Egyptian J. Anim. Prod. (2002)39(2):147-160.

IMPROVING CROP/LIVESTOCK PRODUCTION SYSTEM IN A NEWLY RECLAIMED AREA IN EGYPT

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SUMMARY

A linear programming (LP) model was developed to improve crops and livestock productivity of small farms in a newly reclaimed area in Egypt (Sugar Beet Zone located at Nubaria city). These reclaimed areas are sandy or saline soils, recently recovered or rehabilitated for agricultural usages. The model considered land, labor, livestock, cropping pattern and available cash resources as factors affecting agricultural production. Technical coefficients of the model were estimated from a survey data collected from Sugar Beet Zone (SBZ) located at Nubaria city (140 km North-West of Cairo) during the period from October 1997 to September 1998. Data were collected on two groups of farmers: group 1, traditional farmers, who owned an average of 11.1 feddan each and group 2, university graduates who owned an average 6.42 feddan each. Linear Programming (LP) technique was used to determine the optimum combination of crops and livestock production. One LP model with three scenario were tested, the first one utilized family labor, land and amount of LE 10000 as available cash resources, assuming free choice of crop/livestock system to maximize gross margin (base run (LP1)). While, the second scenario (realistic (LP2)) was an attempt to meet farmer's needs of basic food (wheat, faba bean and maize) along with satisfying animal's requirements from energy (TDN) and crude protein (CP) under the constraint of availability of LE 10000 (1 US$ = 4.63 LE) as cash resources. In the third scenario (ambitious (LP3)) the last constraint in LP2 was increased to LE 15000. Results suggested that, gross margin was improved from LE 7245.74 and LE 4735.85 in the actual situation to LE 7963.81 and LE 13024.78 as suggested from the LP1 and LE 9460.64 and LE 5504.59 in the LP2 and LE 10636.6 and LE 5504.59 in the LP3 in the two studied groups, respectively. These values of gross margins represented an increase of about 10% and 175% in LP1, 30% and 16% in LP2 and 47% and 16% in LP3 over the actual situation in the two studied groups, respectively.

Keywords: Crop/ Livestock system, linear programming, gross margin, Egypt

INTRODUCTION

Newly reclaimed land in Egypt is sandy or saline land recently recovered or rehabilitated for agricultural production. Currently 1.9 million feddan (1 feddan = 4200 m^2) are classified as newly reclaimed land in Egypt (El-Shaer, 1999).

The productivity (yield/feddan) of crops on newly reclaimed land is constrained by many limiting factors. These constraints represent serious threat to the sustainability of agricultural production in these lands. A number of research projects and studies is on going in different institutions in Egypt to develop integrated technology packages for major crops grown on reclaimed lands.

Farmers usually seek an optimal mix of farming activities that maximizes their income. In other words, they are always looking for the best possible way for allocating their limited resources among cropping and livestock activities. Farmers, often, follow their instinct and experience to handle this problem. Instinct and experience do not guarantee optimal results, however, farm planners can offer effective techniques, *e.g.* linear programming (LP), to address such problem and produce optimal solution (Ahmed *et al.* 2002).

The objective of this paper was to use linear programming (LP) technique to determine the optimum combination of crops and livestock representing newly reclaimed lands in Egypt. In addition comparison between the suggested structure obtained from the LP model was made with the actual structure in the two studied groups.

MATERIALS AND METHODS

Data were collected during the agricultural year from October 1997 to September 1998 from Sugar Beet Zone (SBZ) located at Nubaria city in the west of Nile Delta, 140 km North West of Cairo between; longitudes 30°57' E and 30°41' E and latitudes 29°55' N and 29°25' N. Two groups of farmers were identified: traditional farmers (group 1) who owned an average 11.1 feddan each (1 feddan = 0.405 hectare) and university graduates (group 2) who owned an average 6.42 feddan each.

A random sample of 123 farmers was identified. A questionnaire was designed to identify available resources, activities, services, cost, and incomes.

Variables of crop activities included in the study were wheat (X_1), berseem (*Trifolium alexantrinum*) (X_2), faba bean (X_3), maize (X_4) and cash crops (X_5) (i.e. watermelon seed, watermelon fruit and summer tomato) while livestock activities were considered as native cattle (X_6), crossbred cattle (X_7) and buffalo (X_8). Livestock activities did not include small ruminants due to their small number. Tables 1 and 2 show the description of sugar beet zone, available resources, cropping pattern, livestock production and farm budget.

The most frequently cultivated crops were wheat, berseem and faba bean in winter and maize and cash crops in summer.

Farm budget included gross output, variable costs, gross margin and available cash resources (to spend on crop and livestock activities) based on the government support of LE 3000 per feddan and maximum amount of LE 10000 per farm. Gross output of livestock activities included milk, meat and manure. Variable costs for livestock activities included hired labor, green fodders, concentrates, and veterinary services. Also, variable costs for crop activities included hired labor, mechanical power, fertilizer and seeds. Family labor in summer less than in winter due to off-farm jobs in the two studies groups.

Table 1. Results of field survey in the two studied groups

Item	Group 1	Group 2
a) Description		
Sample size (no. of farms)	80	43
Type of soil	Sandy	Sandy
Irrigation		
Source	Nile water	Nile water
Method	Surface	Surface
b) Resources		
Average farm size (feddan)	11.10	6.42
Average family size (person)	9.35	5.12
Family labor availability (man day)/ farm		
Winter	603	534
Summer	471	432
c) Cropping pattern		
Winter cropping area (feddan)		
Wheat	4.10	3.12
Berseem	4.00	2.00
Faba bean	3.00	1.30
Summer cropping area (feddan)		
Maize	3.32	4.31
Cash crops	7.78	2.11
d) Livestock production		
Average herd size (head)	2.31	2.16
Native cattle	1.00	0.63
Crossbred cattle	0.40	0.53
Buffalo	0.91	1.00

Table 2. Gross output (GO), variable cost (VC), gross margin (GM) and available cash resources in Egyptian pounds (LE) per feddan for the two groups

Variables	Group 1			Group 2		
	GO	VC	GM	GO	VC	GM
Winter crops						
Wheat	746	482	264	813	502	311
Berseem	596	381	215	533	337	196
Faba bean	748	535	213	609	426	183
Summer crops						
Maize	616	403	213	402	247	155
Cash crop	790	524	266	753	502	251
Livestock (head)						
Native cattle	1461	366	1095	1290	323	967
Crossbred cattle	1524	386	1138	1355	397	958
Buffalo	1440	347	1093	1370	487	883
Available cash resources	10000			10000		

Mathematical Linear Programming (LP) Model

One LP model structure with three scenarios were tested, the first scenario utilized family labor, land and amount of LE 10000 as available cash resources, assuming free choice of crop/livestock system to maximize gross margin (base run (LP1)). The second scenario (realistic (LP2)) was an attempt to fulfil farm's needs of basic food (wheat, faba bean and maize) along with satisfying animal's requirements from energy (TDN) and crude protein (CP) under the constraint of availability of LE 10000 (1 US$ = 4.63 LE) as cash resources. In the third scenario (ambitious (LP3)) the last constraint in LP2 was increased to LE15000. Input estimates of the model were analyzed using Quantitative System Business (QSB, 1987) software.

Base run (LP1): Table 3 shows the model structure and mathematical presentation for model elements in the two groups.

LP1 structure.

Objective function:

where,

$$\text{Maximize (gross margin)} = \sum_{i=1}^{8} a_i X_i,$$

a_i gross margin for each variable of X_i, X_i are no. of feddans cultivated with wheat (X_1), berseem (X_2), faba bean (X_3), maize (X_4), cash crop (X_5), no. of native cattle head (X_6), no. of crossbred cattle head (X_7) and no. of buffalo head (X_8) .

Constrains:

Land,

$X_1 + X_2 + X_3$ = average farm size, (winter crops)

$X_4 + X_5$ = average farm size. (summer crops)

Table 3. Base run linear programming (LP1) model structure in the two groups.

Item	Cropping activities					Livestock activities			Limit
	Wheat	Berseem	Faba bean	Maize	Cash crops	Native cattle	Crossbred cattle	Buffalo	
X_I	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	
Group 1									
Objective function									
Type (Max.), LE	264	215	213	213	266	643	782	672	
Constraints									
Land									
Winter	1	1	1	0	0				=11.1
Summer	0	0	0	1	1				=11.1
Labor[1]									
Winter	34	25	35	0	0				≤603
Summer	0	0	0	22	29				≤471
ACR[2]	482	381	535	403	524	390	405	448	≤10000
Group 2									
Objective function									
Type (Max.), LE	311	196	183	155	251	359	635	612	
Constraints									
Land									
Winter	1	1	1	0	0				= 6.42
Summer	0	0	0	1	1				= 6.42
Labor[1]									
Winter	30	15	32	0	0				≤ 534
Summer	0	0	0	17	27				≤ 432
ACR[2]	502	337	426	247	502	420	483	548	≤10000

[1] Adult day

[2] Available cash resources.

Family labor,
where,

$$\sum_{i=j=1}^{8} c_j X_i \leq b,$$

c_j is family labor (man day) requirement & b is total family labor; and X_i as mentioned before.

Available cash resources,
where,

$$\sum_{i=j=1}^{8} d_j X_i \leq m,$$

d_j is variable cost for each variable; m available cash resources; and X_i as mentioned before.

Non negativity $X_i \geq 0$,

Realistic (LP2).

This LP model used land, family labor, on farm feeding resources and an available cash resource constrains. On farm feeding resources were as Total Digestible Nutrients (TDN) and crude protein (CP). Table 4 shows the amount of TDN and CP in kg produced from farm crops and their by-products that are utilized in the study and animal TDN and CP requirements per head per year. Amount of TDN and CP of berseem was calculated assuming four fresh cuts each producing 6000 kg and average dry matter of 15%. Amount of wheat straw and faba bean straw was calculated assuming 85% dry matter. Animal requirements were calculated according to the tropical animal unit requirements 1500kg TDN and 180 kg CP per year. These values were multiplied 1.1 times to for crossbred cattle and 1.2 times for buffalo (El-Ashry, 2002).

Table 4. Total Digestible Nutrients (TDN) and crude protein (CP) produced from farm crops (kg/ feddan) and animal TDN and CP requirements per head per year

Item	**On farm**				**Animals requirement, kg**	
	%		**Amount, kg**			
	TDN	**CP**	**TDN**	**CP**	**TDN**	**CP**
Crops						
Berseem	15	2	2160	480		
Wheat straw	37	2	693	38		
Faba bean straw	35	0.05	700	2		
Maize (Green fodder)	02	6	160	40		
Livestock						
Native cattle					1500	180
Crossbred cattle					1650	198
Buffalo					1800	216

Table 5 shows the scenario structure and mathematical presentation for the model elements in the two groups.

LP2 structure.

Objective function:

where,

$$\text{Maximize(gross margin)} = \sum_{i=1}^{8} a_i X_i,$$

a_i gross margin for each variable of X_i, X_i are no. of feddans cultivated with wheat (X_1), berseem (X_2), faba bean (X_3), maize (X_4), cash crop (X_5), no. of native cattle head (X_6), no. of crossbred cattle head (X_7) and no. of buffalo head (X_8) .

Constrains:

Land: Winter

$X_1 \geq 1$ feddan

$X_2 \geq 1$ feddan

$X3 \geq 1$ feddan

$X_1 + X_2 + X_3 \leq$ average farm size

Summer

$X_4 \geq 1$ feddan

$X_5 \geq 1$ feddan

$X_4 + X_5 \leq$ average farm size

Family labor,

where,

$$\sum_{i=j=1}^{8} c_j X_i \leq b,$$

c_j is family labor (man day) requirement and

b is total family labor available; and X_i as before.

Feeding

TDN

$$\sum_{i=j=1}^{8} t_j X_i = 0,$$

where,

t_j is amount of TDN for each variable; and X_i as before.

Crude Protein,

where,

$$\sum_{i=j=1}^{8} p_j X_i = 0,$$

p_j is amount of CP for each variable; and X_i as before.

i.e. the farmer is self sufficient in feed resources.

Table 5. Realistic (LP2) structure in the two groups

Item	Cropping activities					Livestock activities			Limit
	Wheat	Berseem	Faba bean	Maize	Cash crops	Native cattle	Crossbred Cattle	Buffalo	
X_I	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	
Group 1									
Objective function									
Type (Max.). LE	264	215	213	213	266	843	982	872	
Constraints									
Land									
Winter	1	1	1						≤ 11
Wheat	1								≥1
Berseem		1							≥1
Faba bean			1						≥1
Summer				1	1				≤ 11
Maize				1					≥1
Cash crops					1				≥1
Labor(winter)[1]	34	25	35						≤ 603
Labor(summer)[1]				25	29				≤ 471
Feeding (TDN)	-693	-2160	-700	-160		1500	1650	1800	= 0
Feeding (CP)	-38	-480	-2	-40		180	198	216	= 0
ACR[2]	482	381	535	403	524	190	204	284	≤10000
Group 2									
Objective function									
Type (Max.). LE	311	196	183	155	251	759	834	802	
Constraints									
Land									
Winter	1	1	1						≤ 6
Wheat	1								≥1
Berseem		1							≥1
Faba bean			1						≥1
Summer				1	1				≤ 6
Maize				1					≥1
Cash crops					1				≥1
Labor (winter)[1]	30	15	32						≤ 534
Labor (summer)[1]				17	27				≤ 432
Feeding (TDN)	-693	-2160	-700	-160		1500	1650	1800	= 0
Feeding (CP)	-38	-480	-2	-40		180	198	216	= 0
ACR[2]	502	337	426	247	502	102	283	348	≤10000

[1] Available cash resources [2] Adult day

Available cash resources

$$\sum_{i=j=1}^{8} d_j X_i \leq m,$$

where,

d_j is variable cost for each variable; m available cash resources; and X_i as before.

Non negativity: $X_i \geq 0$, $i = 1, \ldots, 5$.

Ambitious (LP3). The structure of this scenario is the same as LP2 with increasing available cash resources from LE 10000 in LP2 to LE 15000 in LP3.

RESULTS AND DISCUSSION

Base run (LP1)

The optimal LP1 output solutions for group 1 and group 2 are shown in table 6. The optimal LP solutions suggested that, farmers should cultivate 100 % of total farm size with berseem in winter and maize in summer in the two studied groups along with 3.43 head crossbred cattle and 15.55 head native cattle in the two studied groups, respectively, to get maximum gross margin. Also, the model showed that, if the farmers wished to cultivate wheat in winter, they should try to reduce the cost of wheat production by LE 99.77 and LE 168.74 per feddan in the two studied groups, respectively. Also, if farmers wanted to cultivate faba bean in winter, they should try to reduce the cost of faba bean production by LE 75.24 and LE 164.69 per feddan in the two studied groups respectively. While, if farmers liked to cultivate cash crops, they should reduce the cost of cash crops production by 240 and 343.44 LE in the two studied groups, respectively.

The suggested areas cultivated with berseem in winter represented about 100 % of total farm size in the two groups and that with maize in summer represented 100 % of total farm size in the two studied groups. This result indicated that farmers in the two groups were used all their land. While, the crop pattern was different from actual situation.

Under the LP1 solution the gross margin per farm was higher than that in the actual situation by about 10% and 175% in the two groups, respectively. The LP1 gross margin in group 1 was less than that in group 2, possibly because the large area in group 1 used more cash resources for cultivation. The gross margin obtained in group 1 was less than other findings in previous studies in South Tahreer province as those conducted by Siam, *et. al.* (1994); Ahmed (1995); Ahmed *et. al.* (1996); and Mahmoud (1997).

The result of LP1 showed that, livestock component contributed considerably to the total gross margin, representing about 40% and 82% of total farm gross margin in the two studied groups, respectively. Both values were greater than those reported by Ahmed (1995) which represented about 20% of total gross margin.

This result supports the concept suggested by Bhatia and Gangwar (1981) that, farmers have different type of thinking other than just maximizing their farm income. Also, Abdulkadri and Ajibefun (1998) suggested that farmers could have objective(s) other than profit maximization like family consumption and diversification of crops to avoid market risk. To deal with market risk problem many researchers (e.g. Charnes and Cooper, 1958; Madansky, 1962; Charnes and Cooper, 1963; Bawa 1973; El-Shishiny and Attia 1985; El-Shishiny, 1988; Rodriguez and Anderson, 1988) introduced various modeling techniques like stochastic or multi-objective farm planning to avoid this problem under uncertainty condition.

Realistic scenario (LP2)

This model was mainly tested to reduce market risk due to cultivating one type of crops obtained from LP1 solution and for to farmers satisfy their basic needs, i.e. an attempt for farm self-sufficiency.

The optimal LP2 output solutions for group 1 and group 2 are shown in table 6. The optimal LP2 solutions suggested that, farmer should cultivate 5.35 feddan wheat, 2 feddan berseem and 3.75 feddan faba bean in group 1 and 4.25 feddan wheat, 1.16 feddan berseem and 1 feddan faba bean in group 2 in winter. While, in summer, he should cultivate 5.41 feddan maize, 2 feddan cash crops and leave 3.69 feddan fallow in group 1 and 5.42 feddan maize and 1 feddan cash crops in croup 2, along with 6.98 and 3.83 head of crossbred cattle in the two studied groups, respectively, to get maximum gross margin. The total crop area suggested by LP2 in group 1 is smaller than total farm size due to the limiting cash resources which led to not cultivating all farm size and leaving some fallow.

Under the LP2 solution the gross margin per farm (Table 6) can be improved from LE 7245.74 and LE 4735.85 in the actual situation to LE 9460.64 and LE 5504.59 as suggested from the LP2 solution in the two groups, respectively. These values were higher than values obtained in the actual situation by about 31% and 16% in the two groups, respectively. Also, the result of LP2 show that, livestock component contributed about 54% and 41% to the total farm gross margin in the two studied groups, respectively. Also, the LP2 solution showed that the return per feddan was improved from LE 652.77 and LE 737.67 to LE 852.31 and LE 857.41 in the two groups, respectively, which represents an improvement of about 31% and 16% to the actual situation in the two groups, respectively.

Ambitious scenario (LP3)

This model was mainly tested to avoid the problem of limited available cash resources suggested by LP2.

The optimal LP3 output solutions for group 1 and group 2 are shown in table 6. The optimal LP3 solutions suggested that, farmers should cultivate 2 feddan wheat, 2.64 feddan berseem and 6.46 feddan faba bean in group 1 in winter. While, in summer, they should cultivate 2 feddan maize and 9.1 feddan cash crops in group 1 along with 7.23 head of crossbred cattle. However, in group 2 the optimal solution of LP3 model was the same as optimal solution in LP2. This result shows that the limitation of available cash resources in LP2 model constrained the farmers for using portion of their land and improved their gross margin by only 30%, but when increasing the available cash resources the gross margin improved by 47%. While, in group 2 the amount of available cash resources sufficed for cultivating the small size farm (6.42 feddan). The contribution of animal activity decreased from 54% in LP2 to 50% in LP3. This result indicated that increasing gross margin with increase available cash resources is due to increasing cultivated area.

Table 6. Actual situation, base run (LP1), realistic (LP2) and ambitious (LP3) linear programming solutions in the two studied groups

Item	Group 1				Group 2			
	Actual situation	LP1	LP2	LP3	Actual situation	LP1	LP2	LP3
Cropping pattern (feddan)								
Winter								
Wheat	4	---	5	2.00	3	---	4	4
Berseem	4	11	2	2.63	2	6	1	1
Faba bean	3	---	3.75	6.46	1	---	1	1
Summer								
Maize	3	11	5	2.0	4	6	1	1
Cash crops	8	---	2	9.1	2	---	5	5
Livestock production								
Average herd size (head)	2	3	7	7.2	2	16	4	4
Native cattle	1	---	---	---	1	16	---	---
Crossbred cattle	0.40	3	7	7.2	1	---	4	4
Buffalo	0.91	---	---	---	1	---	---	---
Resources								
Land (feddan)								
Winter	11				6			
Summer	11				6			
Labor (man-day / feddan)								
Winter	603				534			
Summer	471				432			
ACR[1] (LE / farm)	10000				10000			
Gross margin (LE / farm)	7246	7964	9460	10637	4736	13025	5505	5505
Return / feddan (LE)	653	718	852	958	738	2029	857	857

[1] Available cash resources.

The optimal LP2 and LP3 solutions in group 2 showed that, the amounts of TDN and CP produced on farm were not enough to increase livestock more than 3.83 head of crossbred. So, if the farmers in group 2 got the choice of buying supplementary feeding from outside their farms, like concentrate feed mixture (65% TDN and 14% CP), the gross margin will be increased to LE 6320.70 and LE 6367.87 under LE 10000 and LE 15000 cash resources, for the two groups, respectively, i.e. the percentage of improvement increased from 16% to 34% relative to the actual situation. The cropping pattern in this case was 4.88 feddan wheat and 1.54 feddan faba bean in winter, while in summer all farm area was cultivated by cash crops and the number of crossbred cattle was increased from 3.83 to 4.95 heads. This solution showed that, when farmers cover animal requirements of TDN and CP from resources external to the farm, both berseem and maize would not be included in the cropping pattern. Thus could be due to less gross margin of berseem than that of wheat in winter and maize than cash crop in summer. The realistic LP model was closest to the actual situation model. Animal production in all LP solutions was more profitable than crop production. Due to the limited cash resources, the farmers who have the largest farm size would not increase cultivated area. The amounts of TDN and CP produced on farm satisfied the TDN and CP requirements for 6.98 and 3.83 head for groups 1 and 2, respectively (Table 6), approximately 0.5 head crossbred per feddan.

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تحسين نظام الإنتاج النباتى / الحيوانى فى منطقة حديثة الاستصلاح فى مصر

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١- شـعبة الإنتاج الحيوانى مركز بحوث الصحراء وزارة الزراعة المطرية القاهرة ج.م.ع.،
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استخدمت البرمجة الخطية فى توصيف نظام الإنتاج النباتى / الحيوانى فى منطقة حديثة الاستصلاح فى مصـر (منطقة بنجر السكر بمدينة النوبارية). هذه المناطق المستصلحة أراضى رملية أو ملحية استصلحت حديثا للاستخدام الزراعى. وقد اشتمل النموذج الخطى على العوامل المؤثرة على الإنتاج الزراعى: مساحة أرض وعمالـة وثـروة حيوانـية والدورة الزراعية السائدة ورأس المال المتاح . قدرت المعاملات الفنية للنموذج من خلال حصر للبيانات عن طريق استمارة استبيان من منطقة بنجر السكر بمدينة النوبارية (١٤٠ كيلومـتر شمال غرب القاهرة) بين خطى طول ٣٠° ٥٧' و ٣٠° ٤١' شرقا وخط عرض ٢٩° ٥٥' و ٢٩° ٢٥' شـمالا خلال الفترة من أكتوبر ١٩٩٧ حتى سبتمبر ١٩٩٨. قسمت المنطقة تبعا لنوع المزارعين إلى مجموعتيـن: المجموعـة الأولـى بهـا مزارعون تقليديون يمتلكون حيازة زراعية بمتوسط ١١,١ فدان . المجموعـة الثانـية وبها شباب خريجين يمتلكون حيازة زراعية بمتوسط ٦,٤٢ فدان . استخدمت البرمجة الخطية لتحديد الوضع السائد والمقارنة بين النتائج المتوقع الحصول عليها والوضع السائد فى المنطقة.

اسـتخدم نمـوذج مـن البرمجة الخطية مع اقتراح ثلاث سيناريوهات ، الأول ويشتمل على العمالة والأرض ورأس المـال المتاح كمحددات للنموذج مع ترك حرية المفاضلة بين نشاط الزراعة ونشاط الإنتاج الحيوانى (حل أساسى). السيناريو الثانى (الحل الواقعى) واشتمل على نفس المحددات السابقة بالإضافة الى محـددات غـذاء الحيوان المنتج من الأرض من مجموع المركبات الغذائية المهضومة (TDN) والبروتين الخام (CP) واحتياجات الحيوانات من مجموع المركبات الغذائية المهضومة (TDN) والبروتين الخـام (CP) خلال العام ، وكذلك محدد زراعة جميع أنواع المحاصيل المتاحة. السيناريو الثالث (الحل الطموح) وهـو يمـاثل السـيناريو الثانى ولكن مع رفع المتاح من رأس المال من ١٠٠٠٠ جنيه إلى ١٥٠٠٠ جنيه للمزرعة الواحدة.

وقـد أظهرت النتائج أن العائد قد تحسن من ٧٢٤٥,٧٤ جنيه و ٤٧٣٥,٨٥ جنيه فى المجموعتين محل الدراسة على الترتيب إلى ٧٩٦٣,٨١ جنيه و ١٣٠٢٤,٧٨ جنيه فى السيناريو الأول وإلى ٩٤٦٠,٦٤ جنيه و ٥٥٠٤,٥٩ جنـيه فـى السيناريو الثانى وإلى ١٠٦٣٦,٦ جنيه و ٥٥٠٤,٥٩ جنيه فى السيناريو الثالث فى المجموعتيـن على الترتيب. وتمثل هذه القيم حوالى ١٠% و ١٧٥% فى السيناريو الأول وتمثل ٣٠% و ١٦% فـى السيناريو الثانى وتمثل ٤٧% و ١٦% من فى السيناريوالثالث تحسنا نسبة إلى الوضع السائد فى المجموعتين على الترتيب.