LAND CAPABILITY AND ECONOMIC SUITABILITY OF EL-ORUBA VILLAGE SOILS, EGYPT

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ABSTRACT

The current research aims to investigate soil characteristics and to predict optimum crop pattern using linear programming technique on soils of El-Oruba village. The study site is located in Behira Governorate, at the northwestern delta fringe and of south Mariut Lake. The study area is characterized by different environmental depositions (alluvial, marine and lacustrine environments) in addition to their interferences. Semi-detailed soil survey was carried out, and soil profiles were macro-morphologically described. Soil texture, salinity, sodicity and total carbonate differed widely from location to another, which might be attributed to the influence of the different depositional environments. The investigated soils have texture varied from sandy and sandy clay loam to clay, salinity ranged between 0.4 and 29.5dS/m, SAR values were being in the rang 1.3 to 28.3, total carbonate content ranged between 2.2 and 30.2%. The studied soils are classified as Aridisols and Entisols. Regarding land capability; the three main indexes, namely, soil index (S.I.), fertility index (F.I.) and FILE values ranged from 37.05 to 78.33, 29.5 to 49.14 and 32.79 to 61.43% respectively. Most soils belong to capability class 3 (fair or moderate), whereas other soils belong to capability class 4 (weak or marginal). A limited was found to be capability class 2 (good).

The optimum crop pattern was suggested by using Linear Programming technique as follows: Rice, Cotton, Maize and very small area of onion as summer crops while Clover, Wheat, and very small area of Beans as winter crops. The average net income per feddan in the suggested optimum cropping pattern is 1672.63 L.E., whereas the actual net income per feddan is 1572.88 L.E. This means that the increase optimum cropping pattern lead to an increase the net income by 6.34%. Nine elements (Ploughing, seeds, labour, cultivation, irrigation pesticides, harvest, threshing and transporting) were not optimally exploited and should be beneficiated in the production processes.

***Key words**: Land Evaluation, linear programming, Mariut Lake, Oruba, Economic*

INTRODUCTION

Egypt is suffering from excess population pressure and limited arable area. Therefore, the agricultural security depends largely on two main schemes (I) rising productively of the existing cultivable land, (II) adding new areas to these cultivable lands. Such planning could be attained through land capability and evaluation studies taking into consideration the soil chemical, physical and economic factors (Bahnassy, 1987).

Many investigators have studied soils south of Lake Mariut. Abd El-Rahman (1970) studied the soils of Alexandria Mariut area and pointed out that the different soils have been formed due to the differences in the nature of parent materials (calcareous, marine, lacustrine and alluvial deposits). The morphological characteristics of the lacustrine soils located south of Lake Mariut were studied by El-Husseiny et al (1985), El- Attar et al (1987) and El-Zahaby et al (1999). They found that these soils are stratified and salt affected in some locations. Shells are abundant but irregularly distributed in both the vertical and horizontal directions. These soils were classified as *Ustorthents*, *Ustfluvents*, *Haplargids* and *Haplosalids*.

FAO (1989), in quantitative studies, exhibited that economic analysis is important although the nature of the analysis is varying according to land utilization type under consideration, and whether the study is at semi-detailed level of intensity. However, at the semi-detailed level, it is helpful to carry out cost-benefit analysis on a tentative basis to provide guidance on the economic prospects for the kinds of land use considered. On the other hand, at the detailed level of intensity, economic analysis should be based on data relating to the availability of resources and their allocation by producers, input- output relationships, sales patterns, prices, costs and credit needs and availability. Also, cost-benefit analysis or other quantitative methods of economic analysis may be employed.

Ismail et al., (2004) developed Agriculture Land Evaluation System for arid region (ALES-Arid) software. They listed four major factors to define the land capability classification. These factors were (I) soil chemical and physical properties (II) environmental status (III) irrigation system and water qualities and (IV) soil fertility. This approach also included land suitability classification for several crops and prediction of yield production for wheat and corn. Fayed et al (2005) studied land capability east of Idko Lake using ALES-Arid program and concluded that most of the studied soils were classified as class 3 (fair or moderate) while the others were classified as class 4 (weak or marginal).

Linear programming (LP) is a problem-solving approach that has been developed to help managers made decisions. It is used extensively in agricultural economics research and extension, but extensive use does not alter the fact that the LP model is a simplification of reality (Burton et al., 1987). The

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well known assumptions of additively, linearity, divisibility, fitness, and single-value expectations, are used to reduce complex real world situation to mathematical formulations which can be optimized using the simplest method (Heady and Candler, 1958). Typically, LP solves report only one optimal solution and the number of mathematical constraints. In LP terminology the maximization of a quantity is referred to as the objective of the problem. Thus the objective of all LP is to maximize or minimize some quantity. A second property common to all LP technique is that there are restrictions, which the objectives can be perused (Anderson et al., 1985). According to Man (1978), linear programming (LP) is an analytical or mathematical technique which may be used to fined optimal solution to allocation similar types of decision problems. In order to apply the LP technique to determine the most profitable product, mix of a pilot is often necessary to estimate the input coefficient from sample data (Subhash, 1985). In Egypt, El-Menshawy (1996), by using linear programming technique, found that the optimum cropping pattern leads to an increase the net income by 10.7% and 6.1% for Itay El-Baroud and Abou El-matameer respectively. Moustafa et al (1997) studied the soils of Mahallet-Besher village (Behira Governorate) and pointed out that the optimum crop pattern was suggested by using linear programming technique as flows; cotton, rice and maize as summer crops and clover, wheat as winter crops.

The main objectives were to (i) investigate the soil characteristics, (ii)apply soil classification according to US soil taxonomy, (iii) carry out land capability evaluation and (iv) predict the optimum crop pattern using linear programming technique for the soils located at the north western delta fringe and south of Lake Mariut ((El-Oruba village)

MATERIAL AND METHODS

The study site (El-Oruba village) is part of the northwestern delta fringe, and located between El-Nubaria and El-Hager canals (Fig. 1). It represents fluvio-marine-lacustrine deposits, south of Lake Mariut and their interference with Nile Delta alluvial deposits and the calcareous marine deposits. It is bounded by Lake Mariut in the north, Kafr El-Dawar – Abo El-Matamir road in the south, El-Hager canal in the east and El- Nubaria canal in the west.

Semi-detailed soil survey was carried out, and 15 soil profiles were dug, and morphologically described according to FAO (1990). A total of 48 soil samples were collected for laboratory investigations. These samples were air-dried, ground and passed through 2-mm sieve. The main chemical and physical properties of soils were determined according to the methods outlined by Page et al. (1982). The studied soil profiles were classified according to the American System of Soil Classification (Soil Survey Staff,1998).

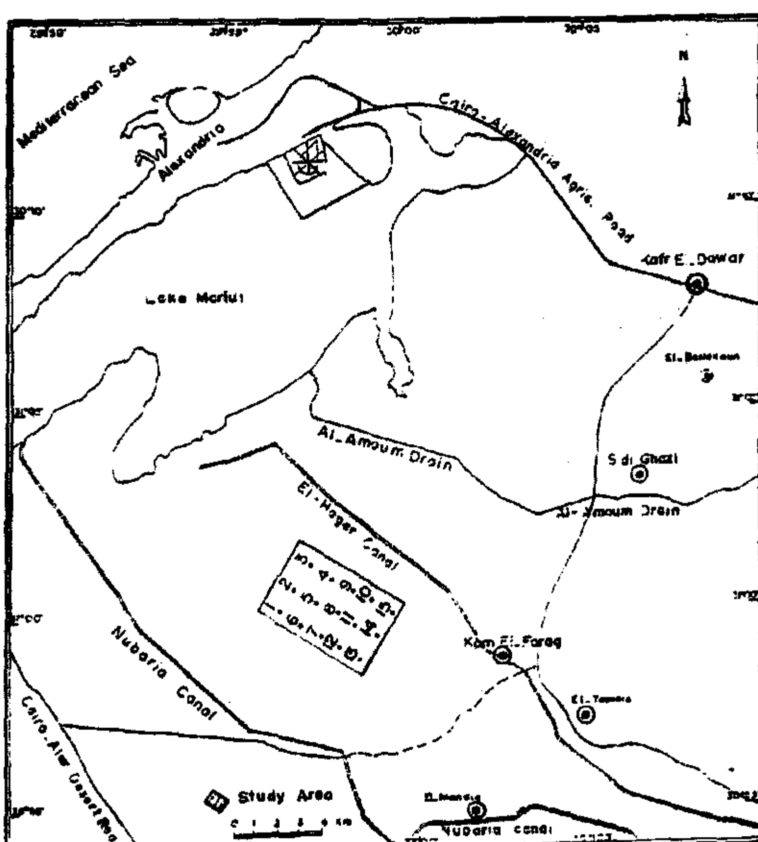

Figure (1): Location of the study area

Land capability

The studied soil profiles had been evaluated by using the Agriculture Land Evaluation System for Arid Region (ALES-Arid) to determine land capability classes and subclasses (Ismail et al, 2004). Agriculture land Evaluation System for arid region It was designed using MS-VB programming language based on the minimum dataset concept and its database was constructed using MS-access. The land evaluation parameters used in the model were soil physical, chemical and fertility characteristics, irrigation water quality; and climatic data. Tables 1 and 2 show the criteria of land capability classification and capability indices for the different capability classes according to Storie (1964).

Table (1): Criteria of land capability classification

	Rating				
Limiting factor	100-80	80-60	60-40	40-20	<20
1- water table (cm)	>150	150-100	100-80	80-50	<50
2- EC (dS/m)	>2	2-4	4-8	8-15	>15
3- SAR	<5	5-15	15-25	25-35	>35
4- OM (%)	>3	3-1.5	1.5-0.8	0.8-0.5	<0.5
5- Av, N (ppm)	>80	80-65	65-55	55-40	<40
6- Av, P (ppm)	>20	20-15	15-10	10-5	<5
7- Av, K (ppm)	>120	120-100	100-80	80-60	<60
8- Av, Fe (ppm)	>21	21-16	16-10	15-5	<5
9- Av, Zn (ppm)	>5.1	5.3-4.2	4.2-3.1	3.1-2.1	<2.1
10- Texture*	SCL,CL,L	SC,SL	C	LS	S

* SCL: sandy clay loam, CL: clay loam, L: loam, SC: sandy clay, SL: sandy loam, C: clay, LS: loamy sand, S: sand

Table (2): Capability indices for the different capability classes

Capability index	Class	Definition
>80	C1	Excellent
60-80	C2	Good
40-60	C3	Fair
20-40	C4	Poor
10-20	C5	Very poor
<10	C6	Non-agricultural

Collection of questionnaires

Twenty-two questionnaires were collected from the farmers during the summer season 2004 and winter season 2005. The questionnaires included farm acreage, crop rotation, detailed costs and returns from crop production. Data of those questionnaires were analyzed using linear programming (LP 88 version 5.15) software developed by eastern software products Inc. (Eastern Software Inc., 1984).

Economic analysis

The collected questionnaires were analyzed to calculate the different economic variables for each individual crop as follows:

1- The costs of inputs and the prices of products (output).
2- Variable cost = input x costs.
3- Output = yield x price.
4- Gross margin = output - variable costs.
5- Net farm income = combined gross margins for all grown crop in relation to their acreage – variable costs. This was calculated for summer and winter season and per year.

Basic data and technical coefficients of the linear programming model

There are two linear programming models (Eastern, 1984):

1- The cropping activities: The summer crops: cotton, Maize, Rice and onion (x_1, x_2, x_3, and x_4), respectively. The winter crops: Clover, Wheat, Beans and Tomato (x_5, x_6, x_7 and x_8, respectively.

2- The constraints are summer crops area (fed.), winter crops area (fed.), Ploughing (hrs./ fed.), seeds (unit / fed.), labour (man/ fed.), cultivation, irrigation (hrs/ fed.), nitrogen fertilizer (50kg/ fed), phosphorus fertilizer (50kg/fed.), organic manure fertilizer (m/ fed.), pesticide (gallon/ fed.), harvest (hrs/ day), threshing (hrs./ fed.), and transporting (y_1, y_2, y_3,.....and y_{14}), respectively.

RESULTS AND DISCUSSION

Soil characteristics

The main chemical and physical properties of these soils are shown in table (3). The soil salinity, sodicity and total carbonate differed widely from location to another. Soil profiles 9, 10, 11, 12, 14 and 15 showed a considerable salt accumulation and high values of SAR. The EC values ranged between 0.4 and 29.5dS/m, whereas SAR values varied between 1.3 and 28.3 and total carbonate content ranged between 2.2 and 30.2%. However, the organic matter (O.M.) content was low and ranged between 0.2 and 1.0%. These low levels of O.M. content confirm the rapid decomposition of organic matter under arid conditions. Soil texture varied from sandy to sandy clay loam in most profiles, while profile 15 only had a clay texture (Table 3). These variations in the chemical and physical properties (Table 3), might be attributed to the influence of the different environments of the deposition.

Table (3): Main soil properties in the studied area.

P.	Depth cm	PH*	EC** dS/m	SAR	$CaCO_3$ %	O.M %	Av.P ppm	Av.K ppm	Av.N ppm	Sand %	Silt %	Clay %	Tex.
1	0-20	8.3	1.9	2.3	21.2	0.8	8.5	2101	50.4	69.3	10.3	20.4	SCL
	20-55	8.4	0.8	1.8	12.5	0.6	7.1	2006	40.6	66.8	20.4	12.8	SL
	55-80	8.5	0.7	1.9	9.8	0.5	-	-	-	68.4	7.6	24.0	SL
2	0-25	8.6	0.6	1.6	10.9	0.7	16.9	2121	48.2	66.8	15.3	17.9	SL
	25-55	8.7	0.5	1.5	16.3	0.4	12.1	2096	36.6	69.3	20.5	10.2	SL
	55-75	8.6	0.4	1.3	18.4	0.3	-	-	-	73.2	15.8	11.0	SL
	75-110	8.6	0.5	1.7	22.8	0.3	-	-	-	77	20.4	2.6	LS
3	0-20	8.6	0.5	1.4	9.9	0.7	9.4	2155	45.1	73.2	15.8	11.0	SL
	20-60	8.6	0.7	2.1	6.4	0.4	3.6	1908	30.9	77.0	15.3	7.7	LS
	60-90	8.3	1.3	2.9	6.3	0.4	-	-	-	77.0	15.3	7.7	LS
4	0-20	8.2	2.5	1.8	8.3	1.0	13.6	2190	40.4	71.0	15.5	13.5	SL
	20-40	8.1	1.4	1.7	7.4	0.8	10.1	2080	36.9	66.9	12.6	20.4	SL
	40-60	8.4	2.3	2.5	9.9	0.2	-	-	-	69.0	13.0	18.0	SL
	>60	-	-	shel	-	-	-	-		-	-	-	-
5	0-25	8.5	1.4	1.3	13.6	0.5	14.0	2191	36.6	63.0	17.9	19.1	SL
	25-60	8.4	1.5	1.2	12.8	0.7	3.8	1098	24.5	60.5	17.3	21.7	SCL
6	0-30	8.5	5.7	6.8	8.4	0.6	13.8	2180	37.8	66.5	12.9	20.6	SL
	30-60	8.6	8.5	7.5	6.7	0.4	8.5	1092	33.4	66.8	12.8	20.4	SL
	60-85	8.6	5.9	7.2	16.9	0.5	-	-	-	71.9	10.2	17.9	SL
7	0-20	8.2	2.5	2.2	8.7	1.0	11.2	2160	25.8	83.0	10.2	6.8	LS
	20-45	8.5	1.6	2.0	30.2	0.8	8.8	1098	-	72.4	15.3	12.3	SL
	45-70	8.5	1.1	Shel	-	-	-	-	-	-	-	-	-
8	0-25	8.8	1.5	3.5	8.9	1.0	14.2	2090	55.8	70.4	8.3	21.3	SCL
	25-60	9.1	1.9	3.8	15.8	0.4	12.3	1055	40.6	50.6	20.2	-29.2	SCL
	60-90	9.2	1.8	3.4	15.3	0.3	-	-	-	43.7	17.8	36.6	SC
9	0-30	8.5	19.7	18.5	7.6	0.9	9.6	2191	52.4	61.7	15.3	23	SCL
	30-50	8.4	29.5	23.6	7.9	0.7	6.3	1080	24.6	92.1	12.6	5.3	S
	50-60	-	shel	-	-	-	-	-	-	-	-	-	-
	60-85	8.5	23.4	21.8	23.2	0.6	-	-	-	41.8	33.1	25.1	L
	85-100	-	shel	-	-	-	-	-	-	-	-	-	-
10	0-25	8.7	12.1	8.5	6.7	0.6	6.4	1004	28.2	92.3	5.1	2.6	S
	25-60	8.8	6.9	5.4	2.2	0.3	2.1	1002	24.3	93.6	2.6	3.8	S
	60-105	8.5	6.0	5.9	4.4	0.5	-	-	-	92.3	5.1	2.6	S
11	0-25	8.6	6.2	8.5	6.7	0.4	14.4	2102	38.6	70.7	12.2	17.7	SL
	25-60	8.6	8.6	7.4	7.6	0.3	10.8	1805	30.2	62.3	15.9	21.8	SL
	60-90	8.6	8.6	7.4	8.0	0.2	-	-	-	64.2	14.6	21.2	SL
12	0-20	8.6	7.2	6.1	9.3	0.5	18.5	2122	42.5	55.6	25.3	19.1	SL
	20-40	8.4	8.3	7.5	22.5	0.6	11.6	1906	40.4	46.3	15.7	38.0	SC
	40-70	8.4	7.2	6.8	13.4	0.3	-	-	-	65.6	15.9	20.5	SCL
13	0-25	8.7	0.8	1.1	18.2	0.7	8.4	1150	24.6	93.6	5.1	1.3	S
	25-55	8.8	0.9	1.2	29.4	4	6.3	1030	18.2	87.2	7.7	5.1	S
	55-95	8.4	1.7	2.0	16.7	0.4	-	-	-	93.6	5.1	1.3	S
14	0-30	8.5	15.1	18.3	6.9	1.0	13.8	2108	45.8	62.6	14.6	22.8	SL
	30-60	8.2	26.2	28.4	5.8	0.5	6.9	2006	40.2	56.6	15.3	28.1	L
	60-90	8.6	14.9	15.2	7.6	0.4	-	-	-	59.8	15.6	24.6	SL
15	0-25	8.7	12.1	13.4	6.7	1.2	13.8	2266	56.4	30.9	23.0	46.1	C
	25-60	8.8	7.6	8.9	8.9	0.7	8.8	2131	42.6	32.2	19.0	48.8	C
	60-90	8.5	5.8	6.7	26.4	0.4	-	-	-	30.9	25.6	43.6	C

*, ** In soil paste

Soil classification

The soils were classified as *Entisols* and *Aridisols* according to the American system of soil classification (Soil Survey Staff 1998). These soils can be classified under two orders namely: *Entisols* and *Aridisols*. The classification of the investigated soils is given in table (4).

Entisols order includes soils that have little or no evidence of development of pedogenic horizons except an ochric epipedon. These soils are represented by profiles 1, 2, 3, 4, 5, 6, 8 and 11are characterized with relatively loamy texture, without any diagnostic horizons except ochric epipedon, regular decrease in organic matter content with depth and prevailing ustic moisture regime. Accordingly, these soils are classified as *Ustorthents* great group. Profile 10 has a sandy texture to a depth of 1m, and is characterized by the absence of the diagnostics horizons, not saturated with water and prevailing ustic moisture regime. Accordingly these soils could be classified into the great group *Ustpsamments*. Profile 15 has a clay texture to a depth of 1m, and is characterized by the absence of the diagnostics horizons, not saturated with water and prevailing ustic moisture regime. Accordingly these soils could be classified into the great group *Ustfluvents*.

The Aridisols order is defined on the basis of the prevailing aridic moisture regime. The soils, belonging to Aridisols, have ochric epipedon and one or more of diagnostic horizons (salic gypsic, calcic,……horizons). Profiles 9 and 14 have a salic horizon which has its upper boundary within 100cm of the soil surface and they are not permanently aquic. Accordingly, these soils could be classified as *Haplosalids*. The soils represented by profiles 7,12and 13 have a calcic horizon that has its upper boundary within 100cm of the soil surface. Accordingly, these soils are classified into the great group *Haplocalcids*.

Table (4): Soil classification of the studied profiles (Soil Survey Staff, 1998)

Order	Suborder	Great group	Profiles
Entisols	Orthents	Ustorthents	1-2-3-4-5-6-8-11
	Fluvents	Ustfluvents	15
	Psamments	Ustpsamments	10
Aridisols	Salids	Haplosalids	9-14
	Calcids	Haplocalcids	7-12-13

Land capability classification

Generally, land capability refers to the potential of land for a number of predefined major land uses. It is not intended to give an assessment for a specific farm management practice to be selected by the land evaluator. In addition, the capability assessment refers to both crop growth conditions and land management operations (Sys et al., 1993). Table (5) illustrates the values of soil index (S.I.), soil class, fertility index (F.I.), fertility class, final index of land evaluation (FILE) and land capability classes (application of ALES-Arid program on the study area). These data show that the three main indexes, namely, soil index (S.I.), fertility index (F.I.) and FILE values ranged from 37.05 to 78.33, 29.5 to 49.14 and 32.79 to 61.43% respectively. These variations in S.I., F.I. and FILE values might be attributed to the differences in soil properties of the studied area. Most of the studied profiles are belonging to capability class 3, which reflect fair or moderate degree of land capability. Land in this class have moderate limitations that restrict the range of crops or require special conservation practices. Moreover, some soil profiles (3,10 and 13) are belonging to capability class 4 (weak or marginal). However, limited soils which are represented by profiles (8 and 15) are belonging to capability class 2 (good). Land in this class has moderate limitations that restrict the range of crops. These land can be managed with little difficulty and under good management they are moderately -high to high in productivity for a wide range of crops. The main limiting parameters in the studied area were soil texture, cation exchange capacity (CEC), sodicity and salinity.

Table (5): The index values of soil, fertility and final index and soil classes in El-Oruba village

Profile No.	Soil index (S.I)	Soil class	Fertility index (F.I)	Fertility class	Final index (F.I.L.E)	Capability class
1	62.51	C2	37.06	C4	46.5	C3
2	61.08	C2	44.15	C3	51.28	C3
3	53.34	C3	29.50	C4	34.48	C4
4	53.34	C3	43.67	C3	47.62	C3
5	66.85	C2	36.15	C4	46.51	C3
6	66.65	C2	38.00	C3	48.68	C3
7	52.05	C3	37.25	C4	43.48	C3
8	76.94	C2	50.20	C3	61.00	C2
9	40.38	C3	41.68	C3	40.82	C3
10	37.05	C4	29.50	C4	32.79	C4
11	66.86	C2	34.89	C3	45.45	C3
12	70.57	C2	40.23	C3	51.28	C3
13	37.42	C4	31.34	C4	33.89	C4
14	46.83	C3	45.31	C3	46.51	C3
15	78.33	C2	49.14	C3	61.43	C2

Economic analysis

The matrix of production activities, constraints and objective functions consist of two groups. The production activities (column) were eight crops (from x_1 to x_8) and included cotton, maize, rice, onion, clover, wheat, beans and tomato, respectively. The constraints (rows) were fourteen (from y_1 to y_{14}) including winter crops area, summer crops area, plough, seeds, labour, cultivation, Irrigation, N, P and organic manure fertilizers, pesticides, harvest, threshing and transporting, respectively.

The right hand side of the matrix is the summation of the product of the specific constraint multiplied by the area for each utilization type (crop). The matrix data were the input to the LP software for further analysis.

The total area of the actual cropping and predicting area for the different crops are shown in table (6). The actual cropping area is derived from the collected questionnaires carried out in the study area but the predicting optimum cropping pattern was obtained from LP technique analysis. The actual and predicted total net income for the suggested optimum cropping pattern is amounted 3774900 and 4014315 L.E. with 1572.88 and 1672.63 L.E. as an average net income per feddan, respectively. This means that the increase optimum cropping pattern lead to an increase the net income by 6.34%.

The optimum crop pattern was suggested by using linear programming technique as follows: Rice, Cotton, Maize and very small area of onion as summer crops and Clover, Wheat, and very small area of Beans as winter crops, as shown in table (6). There are nine elements (Ploughing, seeds, labour, cultivation, irrigation pesticides, harvest, threshing and transporting) which their exploitation are not optimum and should be beneficiated in the production processes, as shown in table (7).

Slack activities and Shadow prices

Table (7) illustrates the over abundance (Slack) in the production elements for El-Oruba village area. It is clear that there were nine elements in excess without the full exploitation and should be beneficiated in the production processes. The other five elements have zero slack, which means that all the available resources of these elements are in full use in the production activities.

The shadow price (marginal production value) is the change in value of the objective function resulting from a one unit increase in the right hand side (RHS), Anderson et al. (1985) and McCarl et al. (1990). Table (7) shows the shadow price of each production elements in the study area. Data exhibited that one feddan increase in the summer and winter crop area will increase the marginal production (Shadow price) by 1118.8 and 1250.5 L.E., respectively, whereas one unit increase in the nitrogen, phosphorous and manure will raise the marginal production by 398.6, 256.0 and 151.6 L.E., respectively.

Table (6): The actual and predicted cropping pattern obtained from linear programming analysis of El-Oruba village.**

state	Actual Cropping area (fed.)	Predicted cropping area (fed.)	Net income/feddan (L.E)	Actual total net income (L.E)	Predicted total net income (L.E)
Summer crops					
Cotton (x_1)	380	430	1575	598500	677250
Maize (x_2)	420	319	950	399000	303050
Rice (x_3)	300	365	2105	631500	768325
Onion (x_4)	100	86	1400	120400	140000
Total	1200	1200	1457.83*	1749400	1888625
Winter crops					
Clover (x_5)	750	834	1980	1485000	1651320
Wheat (x_6)	300	341	1320	396000	450120
Beans (x_7)	100	25	970	97000	24250
Tomato (x_8)	50	-	950	47500	-
Total	1200	1200	1687.92*	2025500	2125690
Ground total	2400	2400	1572.88*	3774900	4014315

** According to 2004-2005 prices. *average

1- Predicted average net income/ fed= 4014315 / 2400=1672.63

2-Rate of increase= (Total predicted – Total actual) / Total actual net income= 6.34%

Table (7): The slack and shadow price of the predicting pattern of El-Oruba village

The prediction element	Right hand side (RHS)	Usage	Slack	Shadow price
y_1=summer crop area	1200	1200	Zero	1118.8
y_2=winter crop area	1200	1200	Zero	1250.5
y_3= ploughing	9682	9553.2	128.8	-
y_4= seeds	18963	17754.8	1208.2	-
y_5= labour	22385	21265.0	1120.0	-
y_6= cultivation	11004	10021.2	982.8	-
y_7= irrigation	15946	15833.4	112.6	-
y_8= nitrogen	9170	9170.0	zero	398.6
y_9= phosphorous	10865	10865.0	zero	256.0
y_{10}= manure	10136	10136.0	zero	151.6
y_{11}= pesticides	6880	6759.5	120.5	-
y_{12}= harvest	32124	31115.8	1008.2	-
y_{13}= threshing	13868	13771.8	96.2	-
y_{14}=transporting	9876	9747.7	128.3	-

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الملخص العربي

القدرة الانتاجية والصلاحية الاقتصادية لاراضى قرية العروبة – مصر

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يهدف هذا البحث الى دراسة ومناقشة خصائص وتقسيم الأراضى وكذلك تقدير قدرتها الإنتاجية مع التنبؤ بالتركيب المحصولي الأمثل باستخدام أسلوب البرمجة الخطية لأراضى قرية العروبة الواقعة جنوب بحيرة مريوط بين ترعة الحاجر وترعة النوبارية، حيث تتميز هذه المنطقة بوجود بيئات ترسيب مختلفة (نهرية، بحرية وبحيرية) بالاضافة الى مناطق التداخل بين هذه البيئات. تم عمل حصر نصف تفصيلي من خلال حفر عدد من القطاعات الأرضية وقد تم أختيار ١٥ قطاع لتمثل منطقة الدراسة، وقد تم وصف كل القطاعات مورفولوجيا وكذلك تقسيمها حسب لنظام التقسيم الأمريكي(١٩٩٨). وقد تميزت الأراضى المدروسة بوجود اختلاف كبيرة فى خصائصها من موقع الى أخر، ربما يرجع ذلك الى اختلاف بيئات الترسيب بالمنطقة. حيث تراوح قوامها من الرملى الى لومى طينى رملي والطينى فى معظم القطاعات مع وجود عدد قليل من القطاعات الرملية وكذلك الطينية، المحتوى من الأملاح وكذلك النسبة المئوية للصوديوم المتبادل والمحتوى من الكربونات الكلية تراوحت بين ٠,٤- ٢٩,٥ مليموز/سم و١,٣- ٢٨,٣ و ٢,٢- ٣٠,٢% على التوالى. وتم تقسيم الأراضي المدروسة الى رتب وتحت رتب ومجامع كبرى وكانت تنتمي إلى رتبتين رئيسيتين هما Entisols and Aridisols

أظهرت نتائج تطبيق برنامج التقييم ALES-Arid أن معظم الأراضى المدروسة تقع فى الدرجة الثالثة (C3) من أقسام القدرة الانتاجية أى ذات قدرة انتاجية متوسطة بينما مساحة محدودة تقع فى الدرجة الرابعة (C4) وهو ذات قدره إنتاجيه ضعيفة، وكذلك مساحة محدودة أيضا تنتمى الى الدرجة الثانية (C2) هو ذات قدرة انتاجية عالية. ويمكن رفع القدرة الانتاجية لهذه الأراضى من خلال زيادة خصوبتها باضافة الأسمدة العضوية والمعدنية خاصة النتروجنية والفوسفاتية مع عمل غسيل للأملاح واضافة الجبس الزراعى لخفض قيمة ال SAR المرتفعة فى بعض المواقع.

من الناحية الاقتصادية يمكن زيادة الدخل المزرعى بنسبة ٦,٣٤% وذلك من خلال زيادة المساحة المنزرعة بمحصول الأرز والقطن مع خفض مساحة الذرة والبصل للموسم الصيفي، أما بالنسبة للموسم الشتوى يجب زيادة مساحة كل من البرسيم والقمح وخفض مساحة الفول والطماطم.