | $5 / 16$. $5 / 31$ | $\begin{aligned} & 6 / 1- \\ & 6 / 15 \end{aligned}$ | $\begin{aligned} & 6 / 16 \\ & 6 / 30 \end{aligned}$ | $\begin{aligned} & 7 / 1- \\ & 7 / 15 \end{aligned}$ | $\begin{aligned} & 7 / 16- \\ & 7 / 31 \end{aligned}$ | $\begin{aligned} & 8 / 1- \\ & 8 / 15 \end{aligned}$ | 3/16- $8 / 31$ | $\begin{aligned} & 9 / 1- \\ & 9 / 15 \end{aligned}$ | $9 / 100$ <br> $9 / 30$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 201. | $?$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Be-seea | 0.63 | 0.63 | 3.51 | 2.75 |  | 2.63 | . 63 | 2.0 | . 25 | 2.0 | 2.0 | 2.0 | 2.9 |  |  |  |  |  |  |  |  | - |
| Broadbeans |  |  | . 25 |  |  | . 25 |  |  | . 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| theat |  |  | 1.0 |  |  | 1.75 |  | 1.75 | . 75 | 1.0 | . 75 | 2.75 |  |  |  |  |  |  |  |  |  |  |
| Cotron |  |  |  |  |  |  |  |  |  | 1.75 | 1.75 |  | 1.75 | 1.75 | 1.75 | 1.75 | 1.25 | 1.75 | 1.75 . |  |  |  |
| . Maize |  |  |  |  |  |  |  | \% |  |  |  |  |  | 1.0 |  | 1.0 | 1.0 | 1.0 | 1.0 | 2.0 | 1.0 |  |
| - Rice |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.25 | 13 | 13. | 6.5 | 6.5 | 6.5 | 13 |  |
| 202. | . |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Berseen | 3.5 |  | 4.29 |  | 2.79 | 1.54 | 2.79 |  |  | 2.0 | 2.0 | 2.0 | 2.0 |  |  |  |  |  |  |  |  |  |
| Onion |  |  |  | . 83 |  | . 83 | . 83 |  | . 83 |  | . 83 |  |  |  | - |  |  |  |  |  |  |  |
| . Mheat |  |  |  | 1.67 |  | 1.67 |  | 1.67 |  | 1.67 |  | 1.67 |  |  |  |  |  |  |  |  |  |  |
| Corton |  |  |  |  |  |  |  |  |  | 5.5 |  |  | 2.75 | 2.75 | 2.75 |  | 2.75 | 2.75 | 2.75 | . |  |  |
| Hater Melon |  | . |  |  |  |  |  |  |  |  |  | . 5 |  |  | 1.0 | . 5 | -- |  |  | : |  |  |
| Cucumber |  |  |  |  |  |  |  | - |  | . 5 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | . 5 |  |  |  |  |  |
| Rice |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.67 | 16.02 | 13.35 | 13.35 | 16.02 | 16.02 | 5.34 | 5.34 |
| Maize Forage |  |  |  |  |  | - | . | i |  |  |  |  |  |  |  |  |  |  |  | . 5 | . 83 |  |
| Tomato | 0.34 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.17 | . 34 | . 17 | 0.34 | 0.38 |
| 203. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | . |  |
| Berseen | 2.75 | . 83 | 4.29 |  |  | 2.49 |  | 4.9 | 4.27 | 1.63 | 1.84 | 2.84 | 1.63 |  | . |  | . |  |  |  |  |  |
| kheat |  |  |  | 2.8 |  | 2.79 |  |  | 2.79 | 2.79 | 2.79 |  |  |  |  |  |  |  |  |  |  |  |
| Flax |  |  |  | 1.33 |  |  | 2.33 |  | 1.33 | 1.33 | 1.33 |  |  |  |  |  |  |  |  |  |  |  |
| Sroadbeans |  |  |  | . 58 |  | . 58 | . 58 | . 58 | . 58 |  | . 58 |  |  |  |  |  |  |  |  |  | . |  |
| Onion | . |  |  | . 08 |  | . 08 | . 08 |  | . 08 |  | . 08 |  |  |  | . |  |  |  |  |  |  |  |
| Cotzon. |  |  |  |  |  |  |  |  |  |  | 4.66 |  | 2.33 | 2.33 |  | 2.33 | 2.33 | 2.33 | 2.33 | 2.33 |  |  |
| Rice |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 5 |  | 15 |  | 30 | 50 | 10 | 10 |
| Haize |  | - |  |  |  |  |  |  |  |  |  |  |  | 1.33 | 2.33 | 1.35 | 1.33 | 1.33 | 2.66 | 1.33 | 1.53 |  |
| 204. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bersse |  | 1.5 | 1 | 2 |  | 2 | 2 | 1.5 | 1.5 | 2 | 3.5 | 2.5 | 2 |  |  |  |  |  |  |  |  |  |
| Mheat | . |  |  |  |  | 1 | 1 |  | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |  | - |
| Maize. |  |  |  |  |  |  |  | , |  |  |  |  |  | 1 |  | 1 | 1 | 2 | 2 | 1 | 1 |  |
| Rice |  |  |  |  |  |  |  |  | : |  |  |  |  |  | . 5 | 3 | 1.5 | 1.5 | 3 | 3 | 1 | 1 |
| 205. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | . 83 |
| Berseem | 3.29 | 3.29 | 3.29 |  |  | 3.29 | 3.29 | 1.85 |  | 1 | 1 |  | 1 |  |  |  |  |  | - |  |  |  |
| Toasto/Cabbage | 1 | 1 | . 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Flax |  |  |  | 2 |  | 1.5 |  | 1.5 |  | 1.5 |  |  |  |  |  |  |  |  |  |  |  |  |
| Cucurber |  |  |  |  |  |  |  |  |  |  | 1.0 | . 5 | . 5 | . 5 | 1.0 | 1.0 |  |  |  |  | - |  |
| Cozton |  |  |  |  |  |  |  | i |  | 1.48 | 2.46 |  |  | 1.46 | 1.46 | 1.46 | 1.46 | 1.46 | 1 1.46 |  |  |  |
| Maize |  |  |  |  |  | 1.5 |  | 1.5 | . |  |  |  | 1 | 1.5 | 2.5 | 2 | 1.5 | . | 2.5 | 2.5 | 1.5 |  |

Table 3 (continued)


Kafr ol-Sheikh 1979-1988


Figure 5. Histogram of the Irrigated Area at Abu Raya Site, 1979-1980.


Figure 6. Line Graph Showing Land Irrigated At Abu Raya Site, 1973-1980

## Irrigation Schedule from Farm <br> Records Data At Abu Rzy日. Site 80/81

The 1980-81 schedule of irrigations is based on 15 farms for which farm records were kept. The farms include a total of 90.55 feddans. They range in size from 1.5 feddans to 16.00 feddans and average 5.04 feddans.

The following tables from 1980-81 Farm Records show the date on which each crop was irrigat:ed, and the amount of land occupied by that crop.

The largest numter of feddans irrigated in winter period was during the period January 1 to January 15 . Water demand was very high during the period June 16 to $\mathcal{E}_{\mathrm{uf}}$ :ember 15 , because of the water applied for rice. The rice was irrigated 9 times during June 16 to July 16,6 times throusu August, and four times during September.

During the first half of January and imediately before the winter closure period (January 19 to February 14) 38.88 feddans of Berseem, 16.51 feddans of Wheat, 5.21 feddans of Sugarbeet, 2.83 feddans of Broad beans, 0.5 feddan of Flax and 0.58 feddan of Onions were irrigated.

After winter closure period, and on the second half of February, 23.22 feddans of Wheat, 31.74 feddins of Berseem, 3.21 feddans of Sugarbeets, 0.83 feddan of Fiax, 0.17 feddan of Cucumber, and 0.50 feddan of Lettuce were irrigated.

The demand for water during the period September 1. to September 15 was to irrigate the largest number of feddans irrigated in summer. It was to irrigate 219.6 feddans of Rice, 18.35 feddans of Cotton, 9.88 feddans of Maize and Maize forage, 1 feddan of Water mellon, 0.91 feddan of Tomatoes, and 2 feddans of Berseem.
gadie t. ivonber of pavonns IRRIGAIED BY IRRIGAITON PERIOD BASED ON
1980-1931 FARM RECORDS UATA FOR TAE ABU RAYA SITE




Kafr el-5heikh 1980-1981


Figure 7. Histogram of the Irrigated Area at Abu Raya Site, 1980-1981

Kafr el-Sheikh 1988-1981


## The Relationship of Irrigated Areas <br> To Water Discharged from <br> Main Canals

In the preceding pages we have described areas which were irrigated during several periods, each lasting two weeks. This was illustrated for the reader with the aid of bar graph. Such graphs make it easy to recongnize those periods when much water is being used, and therefore helps in the planning of irrigation schedules which are in accordance with these high water requirementes.

The largest number of feddans were irrigated during the winter planting period, just before and just after the winter closure, and during the summer, especially in areas planted with cotton and rice. These are crops which require large amounts of water.

In the following pages the results of a preliminary study determining the relationship between the total area devoted to irrigated crops and the amount of water discharged from the Main Canals feeding in the area is presented. This study is based on data gathered by the Water Budget Task Group. Although it is somewhat incomplete in certain areas, this information is sufficient for the analysis of water use during the periods.

If, for example, we compare the water discharge measured for the Abyuha Canal with the area of land irrigated at Abyuha during the period of April 1 to December 31, 1980 ( $\mathrm{pp} .30,32$ ), we see that the lines graphed for each are approximately equal.

However, when we compare the water discharge measured for the Om Sen Canal with the area of land irrigated at the Kafr el-Sheikh site druing the period of March 1 to December 31, 1980 ( $\mathrm{pp} .36-38$ ), we see that. the
line for feddans peaks in June and August at a much greater magnitude than the Q-water discharged. The Q-water also lies below the feddans irrigated for the Kafr el-Sheikh site whereas in the Abyuha case Qiwater is above the feddans irrigated.

These comparisons assume that each irrigation requires a constant amount of water. Since irrigation of a given crop may require more or less water per feddan than the crop may receive due to its condition and stage of growth and the varied amounts of water at each irrigarion , the comparisons are only approximations. More accurate measures of the amount of water applied to each crop at each irrigation is needed to provide an accurate comparison of the demand for water relative to the quantity of water delivered.

## Table 5 <br> Feddans Irrigated and Percent Area Irrigated Gbueha Farm Records

|  | 1980-1981 |  | $\begin{array}{r} 197 \\ \text { Ferdans } \\ \text { Irrigated } \end{array}$ | 980 <br> Percent <br> Irrigated |
| :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { OCT } \\ & 16-31 \end{aligned}$ | 15.2 | 23.1 | 21.5 16.3 | 39.1 |
| $1-15$ $16-30$ | 44.5 | 67.5 | 32.1 | 69.3 |
| DEC $11^{1}-15$ JAN | 21.3 | 32.3 | 16.8 44.0 | 80:\% |
| $\begin{gathered} 1-15 \\ 16-31 \end{gathered}$ | Closure Closure |  | Ciosure |  |
| E $1-15$ $16-28$ | 46.9 16.8 | 71.2 | 49.9 11.4 | 90. 20 |
| MAR 1-15 $16-31$ | 47.5 | 72.2 | 18.4 3 | 33.5 |
| APR $\begin{aligned} & 1-15 \\ & 16-30\end{aligned}$ | 28.38 | 42.9 | 19.4 | 35.3 |
| MAY-15 $18-151$ $18-31$ | 24.5 41.4 | 37.1 | 16.1 | 29.3 |
| JUN $1-15$ $16-30$ | 35.9 60.1 | 54.6 | 29.4 46.3 | 53.4 |
| Jut $1-15$ $16-31$ | 51.0 | 77.5 | 37.1 | 67.4 |
| AUG $1-15$ $16-31$ | 53.2 | 80.8 | 43.1 36.6 | 78.3 66.6 |
| SEP $16-150$ $16-30$ | 41.4 20.4 | 63.0 30.7 | 32:6 | 59:3 |

Table 6
Feddans Irrigated and pischarge to the Abueha Canal Abueha Farm Records

1980-1781
Freddans (Discharge
15.2
$1-15$
$6-31$
NOU
$1-15$
$16-30$
DEC
$1-15$
$16-31$
AN-15
16-31
$1-15$
$16-28$
MAR
1-15
$A A^{16^{-1}-3}$
$1 \frac{1-15}{16-30}$
MAY
1-15
16-31
JUN
$1-15$
$16-30$
J-15
$16-31$
AUG
$1-15$
$16-31$
SEP
$1-15$
$16-30$
24.8
44.5
27.5
21.3
56.5

Closure Closure
46.9
16.8
.
47.5
28.3
24.5
41.4
$35: 9$
51.0
53.2
41.4
20.4
62.5
$65: 4$
39
29.7
46.6

## Closure Closure

49.9
11.4

18:4

| 19.4 | 100.2 |
| :--- | ---: |
| 17.7 | 71.9 |
| 16.1 | 73.8 |
| 21.7 | 100.0 |
| 29.4 | 106.7 |
| 46.3 | 84.4 |
| 37.1 | 106.5 |
| 45.3 | 78.9 |
| 43.6 | 99.3 |
| 32.6 | 120.2 |
| 29.3 | 95.0 |



Figure 9. Line Graph Showing Land Irrigated at Abu Raya Site, 1980-1981

Abyutic 1979-1980


Figure 10. Line Graph Showing \% of Area Irrigated and Abyuha Canal Dishcarge, 19:9-1980.


Figure 11. Line Graph Showing Land Irrigated and Abyuna Canal Discharge, 1980-1981.


Figure 12. Line Grapin Showing of Area Irrigated and Abyuha Canal Discharge, 1980-1981.

Table
Faddans Irrigated and percent Area Irrigated Rafr el Sheikh Farm Records

|  | Fedd 198 Irrigated | 981 <br> Percent <br> Irrigated | $\begin{aligned} & \text { Fediry } \\ & \text { Frrigated } \end{aligned}$ | 1980 <br> Percent <br> Irrigated |
| :---: | :---: | :---: | :---: | :---: |
| OCT |  |  |  |  |
| (1-15 | 15.3 | 16.1 | 15.0 | 33.1 |
| NOU ${ }_{1-15}$ |  |  |  |  |
| $1-15$ $16-30$ | 34.0 | 37.6 | 28:\% | 35:6 |
| DEC $1-15$ | 28.0 | 30.9 | 88.3 | 16.1 |
| JAN-31 | 18.5 | 20.4 | 28.7 |  |
| 1-15 16-31 | 64.5 closure 71.2 |  | 23.11 closure 50.8 |  |
|  |  |  |  |  |
| $1-18$ $M^{16-208}$ | $59.7{ }^{\text {Closure }} 65.9$ |  | $18.5{ }^{\text {Closure }} 40.8$ |  |
| MaR $1-15$ $16-31$ | 38.368.9 | 42.3 | 20:1 | 44.476.9 |
| $A^{16} \mathrm{C}^{-31}$ |  | 76.1 |  |  |
| A $1-15$ $16-30$ | 65.8 | 72.7 | 45.18 | 99.4 |
| MAY ${ }_{1-15}$ | 60.313.6 | 66.615.0 | 22.7 | 50.2 |
| JUN-31 |  |  |  |  |
| 1 1 1 | 173.9.6. | 197.5 | 47 143.4 | 103.7 316.3 |
| JUL-15 | 235.7 | 260.3 204 | 91.5 | 201999 |
| 16-31 |  |  |  |  |
| AUG ${ }_{1-15}$ | 136.4 | 150.6 | 137.3136.1 | 303.0 |
| SEP ${ }^{16-31}$ |  |  |  |  |
| $1-15$ $16-30$ | $251.9$ | 278.2 | $56.5$ | 124.9 |



1980-1981

$\begin{array}{rr}8.3 & 46.9 \\ 15.2 & 25.3 \\ 34.0 & 16.2 \\ 42.2 & 36.1 \\ 28.0 & 28.6 \\ 18.5 & \therefore 0.2\end{array}$
64.5Closure
$59.7^{\text {C1osure }}$
38.3
68.9
65.8
60.7
13.6
33.9
177.6
235.7
185.0
136.4
133.8
251.9

1979-1980
Feddans $\quad$ Discharge
Irrigated (10000 m


## Kafr el-Shoikh 1979-1980



Figure 13. Line Graph Showing Land Irrigated and Om Sen Canal Discharge, Kafr el-Sheikh, 1979-1980.

Kafr ol-Sheikh 1979-1988


Figure 14. Line Graph Showing of of Area Irrigated and Om Sen Canal Discharge, 1979-1980.


Figure 15. Line Graph Showing Land Irrigated and Om Sen Canal Discharge, 1980-1981.

Raf si Guin 100-198:

rigure 16. Line Graph Showing \% of Area Irrigated and Om Sen Canal Discharge, 1980-1981.

## AMERICAN EQUIVALFNTS OP EGYPTIAN ARABIC TERMS AND MEASURES COMMONLY USED IN IRRIGATICN WORK

| Land Araa | In 89 meters | in acres | in fteddano | In hectares |
| :---: | :---: | :---: | :---: | :---: |
| 1 acre | 4,046.856 | 1 | 0.96335 | 0.40469 |
| 1 feddan | 4,200.8335 | 1.03805 | 1 | 0.42008 |
| 1 hectare(ha) | 10,000.00 | 2.47105 | 2.38048 | 1 |
| $18 q$ kilometer | $100 \times 10^{4}$ | 247.105 | 238,048 | 100.00 |
| 184 mile | $259 \times 10^{6}$ | 640.00 | 616.4 | 259.00 |

## Mater Mensures

```
1 billion m
1000 m3 =0.81071 acre-foot = 9.72852 acre-inch
1000 m3/feddan =0.781 acre-foot/acre = 9.372 acre-inch/acre
(= 238 mm of rainfall)
```


## Other Conversions

```
1 ardeb = 198 liters = 5.62 bushels (0.B)
1 ardeb/feddan = 5.41 bushels/acre
1 kg/feddan = 2.12 1b/acre
1 donkey load = 100 kg
1 camel load = 250 kg
1 donkey load of manure = 0.1 m}\mp@subsup{}{}{3
1 camel load of manure = 0.25 m}\mp@subsup{\textrm{m}}{}{3
```


## Egyptiar. in!t for Field Crops

| Crop | E.g. Unit | in kg | in 1bs | in bushels |
| :---: | :---: | :---: | :---: | :---: |
| Ientils | ardeb | 160.0 | 352.42 | 5.87 |
| Clover | ardeb | 157.0 | 345.81 | 5.76 |
| Broad beans | ardeb | 155.0 | 341.41 | 6.10 |
| Wheat | ardeb | 150.0 | 330.40 | 5.51 |
| Maize,Sorghum | ardeb | 140.0 | 308.37 | 5.51 |
| Barley | ardeb | 120.0 | 264.3i | 5.51 |
| Cottonseed | ardeb | 120.0 | 264.32 | 8.26 |
| Sesame | urdeb | 120.0 | 264.32 |  |
| Groundnut | ardeb | 75.0 | 165.20 | 7.51 |
| Rice | dariba | 945.0 | 2081.50 | 46.26 |
| Chick-peas | ardeb | 150.0 | 330.40 |  |
| Lupine | ardeb | 150.0 | 330.40 |  |
| Linseed | ardeb | 122.0 | 268.72 |  |
| Fenugreek | ardeb | 155.0 | 341.41 |  |
| Cotton(unginned) | metric qintar | 157.5 | 346.92 |  |
| cotton(lint or ginned) | metric qintar | 50.0 | 110.13 |  |

## Egyptian Farming and Irrigation Terms

```
fara' = branch
marwa a small distributer, irrigation ditch
masraf = field drain
mesqa m small canal feeding from 10 to 40 farnts
qirat = cf. English "karat," A land measure of 1/24 fuddan, 175.03 m
qaria = village
saf. = 1/24th of a qirat, 7.29 m2
suqia = animal powered water wheel
silrf = drain (vb.), or drainage. See also masraf, (n.)
```

