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PHASE II

Reecurce Management Series

Volume 9

INVENTORY STUDIES

New Lands of Egypt
Socioeconomic Studies

Editors
Asaema El Sidawi, Rashad Abo Elenein, Mahmoud G. Saleh
and Ahmed Mahmoud Abdel Shafi

Volume 9

Resource Management in the New Lands of Egypt: Socioeconomic Studies

Technical Input

Team Coordinator: **Dr Assma El Bilassi**
Agricultural Economics Research Institute, ARC

Team Members: **Dr Samir Adly**
Agricultural Economics Research Institute, ARC

Dr Mohamed Heikal
Agricultural Economics Research Institute, ARC

Dr. Moustafa Bedier
International Center for Agricultural Research in the Dry Areas

Language Editors: **Dr Hala Hafez**

Ellen Larson

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Foreword

Limited soil and water resources and threatened sustainability of agricultural production call for an effective resource management strategy and farming systems approach in agricultural research. Implementing a long-term research program where more emphasis would be on systems-oriented rather than commodity-oriented agricultural research would represent such a strategy. Therefore, the Resource Management Component of the Nile Valley Regional Program (NVRP) of the International Center for Agricultural Research in the Dry Areas (ICARDA) was developed. The Component, which started in 1994 in one of the Nile Valley countries, Egypt, and is expected to be extended to the others, aims at achieving sustainable production at a high level, based upon the need to protect the resource base (land and water) through good management. This would be achieved through basic intensive technical research (long-term on-station trials) and on-farm extensive monitoring of resources in farmers' fields and farmers' decision making logic.

Preparatory studies were carried out prior to conducting the trials and monitoring activities. The objectives of these studies were to define and characterize the major farming systems of the main agroecological environments; to identify and prioritize—with respect to the natural resources—the constraints to optimum utilization and the threats to sustainable production; and to provide an outline for the strategy, design and implementation of the long-term research activities.

The preparatory studies involved three procedures for information collection: **Inventory Studies**, in which existing information and details of the ongoing research and development, related to soil and water management, agronomy and cropping systems, and socioeconomics were collected; **Rapid Rural Appraisals**, which included qualitative sampling of farmers and extension views concerning current limitations, constraints, dangers, and opportunities in the utilization of soil, water, and inputs; and **Multidisciplinary Surveys**, which employed short-focused questionnaires to fill some important information gaps. In general, information collected in the preparatory studies dealt with resource description, resource utilization and management, productivity, and threats to sustainability. This knowledge was used in planning the long-term research activities at selected locations by identifying high-priority researchable resource management problems, in the context of realistic cropping sequences and farm level economics.

The outcome of these studies is hence presented in what is called the **Resource Management Series**. The series includes a total of 18 volumes on Inventory Studies, Rapid Rural Appraisals, and Multidisciplinary Surveys in the Old Irrigated Lands, New Lands, and Rainfed Areas. In the Inventory Studies, five volumes on the research and development activities and findings in each of the Old and New Lands were compiled. These volumes were on Agronomy, Soil Fertility and Management, Water Management, Socioeconomic Studies, and a Synthesis of all the latter. The Inventory Studies of the Rainfed Areas included two volumes, one on the Northwest Coast and the other on North Sinai.

These studies were conducted in Egypt with the involvement of the Agricultural Research Center (ARC), Desert Research Center (DRC), National Water Research Center (NWRC), National Research Center (NRC), Ain Shams University and ICARDA within the NVRP with financial support from the European Commission. Appreciation is expressed to all those who contributed to these important reviews and studies.

Rashad Abo Elenein
National Program Coordinator, NVRP
Agricultural Research Center, Egypt

Mahmoud B. Solh
Director of International Cooperation and
Former Regional Coordinator NVRP/ICARDA

Weights and Measures

1 feddan (fed) = 0.42 hectare = 1.037 acres

1 hectare (ha) = 2.38 feddans

1 ardab wheat = 150 kg

1 ardab barley = 120 kg

1 ardab lentil = 160 kg

1 qentar (cotton) = 150 kg

Acronyms

ARC = Agricultural Research Center

AERI = Agricultural Economics Research Institute

bcm = billion cubic meters

EU = European Union

GARPAD = General Authority for Reclamation Projects and Agricultural Development

ICARDA = International Center for Agricultural Research in the Dry Areas

IRR = Internal Rate of Return

LE = Egyptian pound

MALR = Ministry of Agriculture and Land Reclamation

NVRP = Nile Valley Regional Program

PBDAC = Principal Bank for Development and Agricultural Credit

RRA = Rapid Rural Appraisal

WUE = Water-Use Efficiency

Executive Summary

The present study reviews previous and current studies on conditions in the New Lands of Egypt, which have been conducted by national and international agencies as well as by individuals. Land, water, labor, inputs, and livestock resources in the New Lands are covered.

The most often quoted definition of sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The challenge to humankind is to effectively manage the resources of the planet so as to maximize the satisfaction derived from these resources.

Land reclaimed in Egypt before 1952 is estimated at no more than 125,000 fed (52,521 ha). The so-called "old" New Lands, reclaimed from 1952 to 1975, amounted to 912,000 fed (383,193 ha). In 1977, plans were laid to reclaim 2.8 million fed (1.18 million ha) by the year 2000. Reclaimed land between 1982 and 1992 amounted to 1.043 million fed (0.44 million ha).

There are two distinct types of demand for agricultural land. The first is the demand by investors (large or small, private cooperatives, corporations, and joint ventures) who are able and willing to pay the full cost of reclamation and development. The second is by individuals with limited capital (landless farmers, graduates, civil and military service retirees, and agricultural company workers).

The River Nile is the main source of irrigation water in Egypt. Underground water ranks second, representing only 5% of water resources. Rainfall, even along the coast, is generally inadequate for cultivation. Drainage and sewage water are also used for irrigation, the former implying no risk or danger to public health and the latter implying great risk if used untreated. Under these conditions, irrigation water is considered the prime constraint determining the addition of New Lands to the cultivable area. This situation highlights the need to get the utmost benefit from the available water through developing the management and use of such a scarce resource.

In any evaluation, the trade-off between the implementation cost and the value of water saved by modern irrigation systems must be considered. The shadow price of water, whether on the farm or nationally, is a key factor in making this determination. The shadow price equals the value of the marginal product of water.

The cost of energy for different irrigation systems also plays an important role in the economics of land reclamation. Accordingly, the selection of a suitable irrigation method is very important in the planning of any irrigation project.

Labor availability changes from area to area in the New Lands according to the type of farm and the settlement conditions. In general, there is no labor shortage. Because beneficiaries (landless farmers or resettled traditional farmers) are usually accompanied by large families to the New Lands, they rarely hire outside labor, except during peak periods. The wives of small farmers usually participate in most of the agricultural operations as required. Graduates, with less experience in agricultural production than the beneficiaries, tend to use more hired labor.

Cooperatives and the private sector—both traders and companies—are the main suppliers of agricultural inputs in the New Lands. The role of the Principal Bank for Development and Agricultural Credit (PBDAC) in supplying inputs has shrunk following the agricultural

liberalization policies adopted in Egypt over the past decade. Presently, cooperatives are responsible for supplying grain seed such as wheat, maize and rice.

There is no information available about the number of animals in the New Lands. Most farms are small, with one or two cows or buffaloes, one to 10 sheep and goats, and a few chickens. Lack of financing is the main problem to keeping livestock. Livestock management is traditionally the responsibility of the women and children.

Different studies in the early 1980s showed that yield levels in the New Lands are quite low compared to yields in the Old Lands. The internal rate of return (IRR) is also very low.

Problems which cause low yield in the New Lands include: interruptions in canal water supply, water supply shortages, and a general lack of appropriate technologies for farming under local conditions. The cost of lifting water has been found to be one of the main factors contributing to higher production costs in the New Lands.

Off-farm investment associated with New Lands development ranges from LE 3,000 to LE 9,000/fed (LE 7,140 to LE 21,420/ha). On-farm investment ranges from LE 2,700 to 5,000/fed (LE 6,425 to LE 11,900/ha). In practice, the cost of different components varies depending on the particular circumstances of a specific project.

Generally, there is no fixed cropping pattern in the New Lands. Cropping patterns depend upon many factors: soil type, relative prices, marketing opportunity, availability of water, irrigation system, water quality, available technology, credit availability, farmer experience and farm size.

A comparison between the cultivated areas in two periods, 1980–1984 and 1985–1990, indicates greater increases in the second period. Winter crops increased by 106,000 fed (44,536 ha), summer crops increased only about 9,000 fed (3,781 ha), and permanent crops increased by 86,000 fed (36,134 ha). The main increases in the winter crop area were in grains—especially wheat—and fodder crops. The largest increase in area devoted to summer crops was in maize, while the area under fruit trees more than doubled. Shortages in irrigation water, especially in the summer, led to the decline in the areas planted with rice and sugarcane.

Estimates of marketing indicators for wheat, barley, maize, pea, milk, and livestock production are included in the present study, in addition to a description of different marketing channels. Marketing problems include: the lack of production and product concentration, poor production financing, lack of marketing knowledge, physical losses, inefficient vertical coordination, and high costs.

The law requires that all persons allocated reclaimed land by the government must join a New Lands cooperative. The cooperatives are intended to fulfill several functions. Unfortunately, cooperatives in the New Lands do not fulfill these functions, especially since the liberalization of the agricultural sector.

The number of the cooperatives in the New Lands is estimated at 258, serving an area of about 406,000 fed (170,588 ha). The number of cooperative members is about 75,000.

Agricultural credit in Egypt is dominated by PBDAC. The bank supplies short-, medium- and long-term loans. Traders and wholesalers also play an important role in the field of finance in the New Lands, as do various foreign sources which differ according to the sites.

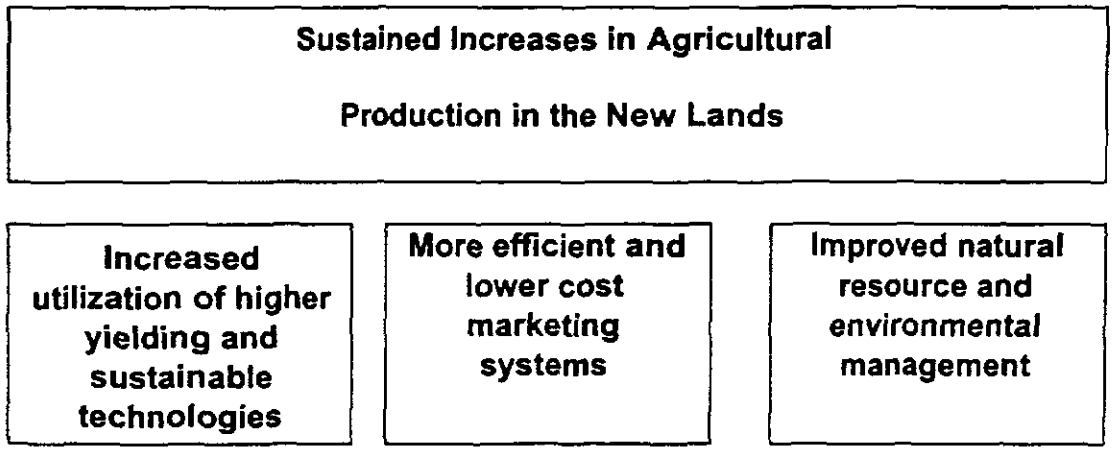
Eight sites in the New Lands are described in this report. These sites are the Sugar Beet area, El Bustan, El Hamoul, El Khatatba, Ismailia, Fayoum, the New Valley, and South Tahrir.

Review of Socioeconomic Studies in the New Lands

Objectives

The main objective of the present study was to review previous and current studies on agriculture in the New Lands of Egypt which have been conducted by national or international agencies or by individuals.

The study is one in a series of preparatory studies for the resource management component of the Nile Valley Regional Program (NVRP)–Phase II, Egypt. The specific purpose is to build up the production potential of the New Lands and then sustain that potential. Strategic objectives for the New Lands are shown below.



Source: USAID (1992).

Agricultural Sustainability

Young and Burton (1992) explain that there are many alternative definitions of sustainability. The most often quoted form is: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." At the farm or system level, the emphasis changes from one of preserving overall capital stocks to the problem of the degradation of individual resources or ecosystems. Resilience is the ability of a system to maintain its structure in the face of external changes. These changes may be environmental or economic, and are of two types: stress or shock. Stress refers to small, incremental, but persistent change, the cumulative impact of which can be large. Examples are erosion, salinization or declining market demand. Sustainable growth refers to continuing increases in output over time.

Markandly (1993) says that three broad areas of action can be identified in the field of sustainable development, namely evaluation, regulation and monitoring. Appropriate legal and socioeconomic policies must be in place. Without a proper account of how the resource base is changing it is not possible to formulate proper policies for sustainable development.

Brindly (1991) identified 10 principles of sustainable development:

- Consult with villagers, farmers, and all other participants. Reach agreement on both problems and solutions before taking action.

- Plan small-scale, flexible projects. A plan should be a blueprint, not a prison. It should be able to incorporate new information that emerges during the project.
- Let the people benefiting from the project make the decisions. The experts' job is to share their knowledge, not impose it.
- Look for solutions that can be duplicated in the hundreds of thousands for the greatest impact on development. But the solutions must be tailored to fit local needs.
- Provide education and training, particularly for young people and women, who remain the most effective agents of change because they are bound to the realities of the family's survival.
- Keep external inputs to a minimum to reduce dependency and increase stability. Subsidies, supplements, and inappropriate technology are unsustainable.
- Build on what people are doing right. New ideas will be adopted only if they do not run contrary to local practice. New technologies must support existing ones, not replace them.
- Assess impacts of proposed changes. A multidisciplinary team, ideally including specialists from the same culture, should look at economic, social, cultural and environmental aspects.
- Consider both inputs and outcomes. The failure of projects focusing on a single outcome, such as agricultural productivity, has proved that more is not always better.
- Maintain or improve the participants' standard of living. Long-term environmental improvements are unsustainable unless they also address the problems the poor face today.

Agricultural Resources in the New Lands

A resource is something that is useful and valuable in the condition in which we find it. The challenge to humanity is to effectively manage the resources of the planet so as to maximize the satisfaction derived from these resources. The major concerns of resource economics are resource allocation in the present and in the future, and the distribution of resource allocation decisions. As its name implies, resource economics focuses on policy questions with respect to natural resources such as land in its many dimensions, water, air and the ecological system (Randal, 1981). In this study, the different available resources in the New Lands will be discussed, considering existing studies and publications.

Land Resources

Evolution of land reclamation

El Bilassi (1981) mentioned that no more than 125,000 fed (52,521 ha) of New Lands were added to the cultivated land during the fifty years preceding 1952. The total reclaimed area between 1952/53 and 1974/75 amounted to 912,000 fed (383,193 ha), of which 742,000 fed (311,764 ha) represents cultivated area (El Tobgy 1976). That area is termed the "old" New Lands, and is distributed as shown in Table 1.

In 1977, it was decided that 2.8 million fed (1.18 ha) would be added to the cultivated area of Egypt by the year 2000 (Table 2).

Table 1. "Old" New Lands.

Region	Area (1000 fed)
East Delta	90.5
Middle Delta	150.0
West Delta	379.6
Middle Egypt	75.7
Upper Egypt	79.9
Sinai	11.3
Other	125.0
Total	**912.0**

1 hectare = 2.38 feddans.

Land reclaimed during the 1980s and 1990s, when more emphasis was given to the private sector, is termed the "new" New Lands. A total of 1.043 million fed (0.44 million ha) was reclaimed between 1982 and 1992 (El Khouly, 1994). Tables 3 and 4 show the distribution of land during 1982–1986 and 1987–1992.

El Khouly (1994) says that land policy has created two distinct demands for agricultural land. The first is the demand by investors (large and small, private cooperatives, corporations, and joint ventures) who are able and willing to pay the full cost of reclaiming and developing land. The government currently allocates 40–60% of the reclaimed land to investors. The second demand for agricultural land is by individuals with limited capital, catered to by settler schemes. This group comprises landless farmers, graduates (both

secondary school and university), civil and military service retirees, and agricultural company workers.

Table 2. Area planned for reclamation by the year 2000.

Site	Area (1000 fed)
East of Delta/west of Suez Canal	1548.5
Middle of the Delta	168.4
West of the Delta	375.0
Middle Egypt	119.7
Upper Egypt	158.5
Northwest Coast	5.0
Siwa Oasis	23.0
Baharia Oasis	45.0
Farafra Oasis	140.0
Dakhla Oasis	60.0
Kharga Oasis	40.0
South of Kharga	135.0
Total	**2818.1**

Source: Ministry of Irrigation and Land Reclamation, Minister's Office. 1977. Policy of Horizontal Expansion and Land. Cairo, November 1977, p. 123 (unpublished data).
1 hectare = 2.38 feddans.

Table 3. Land distribution for the 1982–1986 Five Year Plan.

Region	Military force	Category of distribution (fed)							Total area
		Grad-uates	Gover-norates	Coop-eratives	Sale by auction	Private sector	Invest-ment sector	Social cate-gories	
Sinai and East Canal	3600	1250		9000		4850		3400	22100
East Delta			13000	19000	15000	85000	33000	54000	219000
West Delta	17200							11200	28400
Middle Delta			1000	55000			9000	12300	77300
Middle and Upper Egypt				13150	13000	87400		21000	134550
New Valley						15000		10000	25000
Total	20800	1250	14000	96150	28000	192250	42000	111900	506350

Source: General Authority for Reclamation Projects and Agricultural Development (GARPAD). Ministry of Agriculture and Land Reclamation, Department of Property and Land Disposal.
1 hectare = 2.38 feddans.

Table 4. Land distribution for the 1987–1991/92 Five Year Plan.

Region	Category of distribution (fed)								Total area
	Social categories	Graduates	Private sector	Small holders	Cooperatives	Investment sector	Governorates	Squatters†	
Sinai and East Delta	9500	50900	35600		61200	36000	1000	18000	212200
West Delta	5000	118500				57500			181000
Middle Delta			5000						5000
Middle Egypt	5000	7200			25000	4000		13000	54200
Upper Egypt			14900		5000	60000		45100	125000
New Valley	4000	3000		3000		20000			30000
Total	23500	179600	55500	3000	91200	177500	1000	76100	607400

Source: General Authority for Reclamation Projects and Agricultural Development (GARPAD). Ministry of Agriculture and Land Reclamation, Department of Property and Land Disposal.
† Squatters refers to those bedouins who have possessed land over time without formal purchase agreements. Because the possessed land has become a fait accompli, the government has allowed them to keep it.
1 hectare = 2.38 feddans.

Land allocation

Land allocation for graduates and small farmers has varied from as much as 20 fed (7.1 ha) for graduates to 5 fed (2.1 ha) for small farmers. Currently, the area has been standardized at 5–6 fed per settler.

The criteria for graduate eligibility in the settler schemes are:

- Age between 21 and 30 years.
- Unemployed, with no government commitment for employment.
- Willing to undertake agricultural activities.
- Agricultural institute graduates are preferred.
- Originally from rural areas.

The criteria for small holders are:

- Age not to exceed 40 years.
- No military obligation.
- Occupation is agricultural labor.

- Landless.
- Literate.
- Originally from rural areas.

Distribution to investors takes two forms: i) auction sale; and ii) direct contract, depending upon whether the government or the investor is going to develop the infrastructure.

Water Resources

Available water resources

Since ancient times, Egyptian agriculture has depended entirely on the River Nile for irrigation. Egypt's quota of fluvial water is 55.5 bcm annually. Underground water is the second largest source of water, though it represents only 5% of the total water resources in Egypt. It is found in huge reservoirs in the Western Desert, in addition to the Nile Valley, Delta, and Sinai. Rainfall, even along the coast, is generally inadequate for extensive cultivation.

Under these circumstances, irrigation water is considered the prime constraint determining the addition of New Lands to the cultivable area. In addition, it has always defined the cropping patterns in the Old Lands. The available amount of irrigation water, given the prevailing (old) irrigation techniques and technologies, does not provide adequate quantities of water for land reclamation. In addition, other problems emerge as a result of the increasing demand for water for household, industrial and other purposes.

Certainly, irrigation water is of prime importance, far exceeding the need for other natural resources, and such importance is increasing over time. This highlights the need to get the utmost benefit from the available water through the development of the management and use of such a scarce resource.

Despite the high cost of developing schemes for providing water from different sources, the cost of providing water from the River Nile is the lowest of any alternative.

Adley (1992) mentions that reusing drainage water in irrigation (raising irrigation efficiency) is one method that leads to increasing available resources by using the output of previous irrigation. Such water is lower in quality because of its high soluble salts. There are two considerations for the use of second class water. The first is concerned with health-related criteria, i.e., the concentration of heavy minerals and toxic elements. The second is concerned with economic criteria, i.e., the yield of the land irrigated by drainage water, and the cumulative effect of using such water on the productivity of the land.

However, it is well known that raising irrigation efficiency leads to the increased salinity of drainage water. Several studies on this issue have indicated that using drainage water for irrigation purposes implies no risks to the public health, and that the decline in the yield (which varies according to salinity tolerance) ranges between 22 and 24%. The studies say that it has been proved that the value-added of such water can be increased through a number of soil improvements, and the cumulative effect on field productivity is, in the long run, actually very limited.

On the other hand, using sewage or industry wastewater implies great risks if it is used untreated. In addition, the high cost of handling such water makes it a poor second choice.

Currently, Egypt suffers no water crisis or other shortage of water supply, but the amount of surplus water that can be directed to agricultural expansion is considered a major problem in light of the fact that a considerable percentage of Egypt's food needs is imported.

In 1991/92, the total available supply of water increased slightly to 63.5 bcm. This represents Egypt's 55.5 bcm quota of Nile water, 4.7 bcm of reused drainage water, and 3.3 bcm of underground water. This available supply was distributed as follows: 52 bcm for agriculture, 8.8 bcm for household and industrial purposes, 2.27 bcm for maritime and other purposes, and 3.6 bcm for agricultural expansion. Water resources and water use to the year 2000 are shown in Table 5.

Table 5. Water resource (bcm) outlook (1987–2000).

Resource and use	1987/88	1990/91	1991/92	1992–2000
Available supply:				
1. Nile Water	55.5	54.0	55.5	55.3
2. Jongly Canal	-	-	-	2.0
3. Reuse of drainage water	4.6	4.6	7.87	7.6
4. Underground water	2.6	2.85	3.3	4.9
Total available supply	62.7	61.45	66.67	69.8
Consumption:				
1. Agricultural uses	52.5	49.7	52.0	54.4
2. Household and industries	7.0	7.7	8.8	11.0
3. Maritime and other	2.7	1.84	2.27	0.3
4. Horizontal expansion	0.5	2.21	3.6	4.1
Total Water Use	**62.7**	**61.45**	**66.67**	**69.8†**

† The figure is based on the National Water Balance in the year 2000.
Source: Ministry of Public Works and Water Resources, Irrigation Sector.

Water pollution

To preserve the aquatic environment of the River Nile and other water canals, the use of chemical inputs should be curbed or limited, mechanized control of weeds should be followed and disposal of sewage into water courses should be totally banned, as the Nile and water canals running into Egyptian lands beyond the High Dam represent a closed system. Such practices cause a deterioration in the properties of water and soil, and have a negative impact on the environment and the national objectives in general. Hence, it is necessary to integrate policies related to the use of agricultural resources, especially those concerned with land and water (Adley, 1992).

Economics of irrigation water in the New Lands

Whittington and Haynes (1985) argue that the allocation of surface water supplies for future horizontal expansion should be determined by the availability of good land on which to use

the water. Efficient production requires that the marginal rate of substitution between water and land be equal in old and new areas.

Rydzewski and Ward (1989) conclude that the parameters relevant to the evaluation of various irrigation systems are subject to a wide range of variation, depending on the specific condition addressed.

Modern pressurized irrigation systems are capital intensive, and only high income (mainly horticultural) crops can recover their cost. The market demand for high income crops is limited. Therefore, the development of modern capital-intensive irrigation projects may be limited too.

One major consideration is the trade-off between the cost and the value of water saved by modern irrigation, taking into account the shadow price at the farm and regional levels.

Pacific Consultants (1980) discuss the causes of low productivity and some positive indications. The study found that the cost of energy plays an important role in the economics of land reclamation. High elevations, to which irrigation water must be lifted at considerable cost in terms of energy, are at a disadvantage relative to low elevations. The reclamation of New Lands where water must be lifted more than about twenty meters does not appear to be economical according to internal rates of return. High-pressure sprinkler irrigation systems are less economic than irrigation systems which use less energy.

The study found that a number of investment opportunities are economically feasible, with potentially attractive rates of return. This includes sizable investments in the rehabilitation of selected "old" New Lands, and possibly in certain New Lands where the lift requirement is small.

The study concludes that, to enhance economic feasibility, proposals for land reclamation projects must fall within the following criteria:

- Highest priority should be given to rehabilitating those "old" New Lands in areas where the water lift is relatively low and surface irrigation is used.
- Energy saving irrigation, such as improved surface irrigation and drip or bubble irrigation, should be used. Sprinkler irrigation (even with low pressure) is a high energy consumer and is economically feasible only for special crops in limited areas.

Habashi and Darwish (1987) evaluated the shadow price of irrigation water in the Gemmeiza region. Two methods were used to estimate the shadow price of water for the production of wheat and maize, namely the residual method and the production function method.

Using the residual method, in the case of wheat, the shadow price of water was estimated at LE 0.46 and LE 0.38 per cubic meter for surface and sprinkler irrigation systems, respectively. For maize, the shadow price was estimated at LE 0.23 and LE 0.13 for surface and sprinkler irrigation systems, respectively.

Using the production function method, the shadow price of water equal to the value of the marginal physical product for wheat was LE 0.22, LE 0.25, and LE 0.18 per cubic meter for surface, sprinkler, and drip irrigation, respectively. The shadow price of water for maize was LE 0.21 and LE 0.19/m^3 for surface and drip irrigation, respectively. These estimates cover only variable costs and do not include investment costs.

NARP (1994) reports on irrigation methods and management in the New Lands. It was found that irrigation is used when the benefits exceed the costs. Irrigation management consists of determining when to irrigate, how much water to apply at each irrigation during each stage of plant growth, and the operation and maintenance of the irrigation system.

The selection of a suitable irrigation method plays an important role in the planning of any irrigation project. The objective of obtaining a high application efficiency and a uniform distribution of water in the effective root zone at a low cost must be taken into account.

The New Lands Development Study (NARP, 1994) reports that demand for water in Egypt will not exceed supply before the year 2000. Irrigation costs using canal and deep well water under different on-farm irrigation systems are shown in Tables 6 and 7, irrigation requirements for fruits, vegetables, and field crops in Tables 8, 9, and 10, respectively. Water-use efficiency (WUE) for fruits, vegetables, and field crops is shown in Tables 11, 12, and 13, respectively. Although surface irrigation with ditches is water intensive, it is the least costly, while water consumption is lowest under drip irrigation.

Table 6. Irrigation (canal) cost† under different irrigation systems (LE/fed).

Description	Surface systems			Sprinkler systems			Localized systems		
	Irr. ditches	Lined canal	Gated pipes	Fixed	Mobile	Pivot	Mini-spr. bubbler	Drip	
								Veg.	Fruit
1. Capital cost									
Land leveling	120	120	120	50	50	50	50	50	50
Irr. network	150	1060	1360	2500	1600	1500	2500	2400	1500
Total	**270**	**1180**	**1480**	**2550**	**1650**	**1550**	**2550**	**2450**	**1550**
2. Annual fixed cost									
Interest	47	207	259	446	289	271	446	429	271
Depreciation	10	60	100	250	310	160	300	280	200
Tax, insurance, etc.	–	18	22	38	25	23	38	37	23
Total	**57**	**285**	**381**	**734**	**624**	**454**	**784**	**746**	**494**
3. Annual operating expenses									
Labor	55	120	100	20	40	25	40	50	40
Energy and consumables	–	–	15	110	110	25	60	90	60
Maintenance & spare parts	5	40	50	80	60	50	70	70	40
Total	**60**	**160**	**165**	**210**	**200**	**100**	**170**	**210**	**140**
Total costs	**117**	**445**	**546**	**944**	**824**	**554**	**954**	**956**	**634**

† Based on a farm size of 50 fed.
Saline soil conditions increase operating costs by 20%
Source: NARP (1994).
1 hectare = 2.38 feddans.

Table 7. Irrigation (deep well) cost† under different on-farm irrigation systems (LE/fed).

Description	Surface systems			Sprinkler systems			Localized systems		
	Irr. ditches	Lined canals	Gated pipes	Fixed	Mobile	Pivot	Mini-spr. bubbler	Drip	
								Veg.	Fruit
1. Capital cost									
Land leveling	–	–	–	50	50	50	50	50	50
Irrigation network	–	–	–	3600	2700	2600	3600	3500	2600
Total	–	–	–	**3650**	**2750**	**2650**	**3650**	**3550**	**2650**
2. Annual fixed cost									
Interest	–	–	–	639	481	464	639	621	464
Depreciation	–	–	–	320	449	274	429	406	342
Tax, insurance, etc.	–	–	–	55	41	40	55	53	40
Total	–	–	–	**1014**	**971**	**778**	**1123**	**1280**	**846**
3. Annual operating expenses									
Labor	–	–	–	20	40	25	40	50	40
Energy and consumables	–	–	–	120	120	35	70	100	70
Maintenance and spare parts	–	–	–	90	70	60	80	80	50
Total	–	–	–	**230**	**230**	**120**	**190**	**230**	**160**
Total costs (2+3)	–	–	–	**1244**	**1201**	**898**	**1313**	**1510**	**1006**

† Based on a farm size of 50 fed.
Saline soil conditions increase operating costs by 20%.
Source: NARP (1994).
1 hectare = 2.38 feddans.

Table 8. Irrigation requirements (m^3/fed) for fruit trees in the New Lands under different irrigation systems.

Fruit tree	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mango	174	343	346	527	718	706	710	715	528	514	170	170	5620
Grapes	–	–	268	467	457	582	588	448	87	–	–	–	2897
Citrus	101	302	200	424	538	645	633	629	425	409	203	102	4713
Avocado	136	207	195	311	349	402	491	471	340	280	203	66	3451
Banana	172	300	397	518	674	756	757	709	584	418	168	170	5708
Pome fruit	58	43	142	195	254	339	338	327	268	162	106	53	2285
Pome fruit	90	58	172	255	413	507	506	471	365	291	141	138	3407
Pome fruit	204	66	369	414	699	823	814	838	644	456	259	176	5762
Pome fruit	168	108	347	475	663	889	930	874	796	540	261	260	6311
Stone fruit	–	153	103	229	323	933	421	367	288	277	139	71	3224
Stone fruit	117	74	150	33	427	564	592	557	452	358	170	174	3968
Stone fruit	315	–	402	556	679	998	1079	943	686	666	257	263	6843

Source: NARP (1994).
1 hectare = 2.38 feddans.

Table 9. Irrigation requirements (m^3/fed) for vegetable crops in the New Lands.

Vegetable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Pepper	–	116	347	571	735	492	–	–	–	–	–	–	2261
Sugar beet	230	348	–	–	–	–	–	–	158	383	314	346	1779
Bean	–	–	146	521	669	–	–	–	–	–	–	–	1336
Tomato	181	311	69	–	–	–	–	–	–	127	209	205	1102
Tomato	–	–	361	488	814	915	561	–	–	–	–	–	3079
Cabbage	–	–	–	–	–	–	–	–	127	268	266	180	841
Melon	–	32	205	547	697	409	–	–	–	–	–	–	1890
Potato	112	–	–	–	–	–	–	–	144	313	292	229	1090
Potato	44	205	478	656	489	–	–	–	–	–	–	–	1872

Source: NARP (1994).
1 hectare = 2.38 feddans.

Table 10. Irrigation requirements (m^3/fed) for field crops in the New Lands.

Field crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Alfalfa	326	532	782	935	1176	1349	1355	1265	759	759	423	319	9980
Cotton	–	–	74	271	525	1024	906	724	348	–	–	–	3872
Maize	–	–	–	132	377	826	978	3923	–	–	–	–	2704
Soybean	–	–	90	334	796	885	685	132	–	–	–	–	2920
Sunflower	–	–	–	220	570	919	868	154	–	–	–	–	2730
Groundnut	–	–	–	–	397	813	1067	951	334	–	–	–	3562
Onion	–	74	243	505	681	432	–	–	–	–	–	–	1935
Clover	206	426	576	768	893	286	–	–	–	65	123	106	3448
Flax	–	–	–	–	223	534	779	115	961	666	–	–	4309
Sesame	–	–	–	48	376	1020	1173	501	–	–	–	–	3118
Barley	134	330	522	434	–	–	–	–	–	–	–	65	1483
Wheat	130	475	638	773	–	–	–	–	–	–	98	89	2153
Sorghum	–	–	–	–	180	533	1301	962	217	–	–	–	3023

Source: NARP (1994).
1 hectare = 2.38 feddans.

Table 11. Water-use efficiency (WUE) for fruit trees in the New Lands.

Fruit tree	Irrigation system	Yield (t/fed)	Irrigation requirements (m^3/fed)	WUE (kg/m^3)	Irrigation cost (LE/fed)
Apple	Drip	20	6500	3.07	634
Peach	Drip	10	6000	1.66	634
Almond	Drip	0.75	6000	0.125	634
Apricot	Drip	10	6500	1.5	634
Pecan	Drip	–	6000	–	634
Date palm	Bubble	6.0	8400	0.71	954
Fig	Drip	4.0	6000	0.66	634
Citrus	Drip	17.0	7900	2.15	634
Mango	Drip/bubble	8.0	8000	1.0	954
Ananas	Drip	–	–	–	634
Persimmon	Drip	–	6500	–	634
Pear	Drip	–	6500	–	634
Banana	Drip/mini-sp.	15	5708	2.62	954
Guava	Drip	6	–	–	634
Olives	Drip	8	5600	1.42	634
Grapes	Drip	–	–	–	–
Flame		8	5500	1.45	634
Seedless		12	5500	2.18	634
King Robi		12	5500	2.18	634

Source: NARP (1994).

Table 12. Water-use efficiency (WUE) for vegetable crops in the New Lands.

Vegetable	Irrigation system	Yield (t/fed)	Irrigation requirements (m^3/fed)	WUE (kg/m^3)	Irrigation cost (LE/fed)
Pea	Drip	4	1529	2.60	319
Tomato	Drip	15	2129	7.04	478
Potato	Drip	8	1966	4.10	319
Pepper	Sprinkler	10	3263	3.06	638
Sweet melon	Drip	6	2890	2.07	478
Cantaloupe	Drip	–	–	–	478
Cowpea	Drip	0.6	3037	0.19	319
Watermelon	Drip	10	2880	3.46	478
Cucumber	Drip	7	2474	2.82	240
Artichoke	Drip	–	–	–	–
Strawberry	Drip	9	–	–	–
Squash	Drip	6	1210	4.93	240
Eggplant	Drip	12	–	–	638
Cabbage	Drip	–	1861	–	478
Carrot	–	–	1936	–	319

Source: NARP (1994).
1 hectare = 2.38 feddans.

Table 13. Water-use efficiency (WUE) for field crops in the New Lands.

Field crop	Irrigation	Yield (t/fed)	Irrigation requirements (m^3/fed)	WUE (kg/m^3)	Irrigation (LE/fed)
Alfalfa	Sprinkler	–	9980	–	944
Berseem	Sprinkler	–	4355	–	472
Cotton	Drip	–	3872	–	828
Maize	Sprinkler	2.03	4100	0.50	472
Soybean	Sprinkler	1.51	4502	0.34	472
Sunflower	Drip	0.50	4074	0.12	472
Groundnut	Drip	0.85	6314	0.13	472
Onion	Sprinkler	–	2264	–	472
Fodder beet	Sprinkler	–	–	–	472
Flax	Sprinkler	–	–	–	472
Barley	Sprinkler	–	1500	–	472
Wheat	Sprinkler	1.2	2153	0.56	472
Sorghum	Sprinkler	–	2394	–	472
Sugar beet	Sprinkler	16.4	2205	7.4	472
Sesame	Sprinkler	0.46	3100	0.15	472

Source: NARP (1994).
1 hectare = 2.38 feddans.

Irrigation water has to be used efficiently. Water is a costly resource for a government, whereas for farmers it is virtually free. Improving irrigation water-use efficiency requires good land leveling and the application of only enough water to meet crop demand.

Labor Resources

Labor availability changes from area to area in the New Lands according to the type of farmers in the area and settlement conditions. The Rapid Rural Appraisal of the New Lands Development Study (NARP, 1994) shows that in the seven areas surveyed, surplus labor was available at rates ranging from LE 5 to 10 per man/day. In some cases, graduate farmers employed their small farmer neighbors; in others, laborers were available in the open market. In Tamia, Fayoum governorate, small holders reported that family labor was adequate, except in peak seasons. Graduate farmers in Kafr El Sheikh and the New Valley governorates reported that there were labor shortages. The average rate per man/day was higher in graduate villages rather than in beneficiary villages. This can be attributed to the higher demand for hired labor in the former. Investors in El Khatatba were able to recruit labor at rates of LE 4–6 per man/day. The same rate was reported in El Bustan. In the Sugar Beet area, however, farmers are usually paid LE 6–7 per man/day, and during peak periods wages increased to LE 10 per man/day.

Beneficiaries are usually accompanied by a large family when they settle in the New Lands, thus generally satisfying the demand for labor. Graduates, whose families generally do not come with them to the New Lands, have a greater demand for hired labor, especially when they lack the experience.

Because of their previous experience in the Old Lands, the wives of small farmers participate in all agricultural production operations except plowing and hoeing, which are considered especially strenuous. Traditions prevent women from working as hired laborers in some New Lands areas such as Fayoum. If they are obliged to work on other farms to increase family income, they usually receive only half the rate paid to men. In Nubaria, hired women receive the same rate per day as men.

Input Sources

For many years, PBDAC was the main supplier of different agricultural inputs. This changed with the advent of agricultural policy reform, which initiated the liberalization and privatization of the agricultural sector beginning in the late 1980s and continuing into the 1990s. Under the new policies, governmental control of inputs and outputs has been removed. Subsidies have been eliminated from agricultural inputs. The role of PBDAC as an input supplier has therefore shrunk. Farmers have turned to the private sector to meet their production needs.

The Rapid Rural Appraisal of the New Lands Development Study (NARP, 1994) findings show that the cooperatives and the private sector, comprised of both traders and companies, are the primary sources for inputs in all sites under investigation. PBDAC was mentioned as a source of inputs only in the New Valley, which is remote enough that private sector activities are still rather limited. PBDAC was also mentioned by investors in El Khatatba as a source of fertilizer.

Cooperatives usually supply grain seed such as wheat, maize and rice. Their seed is of better quality than that purchased in the private sector. Vegetable seed is bought from traders or companies. Fertilizers and machinery are supplied by the cooperatives or the private sector at almost the same price.

Though prices of all inputs have increased with the elimination of subsidies, they are available and there is no shortage.

Livestock

Livestock plays an important role in the New Lands, especially among small holders, most of whom came to the New Lands with substantial experience. Livestock management is traditionally carried out by women and children.

There is no information about livestock numbers in the New Lands.

The Rapid Rural Appraisal of the New Lands Development Study (NARP, 1994) reports that most livestock enterprises in the New Lands are small, with one or two cows or buffaloes, one to 10 sheep and goats, and a few chickens. The availability of manure, provided by the livestock in the New Lands, is important to improving land properties via the replenishment of nutrient levels, nutrient exchange capacity and water holding capacity. Where livestock are kept on small farms, net farm income is almost double. It was found that only 50% of small holders have livestock. Lack of finances is the main problem to keeping livestock. Very few graduates have livestock, because their families are not settled in the New Lands. The study added that a few very large farms have large livestock herds, but the majority of these large farms have only a few, or no livestock.

The Rapid Rural Appraisal indicates that women's participation in livestock activities in the New Lands is very high. Women and often young girls are responsible for the herding and feeding of livestock. Occasionally, they also take sick animals to the veterinarian, if the men are busy. The marketing of livestock and poultry products, such as eggs, cheese and butter, and live chickens, offers an additional source of income for the household. Women are responsible for the production and marketing of these products.

Economic Aspects of New Lands in Egypt

The Hunting Technical Services (1979) and Pacific Consultants (1980) studies show that yield levels in the New Lands are quite low compared to average yields in the Old Lands of the Nile Delta. Based on their surveys, the Hunting Technical Services team concluded that yield in recently reclaimed areas is 20–50% lower than in the Old Lands.

Utilizing a cost–benefit technique, the Pacific Consultants' report found a very low internal rate of return (IRR). The baseline scenario used in the study had an IRR of only 2.5%. The study raises some fundamental questions about future investment in land reclamation. The study explores the impact of rapidly increasing energy costs. It was surprising to the study team that—rather than investment and social services costs—it was energy costs—for lifting water for irrigation—that played the dominant role in economic analysis. The cost of energy is causing fundamental changes in the economics of land reclamation.

The World Bank's land reclamation sub-sector review of 1984 presents a detailed analysis and findings similar to those of Pacific and Hunting. The IRR estimate by the World Bank ranged from 2 to 3% depending on the type of soil and the height of pumping lift. Delta clay soils were more economical to reclaim, whereas sandy soils were shown to have lower returns.

Tomich and Gotsch (1987) and Tomich (1992) shows that the farmers who settled in the New Lands find it necessary to alter their traditional Nile Valley farming practices because of the different circumstances and difficulties encountered in the New Lands. They are also working without support from government, research or extension services.

Kishk *et al.* (1985) report that the farmers operating in the New Lands in Samalout complain about low yields because of the frequent interruptions in irrigation water supply. Important differences were observed in the economic performance of the graduates and small holders settled in Samalout. While graduate farmers have larger farms and obtain higher yields than the small holders in many cases, they also pay higher prices for labor and other inputs which cause their net returns to be lower. Graduate performance is also influenced by the fact that many of them continued to live and keep their families in urban areas.

Fahmy (1991) and Abdel Aziz (1992) report that yield in the New Lands is lower than the national averages. Farmers related various problems including interruptions in canal water supply, shortages in water supply due to design deficiencies in the water delivery facilities, and a general lack of appropriate technologies and technical support for farming under New Lands conditions. Both studies compare the performance of small holders, graduates, and other social groups (veterans and retired public employees). Although investors were often found to have higher crop yields, small holders were the most efficient (profitable returns or net returns) of the four groups. The veterans and retired employees ranked high in profitability in many crops.

The World Bank (1989, 1992) reports that a number of the problems which had adversely impacted on earlier land reclamation activities have been resolved. The implementation of physical land reclamation has become a relatively straightforward, trouble-free technical exercise. However, obtaining optimum benefits from reclaimed land will largely depend

upon the provision of agricultural services, research, extension, training, credit and production practices, as well as water management and allocation, etc.

The World Bank's studies report an economic rate of return in excess of 14% in their evaluation of New Lands projects. Water lifting was found to be one of several important variables affecting the overall rate of return, but not the major one.

The Rapid Rural Appraisal of the New Lands Development Study (NARP, 1994) suggests an immediate program to improve productivity in areas already reclaimed. The economic analysis shows that with intensification programs, the rates of return, even in small farms, can be raised to levels exceeding current capital cost.

A detailed cost/benefit analysis was done for the typical current and prospective scenarios in the sandy soil areas of the New Lands based on the results of NARP (1994) farmer surveys. The results are summarized in Table 14.

Table 14. Annual benefits and costs (LE/fed) for different scenarios in the New Lands.

Item	Small farmer (canal)	Small investor (canal)	Larger investor (well)
A. Current scenario-new projects			
Total revenues	1,243	1,789	3,603
Net family income	245	(352)	555
Government investment	(702)†	(297)	0
Government operation and maintenance	(212)	(196)	0
Net benefit (cost)	(668)	(844)	555
Internal rate of return (IRR)			
Farmer	3.4%	-4.6%	–
National	-13%	-0.7%	–
B. Feasible scenario-new projects			
Total revenues	2,899	4,249	5,405
Net family income	1,329	1,574	2,055
Government investment	(827)	(479)	0
Government operation and maintenance	(239)	(217)	0
Net benefit (cost)	262	878	2,055
Internal rate of return (IRR)	–	–	–
Farmer	20.8%	23.3%	–
National	13.4%	21.8%	–
C. Feasible intensification of existing projects			
Total revenues	2,899	4,249	5,405
Net family income	1,329	1,574	2,055
Government investment	(147)	148	0
Government operation and maintenance	(239)	(217)	0
Net benefit (cost)	942	1,505	2,055

Source: NARP (1994).
1 hectare = 2.38 feddans.
† Numbers in parentheses represent negative investments; i.e., cost or loss.

Investment Costs of New Lands Development

NARP (1994) reports show that New Lands production has changed in many ways over the past 15 years because of the spread of modern irrigation systems and the introduction of new technologies and higher-yielding crops. Because of the changes in government regulations, it is now common for private investors to develop wells and establish farms in areas not served by canals.

The study adds that the current investment costs of constructing main canals, pumping stations, roads, power grids, utilities and administrative buildings range between LE 3,000 and 9,800 per feddan depending on the circumstances of the particular site. On-farm investment for initial land development, distribution pumps and irrigation systems differs as well (Table 15). In addition, the government has included graduate and small holder housing costing LE 15,000–20,000 per unit.

Table 15. Initial investment costs, LE per feddan of farm area, 1993.

Item	Low (minimum costs investments	High (maximum costs investments)
Off-farm infrastructure:		
Main and branch canals	940	2220
Pumping stations	490	4220
Main roads	110	1040
Electricity network	510	1220
Utilities	340	2390
Administrative buildings	510	720
Total	**2970**	**9800**
On-farm infrastructure:		
Land leveling and development	85	384
Housing	2500	3330
Building, houses and animal shelters	298	1928
Pump for irrigation	1050	1050
Well drilling, casing, screens (75 m and 225 m well depth)	472	1416

Source: NARP (1994).
1 hectare = 2.38 feddans.

Main pumping stations are currently being built at an average cost of LE 3.2 per meter of lift. For example, one feddan of farm area that is estimated to require 5500 m^3 of water per year, in a project with a 45-meter lift, would require pumping facilities costing LE 792. Of this, pumps, motors and related equipment represents 75% and housing and public works the remaining 25%. Estimated power requirements, based on GARPAD designs, average 4.5 kW per 1000 m^3 per meter of lift. Thus, one feddan would require 1114 kWh/year.

Well establishment costs are quite variable, judging by the data obtained from El Khatatba farmers in the NARP (1994) survey. Most wells in the area range in depth from 40 to 100

meters. The average total expenditure on six wells established in the area in 1989/90 was LE 49.64 per feddan, per meter of well depth. Converted to 1993 prices, this would be LE 75 per feddan per meter of lift, including the cost of the well and pump. The energy cost for such a well would equal that of canal lifting, i.e. 4.5 kWh per 1000 m^3 per meter of lift.

In practice, the cost of the components varies depending on the particular circumstances of the specific project.

Government Recovery of Investment Costs

It is government policy to subsidize initial investment costs. NARP (1994) reports that private investors are expected to do their own on-farm development and provide their own housing. The government charges investors who buy land in regular project areas half the project development costs. Graduates and small holders are charged LE 1,000-1,200 per feddan of farm area, plus LE 6,000 to 8,000 for their houses. Both are given grace periods before repayment starts as well as relatively low interest rates. The subsidy per feddan is higher for graduates and small holders than it is for investors, but the investor farms also tend to be much larger.

Cropping Systems in the New Lands

NARP (1994) indicates that in the New Lands there is a greater comparative advantage in producing vegetables and fruit than in traditional crops such as wheat and maize. Cropping patterns in the New Lands depend upon many factors, namely: soil type, relative price, marketing opportunity, availability of water, irrigation system, water quality, technology, credit availability and farm size, in addition to farmer's knowledge and experience.

Generally, there is no fixed cropping pattern in the New Lands. Table 16 describes the cropping systems in the New Lands for the two periods 1980-84 and 1985–1989. The table shows that the winter crop area increased by about 106,000 fed (44,537 ha) between the two periods, while the increase in the area for summer crops was only about 9,000 fed (3,781 ha). The area planted to permanent crops increased by about 86,000 fed (36,134 ha). The total crop area increased from 852,000 fed (357,983 ha) in the first period to 1,054,000 fed (442,857 ha) in the second period, representing 7.7 and 9.1% of cultivated Old Lands, respectively. The main increases in the area of winter crops were in grain crops—especially wheat—and fodder crops. The main increase in the summer crop area was in maize, while the area of rice declined by about 19,000 fed (7,983 ha). The area planted with fruit more than doubled in the second period. A comparison of the two periods shows that water played a key role in dictating the area under production. Because of the shortage in irrigation water, especially in summer, the area under summer crops was roughly the same in the two periods. Areas planted to sugarcane and rice, which are the highest water consumers, declined in the second period.

The experience of successful farmers indicates that oil seed crops have an advantage in sandy soil. They believe that this advantage is partially due to the more porous soil, and to fewer diseases. The majority of fruit and vegetable crops in the New Lands can do as well as in the Old Lands if managed properly.

Tables 17, 18, 19 and 20 outline four examples of typical rotations for various locations, soil types and crops in the New Lands. A comparison of cropping pattern for different grower categories based on the New Lands Development surveys in 1993 (NARP, 1994) is presented in Table 21.

The New Lands Development Study (NARP, 1994), which was carried out for small holders, graduates, small investors and large investors, revealed major inter-group differences in sufficient income and net returns. The typical 5-6 fed farm rarely produces sufficient income from crops to cover operating costs and provide major returns to family labor and investments, despite cultivation of essentially 100% of the land and cropping intensities averaging 1.6. Investors plant a smaller percentage of their available land than small farmers.

Yield from small farms represents only about 60% of yield in the Old Lands; costs are higher (mainly because of the higher cost of irrigation and energy and fertilizer requirements). A variety of difficulties with drip and sprinkler irrigation systems and water supply contributes to high risk, high cost and limited cropping flexibility. In many cases, this leads small holders to shift to flood irrigation. Lack of suitable specific technologies and institutional financing are further constraints.

Table 16. Cultivated area (1000 fed) and relative importance of cropping patterns in 1980–1984 and 1985–1989.

Winter season	1980–1984		1985–1989		Summer season	1980–1984		1985–1989		Permanent	1980–1984		1985–1989	
	area	%	area	%		area	%	area	%		area	%	area	%
Wheat	65	16	104	20	Maize	65	19	79	23	Sugarcane	15	14	14	7
Barley	43	11	52	10	Sorghum	22	6	23	7	Alfalfa	35	32	38	19
Bean	12	3	19	4	Rice	100	30	81	23	Fruits	60	54	144	74
Lentil	2	0.5	4	0.7	Cotton	4	1	5	1.5					
Fenugreek	2	0.5	3	0.6	Peanut	16	5	19	5.5					
Lupine	2	0.5	3	0.6	Sunflower	4	1	5	1					
Vegetables	45	11	49	10	Sesame	6	2	6	2					
Green bean	2	0.5	3	0.6	Soy bean	4	1	4	1					
Onion	3	1	4	0.7	Sugar beet	4	1	5	1					
Long berseem	103	25	133	26	Vegetables	77	23	79	23					
Short berseem	75	19	80	16	Clover	33	10	37	11					
Fodder	34	8	39	7	Other crops	1	0.3	2	0.5					
Berseem seed	12	3	14	3	Medical and	2	0.7	2	0.5					
Other crops	2	0.5	2	0.4	aromatic									
Medicinal and aromatic plants	2	0.5	2	0.4	plants									
Total	**404**	**100**	**511**	**100**	**Total**	**338**	**100**	**347**	**100**	**Total**	**110**	**100**	**196**	**100**

Source: Fahmy (1991).
1 hectare = 2.38 feddans.

Table 17. Crop rotations in sandy soils.

Year 1	Year 2	Year 3	Year 4
1/3 alfalfa (P)†	1/3 alfalfa (P)	Alfalfa (P)	1/3 citrus and berseem between young trees and vegetables
1/3 barley (W)‡ + Peanut (S)§	1/3 berseem or lupine or faba bean (W) + Sesame or cowpea	Barley + Vegetables (W) + Peanut or cowpea (S)	1/3 berseem (W) + Soybean or sunflower or sesame (S)
1/3 berseem or lupine or faba bean (W)	1/3 barley + Vegetables + Peanut or cowpea	1/3 berseem or lupine or faba bean (W) + Sesame or cowpea	1/3 wheat (W) + Peanut + Vegetables (S)

Season is from October to October.
† P: Permanent crop (3–4 years), planted between September and October.
‡ W: Winter crops, planted from October to November.
§ S: Summer crops, planted in May–June.
Source: NARP (1994).

Table 18. Crop rotations for calcareous soils grown with grapes.

Year 1	Year 2	Year 3	Year 4
1/3 alfalfa (P)	1/3 alfalfa	1/3 alfalfa	Grape
1/3 barley (W) + cowpea (S)	Berseem or lentil or faba bean (W) + Maize (S)	Wheat + Vegetables (W) Sunflower (S)	Berseem + Vegetables
1/3 berseem or lentil or faba bean + sweet corn	Barley or Wheat (W) + Sunflower or soybean or cowpea	Berseem or lentil (W) + Maize (S)	Wheat or vegetables + Sunflower or soybean

Source: NARP (1994).

Table 19. Rice and cotton rotations in salt-affected soil in the Delta (tri-crop rotation).

Year 1	Year 2	Year 3
1/3 berseem catch + (W) Cotton (S)	Wheat or flax or faba bean (W) + Rice (S)	Berseem (W) + Maize (S)
1/3 berseem	Berseem catch	Wheat or flax or faba bean
1/3 wheat or flax or barley or faba bean (W) + Rice (S)	Berseem (W) + Maize (S)	Berseem catch + Cotton (S)

Source: NARP (1994).

Table 20. Sugar beet and oil crop rotations in the New Lands based on soil type.

Rotation 1	Rotation 2	Rotation 3
Sugar beet (Sept-March, April) & Sunflower (April, May to Sept, Oct) or summer forage	Sugar beet and sunflower	Sugar beet and sunflower
Wheat and maize	Berseem and maize	Berseem and forage
Wheat and forage	Berseem catch and cotton	Wheat and maize or forage

Source: NARP (1994).

Table 21. Comparison of cropping patterns for different grower categories: average of five survey areas in Lower Egypt.

	Area (fed)				
	Graduates	**Small holders**	**Investors**	**Other groups**	**All farms**
Average area in use	5.36	5.75	28.50	7.36	13.73
Winter field crops	4.23	3.67	2.38	4.62	5.14
Winter vegetable crops	0.86	1.17	2.69	1.02	1.68
Summer field crops	2.32	3.55	1.46	3.00	2.38
Summer vegetable crops	2.12	0.71	1.97	0.13	1.67
Fruits	0.04	0.37	20.37	1.13	7.44
Total area planted	**9.56**	**9.47**	**28.87**	**9.89**	**18.30**
Percent vegetables	31.1%	19.9%	16.1%	11.6%	18.3%
Percent fruits	0.4%	3.9%	70.6%	11.4%	40.7%
Percent field crops	68.5%	76.2%	13.3%	77.0%	41.1%
Cropping intensity	**1.79**	**1.71**	**1.73**	**1.50**	**1.88**

Source: NARP (1994)
1 hectare = 2.38 feddans.

The study shows that yields obtained by some superior small farmers and by large farmers as a whole are large enough to be economically competitive with other investments.

The major factor in higher yield is the ability to deal with the constraints that plague small farmers such as irrigation system, operation and maintenance, lack of markets and lack of information on production technology. Tables 22, 23, 24 and 25 show yield, value of production, cost, and net income obtained by the New Lands Development Study for:

- Small farmers.
- Superior small farmers.
- The study group estimates of feasible production in the New Lands.
- Average production in Old Lands.

Table 22. Estimated yield (t/fed) based on farmers†, superior average‡, scientist farm plan§, and Old Lands mean¶ (1992/93).

Crop	Mean New Lands†	Mean superior New Lands farmer‡	New Land feasible level§	National mean (Old Lands)¶
Wheat	1.05	1.80	2.70	2.10
Maize	1.12	1.54	4.20	2.66
Rice	2.00	3	4	3.00
Barley	0.48	-	1.80	0.84
Sorghum	0.84	-	2.80	2.10
Sesame	0.24	0.48	0.84	0.48
Berseem	28.0	30	30	40.00
Cotton (qentar)	4.00	6	8	7.00
Peanut	0.83	1.13	1.50	0.98
Sunflower	1.00	-	2	1.00
Alfalfa	40.0	-	60	25.00
Onions	4	-	20	10.00
Broad bean	0.62	1.09	1.55	0.78
Sugar beet	14.0		30	21.00
Vegetables††				
Tomato	18/9	28/15	15	14/11
Potato	14			9
Green pepper	3/3		10	8/6
Green bean	2			4.40
Watermelon	3/5		10	9
Eggplant	3V6		12	10/8
Cantaloupe	6	10	6	8
Cucumber	6/6	11	7	7/6
Green pea	1/8		3	4
Fruits				
Apple	5		22	5
Grape	4	5	12	6
Banana	-		25	12
Orange	-		25	11
Tangerine	-		15	11
Peach	4		12	5
Pear	5		25	5
Mango	2		10	4
Fig	1		4	5
Olive	2		9	3
Apricot	-		12	7

† This includes investors, graduates, and small holders, but excludes large industrial farm enterprises (1993).

‡ Top achieving 5% of small and medium-sized farms (1993).

§ Estimates of technically feasible yields based on New Lands research data and scientists estimates (1993).

¶ National mean (1991/92).

†† Where multiple figures are shown in a column, the first is for the winter crop and the second for the summer crop.

Source: NARP (1994).

1 hectare = 2.38 feddans.

Table 23. Estimated average value (LE/fed) of production obtained by New Land survey: farmers†, superior New Land farmers‡, scientists estimates of current potential§, and Old Lands mean¶ (1992/93).

Crop	Mean New Lands†	Mean superior New Lands farmer‡	New Land feasible level§	National mean (Old Lands)¶
Wheat	536	826	1350	1435
Maize	426	615	2100	1243
Rice	830	1054	1575	1506
Barley	210	-	975	513
Sorghum	-	-	1300	1064
Sesame	471	874	2100	10010
Berseem	730	944	1400	2365
Cotton (qentar)	1460	2466	-	2759
Peanut	1044	1402	-	1043
Sunflower	460	-	1575	938
Alfalfa	880	-	-	-
Onion	477/885	-	4000	2145
Broad bean	494	747	1400	1231
Sugar beet	990	-	-	938
Vegetables††				
Tomato	7356/2995	10779/4380	3750	4546/2245
Potato	3689			2429
Green pepper	1627/1687		2500	1875/1450
Green bean	189			1494
Watermelon	2052/2602		2500	2325
Eggplant	910/1534	8883	2040	2220
Cantaloupe	4891	6600	1500	
Cucumber	3698\3685		2100	1556
Green pea	437		1800	1976
Fruits				
Apple	4092		12760	
Grape	2851	3610	6000	
Banana			25000	
Orange			6250	
Tangerine			3750	
Peach	1724		6000	
Pear	2591		11250	
Mango	2419		9000	
Fig	450		1200	
Olive	2304		8000	
Apricot			9600	

† This includes investors, graduates, and small holders, but excludes large industrial farm enterprises (1993).

‡ Top achieving 5% of small and medium-sized farms (1993).

§ Estimates of technically feasible yield based on New Land research data and scientists estimates (1993).

¶ National mean (1991/92).

†† Where multiple figures are shown in a column, the first is for the winter crop and the second for the summer crop.

Source: NARP (1994).

1 hectare = 2.38 feddans.

Table 24. Estimated production costs (LE/fed) obtained by the New Land survey: farmers†, production scientists farm plans‡ and Old Lands farms§ (1992–1993).

Crop	Mean New Lands†	New Land feasible level‡	National mean (Old Lands)§
Wheat	592	530	569
Maize	508	700	616
Rice	678	850	747
Barley	458	450	426
Sorghum	431	600	587
Sesame	398	550	481
Berseem	371	450	511
Cotton (qentar)	763	1200	864
Peanut	612	800	558
Sunflower	266	560	471
Alfalfa	1044	800	-
Onion	738	850	1037
Broad bean	597	540	554
Sugar beet	555	780	639
Vegetables¶			
Tomato	2879/1978	2771	1347
Potato	1952		2158
Green pepper	1157/834	1811	1308
Green bean	1225		726
Watermelon	1547/853	1524	1404
Eggplant	929\1504	1546	1033
Cantaloupe	1773	1154	
Cucumber	1742	1576	1059
Green pea	549	1103	753
Fruits			
Apple	1667	6000	
Grape	1643	4000	
Banana	1593	10000	
Orange	835	4000	
Tangerine		3500	
Peach	1663	5000	
Pear	1438	4000	
Mango	761	3000	
Fig	528	2500	
Olive	964	3000	
Apricot		5000	

† This includes small farmers investors, graduates, and small holders, but excludes large industrial farm enterprises (1993).

‡ Estimates of technically feasible yields based on New Lands research data and scientists estimates (1993).

§ National mean (1991/92).

¶ Where multiple figures are shown in a column, the first is for the winter crop and the second for the summer crop.

Source: NARP (1994).

1 hectare = 2.38 feddans.

Table 25. Estimated net income (LE/fed) by crop average, obtained from the New Lands survey: farmers†, New Lands superior farmers‡, production scientists budget net income§ and Old Lands net income¶ (1992/93).

Crop	Mean New Lands†	Mean superior New Lands farmer‡	New Land feasible level§	National mean (Old Lands)¶
Wheat	-56	234	820	866
Maize	-82	107	1400	597
Rice	152	376	725	759
Barley	-248	-	525	105
Sorghum	-	-	700	477
Sesame	74	477	1550	529
Berseem	359	573	950	1854
Cotton (qentar)	697	1703	-	1895
Peanut	432	790	-	485
Sunflower	194	-	1015	467
Alfalfa	-164	-	-	-
Onion	-261/147	-	3150	1108
Broad bean	-103	150	860	677
Sugar beet	435	-	-	299
Vegetables††				
Tomato	4477/1017	2402	979	3199/898
Potato	1737			271
Green pepper	470/853		689	567/142
Green bean	-1036			768
Watermelon	505/1749		976	921
Eggplant	-19/30		494	1187
Cantaloupe	3118	71010	346	
Cucumber	1956/1943		524	497
Green pea	-112		697	1223
Fruit				
Apple	2425		6760	
Grape	1208	1967	2000	
Banana			15000	
Orange			2250	
Tangerine			250	
Peach	61		1000	
Pear	1153		7250	
Mango	1658		6000	
Fig	-78		-1300	
Olive	1340		5000	
Apricot			4600	

† This includes small farmers, investors, graduates, and small holders, but excludes large industrial farm enterprises (1993).

‡ Top achieving 5% of small and medium-sized farms (1993).

§ Estimates of technically feasible yields based on New Land research data and scientists estimates (1993).

¶ National mean (1991/92).

†† Where multiple figures are shown in a column, the first is for the winter crop and the second for the summer crop.

Source: NARP (1994).

1 hectare = 2.38 feddans.

The tables show that yields in the New Lands are low for many crops, particularly for food grain and other field crops. Cost per unit of production is significantly higher in many cases in the New Lands than in the Old Lands. There are, however, some exceptions to these low yields; winter tomato averaged 18 tons per feddan in 1992, compared to the national average of 14 tons per feddan.

The tables also show that the feasible high yield levels that can be attained in the New Lands (column three in Table 22) are accompanied by an increase in cost per feddan (column two in Table 24). The cost increase can be compensated, and the estimated net income per feddan can exceed the national mean in some field crops such as oil seed and onion (column three in Table 25). Fruit, except peach, fig and tangerine, can also realize high profits per feddan.

The New Lands Development Study (NARP, 1994) reported that major cost items were found to be very similar for each crop, i.e. machine hire, seed, water and machine harvesting. In fact, the costs per feddan, other than for energy, are quite similar for old and new areas. Fertilizer types varied somewhat, but total cost was fairly uniform.

Marketing in the New Lands

Indicators for Plant Production

Habashi *et al.* (1993) conducted a survey in Nubaria (West Nubaria, Sugar Beet and El Bustan) to study the production and marketing of fruit, vegetables, field crops and animal products. The study shows that 304,000 fed (127,731 ha) were reclaimed in Nubaria and distributed as follows: 52% to graduates and beneficiaries, 34% to private and public companies and 14% to small investors. Marketing indicators were as follows:

Wheat

- The cultivated area of wheat in both private and public companies represented about 86% of the total sample wheat area. The rest of the wheat area was cultivated by beneficiaries and graduates.
- The average productivity per feddan was about 0.675 ton. The maximum productivity (1.13 t/fed) was obtained by beneficiaries in West Nubaria.
- It was found that about 8.2% of the total production of wheat was consumed by the household, while 91.8% was marketed.
- The farm gate price of wheat was LE 161.84/ton, while the wholesale price was LE 173.74/ton.
- Marketing costs were estimated at LE 2.38/ton at the farm gate and LE 7.38/ton in the wholesale market.
- Net revenue per feddan of wheat was about LE 83 at the farm gate and about LE 101.7 in the wholesale market.

Barley

- The productivity of barley ranged between 0.1 and 0.9 t/fed.
- Sixty-one percent of production was sold at the farm gate, 35% was sold to companies through contracts and 4 was sold in the wholesale market.
- The farm gate price of barley amounted to LE 350/ton. The contract price was LE 500/ton.
- Marketing costs amounted to about LE 43.6/ton and net return per feddan amounted to LE 73 at the farm gate, LE 97 in the wholesale market and LE 189 on contract.

Maize

- The average productivity of maize was 1.29 t/fed. It was found that household consumption represented about 41% of the total production of the sample and was about 71% of the total production in the Sugar Beet area.
- The average farm gate price was LE 104.72/ton and the wholesale market price was LE 149.94/ton.

- Marketing costs amounted to LE 23.8/ton and net revenue ranged between LE 93 to 297/fed.

Pea

- The area cultivated with peas represented about 16% of the total sample area.
- The majority of the pea crop was sold in the wholesale market (82%).
- Marketing costs amounted to about LE 74/ton. Net revenue per feddan was LE 70 at the farm gate and LE 194 in the wholesale market.

Marketing of Animal Products

Milk production

- Milk production was concentrated in West Nubaria and El Bustan.
- Ninety percent of the total milk production was sold to wholesalers, 8% was sold at the farm gate and 2% was consumed by the household.
- The average selling price per ton of milk was LE 450 to companies and LE 650 to wholesalers.
- Average feeding cost/head/year was LE 1,355 and net revenue per head amounted to LE 183/year.

Livestock activity

- This activity was found only on investor farms.
- Average purchasing price was LE 1,300/head and average selling price was LE 2,200/head.
- Net revenue per head was LE 245 in West Nubaria and LE 312 in El Bustan.

Marketing of Fruits and Vegetables

The New Lands Development Study (NARP, 1994) analyzed food marketing with special reference to the New Lands in Egypt. The study reports that the increase in fruit and vegetable production after 1984 was primarily the result of the expansion of cultivated area in the New Lands.

Most fruits and vegetables are marketed through one of the following channels:

- Sale to wholesalers before harvest (*kelala*).
- Sale to wholesalers at the farm gate after harvesting and packing.
- Sale through wholesalers in Cairo and Alexandria.
- Sale to traders in local or district markets.
- Direct export.

Small farmers frequently receive cash advances from wholesalers during the production season in exchange for guaranteed delivery of the crop at harvest time.

Net farm prices (after subtracting the farmer's marketing costs) tend to be highest for exports. Sales at wholesale market prices (under *kelala*) lead to the lowest net farm prices for the farmer. Wholesalers charge the following fees: 610% sales commission, 1% market tax, LE 12.5 per ton for depreciation of the palm crates which are rented to the producers, and LE 10 per ton for unloading.

Marketing services provided by wholesalers to farmers are limited to selling and off-loading, so a few large New Lands farmers have developed grading, sorting, packing and branding facilities on their own. As a result, they are able to improve average sales prices by about 30%.

Marketing Problems

The New Lands Development Study described the following marketing problems:

Economies of scale

The entire Egyptian food system (production and marketing) is characterized by small-scale enterprises. Since there are no grades and standards, transaction costs are particularly high.

Lack of production and product concentration

Small farmers cannot achieve the level of technological and managerial sophistication that dramatically increases yields.

Poor production financing

The average farmer finds production and marketing loans difficult to obtain. As a result, fruit and vegetable producers often get that financing from wholesalers. Since farmers have limited bargaining power, wholesalers get unfair profits at their expense.

Lack of market knowledge

Farmers have little access to information about the behavior of markets. They have no reliable information on prices at the market at times when their products are being sold or information about projected supply, demand and prices.

Physical losses

Physical losses for perishable products are high. Research shows that average losses are 20% for fruit and 30% for vegetables. This means that the farmer's price will be reduced by that amount. At the same time, he or she must pay the cost of handling, transporting and disposing of the product that is not sold.

Ineffective vertical coordination

Marketing institutions are doing a poor job coordinating the production and marketing process to assure efficient and effective delivery of nutritious and healthy products.

High marketing costs

The problems described above combine to produce high marketing costs relative to the quality of products. Another study (FAO, 1990) in Nubaria, found that settlers rely on the

informal network of neighbors for their information on prices and market conditions, but this is seldom timely. The market pays premium prices for graded, well packed (e.g., in a carton) products. Settlers are aware of this but do not grade and use containers, leading to losses of 25–30% in vegetables. They argue that the quality of their products is so poor that the additional cost of improved packing and grading is unwarranted.

New Lands Marketing Recommendations

- Immediate training and technical assistance in the export business, management and production for export should be provided.
- Evaluation of the feasibility of rural assembly markets for the New Lands should be undertaken.
- Marketing extension should be provided.

Cooperatives in the New Lands

A study by FAO (1990) reports that there are five types of cooperatives in Egypt. One type is the National Land Reclamation Cooperatives which include the following:

- The special land reclamation cooperatives, with voluntary membership among those who have reclaimed and developed land.
- The New Lands cooperatives, situated on land reclaimed by the government and allocated to settlers or private investors.
- Desert land cooperatives operating in Sinai, Giza and Matrouh.

The law requires that all persons who have been allocated reclaimed land by the government must join a New Lands Cooperative. The maximum number of members for any single cooperative is 1,000; any additional members must form a new cooperative.

The local cooperatives in Egypt usually carry out the following functions:

- Organize and supervise cropping patterns in line with GOE policy.
- Supply farmers with agricultural inputs.
- Provide credit facilities to assist the purchase of inputs and general agricultural development.
- Receive products from farmers for marketing.
- Develop community facilities and services.

Unfortunately, cooperatives in the New Lands don't fulfill these five functions.
After the liberalization of the agricultural sector, the role of cooperatives shrank. There is strong governmental control of the cooperatives. This control is tighter in the New Lands than it is elsewhere. The rationale is that the settlers do not own the land until they pay for the land and the house.

Abdel Aal (1994) conducted an analytical study about the efficiency of the cooperative performance in the New Lands. The study concludes that cooperatives, if conducting their functions efficiently, could play a significant role in the New Lands development. They are considered to be the essential organization to meet farmers' needs and protect their interest.

The number of cooperatives in the New Lands is estimated at about 258, serving approximately 406,000 fed (170,588 ha). The number of cooperative members is 75,209. Tables 26, 27, and 28 describe the cooperatives in the New Lands, the area served by those cooperatives and the distribution of members according to type of settler and governorate.

Table 26. Summary of the number of cooperatives (based on category of landowners) in the New Lands (1991).

Governorate	Number of cooperatives				Total
	Beneficiaries	Graduates	Employees	New graduates	
Beheira	37	9	12	14	72
Kafr El Sheikh	36	1	3	8	48
Alexandria	23	4	-	11	38
Aswan	28	-	-	-	28
Sharkia	19	2	1	-	22
Dakahlia	13	-	2	-	15
Minia	2	1	1	9	13
Matrouh	-	-	-	11	11
Beni Sueif	-	1	1	2	4
Fayoum	3	-	-	-	3
Sohag	2	-	-	-	2
Qena	1	-	-	-	1
Damietta	1	-	-	-	1
Total	**165**	**18**	**20**	**55**	**258**
Percentage	**63.9**	**6.9**	**7.9**	**21.3**	**100**

Source: Collected and calculated from the National Land Reclamation Cooperatives.

Table 27. Summary of the area served by cooperatives (based on category of landowners) in the New Lands (1991).

Governorate	Area served (fed)				Total
	Beneficiaries	Graduates	Employees	New graduates	
Beheira	63440	21908	17719	19829	122896
Kafr El Sheikh	75822	1072	8076	12426	97417
Alexandria	24677	6988	--	4182	35847
Aswan	35907	--	--	--	35907
Sharkia	29965	2026	1085	--	33076
Dakahlia	2716	--	7000	--	33716
Minia	6459	726	--	9645	16830
Matrouh	--	--	--	8504	8504
Beni Sueif	--	1726	2010	1170	4906
Fayoum	6527	--	--	--	6527
Sohag	3933	--	--	--	3933
Qena	2345	--	--	--	2348
Damietta	4500	--	--	--	4500
Total	**280314**	**34446**	**35890**	**55756**	**406406**
Percentage	**68.97**	**8.5**	**8.8**	**13.72**	**100**

Source: Collected and calculated from the National Land Reclamation Cooperatives.
1 hectare = 2.38 feddans.

Table 28. Summary of the number of cooperative members in the New Lands (1991).

Governorate	Beneficiaries	Graduates	Employees	New graduates	Total
Beheira	9625	520	1045	3855	15045
Kafr El Sheikh	10917	44	980	2372	14313
Alexandria	6986	255	--	379	7620
Aswan	17909	--	--	--	17909
Sharkia	5855	78	71	--	6004
Dakahlia	4816	--	1490	--	6306
Minia	745	26	--	2150	2921
Matrouh	--	--	--	890	890
Beni Sueif	--	62	175	235	472
Fayoum	1490	--	--	--	1490
Sohag	862	--	--	--	862
Qena	877	--	--	--	877
Damietta	500	--	--	--	500
Total	**60582**	**985**	**3761**	**9881**	**75209**
Percentage	**80.5**	**1.3**	**5.1**	**13.1**	**100**

Source: Collected and calculated from the National Land Reclamation Cooperatives.

Finance and Credit

The FAO study (1990) reports that there are three sources of credit in Nubaria: the Principal Bank for Development and Agricultural Credit (PBDAC), the Livestock Fund, and traders.

Agricultural credit in Egypt is dominated by PBDAC. The bank has facilities which offer a full range of banking services, providing the means of mobilizing savings for agricultural needs. Though wholly owned by the government, PBDAC and its affiliated banks enjoy considerable autonomy in their day to day operations. PBDAC consists of the Principal Bank, governorate-level banks, district and village banks and agencies.

PBDAC offers short-term agricultural loans to partly cover production inputs and operations. The amount of the loan varies from crop to crop. In general, the duration of short-term loans does not exceed 14 months, and repayment dates are synchronized with crop sales.

Medium-term loans are granted to individual farmers as well as to cooperative societies, companies and associations for agricultural production or for financing off-farm business. The duration of the loan varies from 13 months to five years, provided that it is within the expected life span of the asset financed. In addition, real estate or mortgage of house/land is required.

Long-term loans of 5–15 years are used for activities such as land reclamation, construction of farm buildings, poultry houses as well as for horticulture plantations with a long development period.

The Livestock Fund was established on 16 December 1969 by a Ministerial Decree for the purpose of offering one head of cattle to every beneficiary of newly reclaimed lands. More than a financial institution, the fund constitutes a bridge between the settlers and the public companies who produce and sell livestock on credit. The settlers receive the cattle after making a cash advance which varies from 20% for New Land settlers to 40% for Old New Land settlers. In either case, settlers pay back the remainder in five equal, interest free installments over five years.

The Rapid Rural Appraisal survey conducted by the National Land Development Study (NARP, 1994) identifies the following sources of finance in the seven sites of the survey:

- Loans from PBDAC.
- Loans from wholesalers/traders.
- Agricultural cooperative loans.
- Self-financing.

Although utilization of these various types of financing varied among areas, loans from wholesalers and traders were the dominant form of funding.

The farmers expressed two major complaints regarding the financing options available. The procedures, i.e. paperwork for receiving loans from PBDAC, are slow and so loans were not available at the proper time to begin cultivation. Farmers dislike dealing with traders as they make them sign a "blank receipt" at the time of taking the loan, which the wholesaler can fill

in with an amount actually higher than the loan if he becomes displeased with the farmer. Farmers also felt that the amounts they were receiving from the wholesalers were quite low.

Other Sources of Finance in the New Lands

There are other sources of finance in the New Lands, supplied by foreign agencies such as:

Bustan Farmers' Support project

The project aims at delivering agricultural equipment to graduates. It is financed by a grant of FF 10 million in addition to LE 5.5 million. The project also supplies the graduates with inputs.

El Nakra Valley project

The project aims at supplying the valley with irrigation pumps to increase the area under cultivation, increase the standard of living for the farmers and create a new integrated community. France finances the project at FF 150 million.

Graduate loans

The project aims at buying inputs and equipment, and establishing production workshops for graduates. It is financed by the returns of German food support, with a budget of LE 3 million. The first phase began in 1994.

Supporting graduate projects in Nubaria

The project includes LE 20 million for infrastructure development in reclaimed areas in Nubaria. Another grant, which is administered by GARPAD, amounting to LE 5 million is used as loans to the graduates to buy inputs. France is providing financial support for the project.

Characteristics of Sites in the New Lands

The New Lands Development Study (NARP, 1994) chose seven sites in various areas in the New Land to survey. The following is a description of those sites, and the problems and constraints found in each of them.

Sugar Beet Area

The total cultivated area in the eastern Sugar Beet region is 25,007 fed (10,507 ha) and is 34,519 fed (14,503 ha) in the western Sugar Beet region. The cropping patterns in the regions are different. Wheat, broad bean, and berseem are the most important winter crops, occupying 20,886, 4,027, and 3,914 fed (8,775, 1,692, and 1,644 ha), respectively, representing 61, 12, and 11% of the total cultivated area, respectively. Tomato, watermelon, cantaloupe, and other vegetables are the most important summer crops. The main source of irrigation in this area is El Nasr Canal. Farmers employ surface (79%), drip (12%) and sprinkler (9%) irrigation systems.

Problems and constraints

- Most of the graduate villages in the Sugar Beet area suffer from the lack of drinking water, which is provided on an irregular basis or not at all. Moreover, the lack of transportation, telephone and health services has prevented graduates from living comfortably in these villages. This, besides the lack of security, is reflected in the lack of livestock in this area.
- Houses assigned to the graduates are inadequate.
- The main complaint is the long period between irrigations (17 days) which leads to a complete breakdown of irrigation of cultivated areas.
- Many of the graduates claim that some of the holders have established illegal water connections. In addition, there are serious technical flaws in some branches (e.g., Branch 216), and some branches actually slant in the wrong direction for water flow.

El Bustan

El Bustan is located south of the Nubaria Canal. It covers about 156,000 fed (65,546 ha), of which about 75,000 fed (31,512 ha) have been reclaimed in three stages. The study covered the first stage of reclamation, about 23,300 fed (9,789 ha) with 4,524 holders. The reclaimed area is distributed among graduates (77.5%), small farmers (13%), private investors (6.5%) and other social groups (3%). The average farm size for the above groups is 6, 5, 20 and 14 fed (2.5, 2.1, 8.4, and 5.9 ha), respectively.

The dominant soil type in El Bustan is calcareous sand. However, there is an area of about 25,000 fed (10,504 ha) of sandy loam, occupied by squatters (bedouins who have possessed land over time without formal purchase agreements; and because the possessed land has become a fait accompli, the government has allowed them to keep it).

Bustan employs the three types of irrigation systems (surface, sprinkler and drip).

The cropping patterns in El Bustan include various field and horticultural crops. The major summer field crop is peanut, occupying about 40% of the summer cultivated area. Other major crops are watermelon seed (16.5%), sesame (6.5%), green pea (5%), maize (5%), eggplant (4.5%) and others (8%). About 14.5% of the cultivated area is occupied by citrus. The major winter crops are wheat, green pea and berseem.

Problems and constraints

- The frequent problems with electric power affect the supply of irrigation water into fields, which leads to low yield.
- The absence of markets in the area leads to the waste of some crops, such as onion in 1992. In addition, there is no available marketing information.
- The unavailability of any drainage system.
- The absence of public transportation between villages.
- The unavailability of extension services.
- Lack of finance or credit leads farmers to sell their crops at low prices, as well as signing blank receipts in order to obtain agricultural inputs.
- Distribution of unleveled land among early retirees or other farmers of specific social groups.
- Lack of sufficient and efficient marketing channels.
- There are only four channels for marketing agricultural products, two of which are carried out on the farm (*kelala* and selling by weight on the farm) while the other channels are the district market and the wholesale market.

El Hamoul

Kafr El Sheikh governorate is located in the North Delta, with a total area of about 819,000 fed (344,117 ha). The cultivated area is estimated at 525,000 fed (220,588 ha), which represents 64% of the governorate. However, the possible cultivable land is estimated at 186,000 fed (78,151 ha), or about 63% of the uncultivated land. This cultivable land is distributed between six districts, mostly in El Hamoul and minimally in Foa. The total area of reclaimed land in the governorate since 1980 is estimated at 66,248 fed (27,835 ha).

The main source of irrigation is the Nile through six main canals; thus the common irrigation system is surface (flood) irrigation for both Old and New Lands. The irrigation water is sufficient in the southern part of the governorate, while in the northern part (El Borolos and Motobus) a mixture of drainage and irrigation water is used. The drainage system includes both open and tile drains. However, this does not cover all of the New Lands in the governorate.

El Khatatba

The New Lands in El Khatatba occupy about 26,700 fed (11,218 ha) owned by investors. The holding size ranges widely, from 10 to 2,000 fed (4.2 to 840 ha) although the larger size

is not held by single owners because of a law limiting the maximum holding to 200 fed/person.

Holding	No. of holders	Total area (fed)
UP TO 30 fed	71	1100
30-50	48	1813
50-100	77	4682
100 and more	84	19034

1 hectare = 2.38 feddans.

Even though land reclamation started in this area in 1983, the actual cultivation process did not start until 1989. The soil in this area is sandy and requires a large quantity of manure and chemical fertilizers. There is no drainage system; however, the owners employ soil improvement processes such as adding agricultural gypsum. The only source of irrigation is well water, which differs in cost of establishment depending on well depth (60-80 m) and date of establishment. Lifting water from wells depends on pumps run by diesel fuel. Also, pump maintenance is very expensive in this area because of the scarcity of spare parts. This also affects the maintenance of the common irrigation system in this area, which is drip irrigation (90%). There is no obligation to use any specific crop rotation in this area. However, about 70% of the cultivated area is planted to fruit because of the high cost of irrigation, soil type, and the pricing policy of marketing crops. Livestock enterprises are nonexistent because of various major problems such as the difficulty of growing forage crops because of the high cost of irrigation, the unavailability of veterinary services, and the lack of livestock market.

Problems and constraints

- Unavailability of extension services. The available extension pamphlets ignore the New Lands climate and requirements.
- Unavailability of electricity.
- The current credit system does not take into consideration the high cost of reclaiming land, especially in the early years. Therefore, the investors propose that the state should adopt a different program for credit, especially after having removed subsides on agricultural inputs.
- Marketing is a major problem in this area, especially for small investors because of the lack of cooperatives and a credit system which encourages investment in collecting centers for sorting and grading vegetables and fruit.
- There is a need for establishing roads which will facilitate agricultural activities.

Ismailia

The total area of Ismailia is about 1.067 million fed (0.448 million ha). The population was about 654,000 in 1992, about 70% of whom lived in rural areas. The main economic activity is agriculture. The total cultivated area in the governorate is about 192,000 fed (80,672 ha), which represents about 20% of the total governorate. The rest is desert land. However, the total cultivable area in the governorate is estimated at about 536,000 fed (225,210 ha).

The main source of irrigation in Ismailia governorate is the Ismailia Canal, which serves the area between Kilometer 75 and end of Kilometer 128. It has two branches, the Suez Canal at Kilometer 123, which irrigates the agricultural land up to the border with Suez governorate, and Port Said Canal at Kilometer 125, which serves the agricultural land up to West Kantara City.

There are newly reclaimed areas throughout the districts of Ismailia governorate. The area reclaimed between 1980 and 1992 is estimated at about 80,000 fed (33,613 ha). This new area is distributed over El Manief, within Ismailia District, Sarabium in Faid District, Ferdan and Abu Khalifa in West Kantara District, El Tel El Kebeer and Old Mahsama in El Tel El Kebeer District.

There are two sources of irrigation, Nile water and well water. The first source comes through El Manief canal, which extends about 17 kilometer and has seven branches. The total cultivated area irrigated under surface irrigation by this canal and its branches is about 8,000 fed (3,361 ha). The wells provide water for about 12,000 fed (5,042 ha). The average well depth is about 70 meters, while the average area irrigated by one well is 15-20 fed (2.1-8.4 ha). The most common irrigation method is drip.

The second type of holders are investors who have the capability to self-finance their agricultural enterprises. These investors are organized into cooperatives such as El Salam and El Ismailia for Agricultural Development. Investors adopt a cropping pattern which emphasizes winter vegetables (such as tomato, cucumber, green bean, pepper, and eggplant), grown under tunnels, as well as orchards (such as olive and grape). Most of the investor farms are managed by either a hired agricultural engineer or a specialized farmer for a share of the profit.

Fayoum

The small holders in Tamia, Fayoum, report more constraints and lack of services than most other sites in the study. Small holders in Tamia use surface irrigation on land that is poorly drained, resulting in deterioration of the land and, consequently, lower crop yield. Tamia reported some of the lowest crop yields in the RRA survey. Such low yields are cited by residents as the principal reason for low family income. Small holders in Mazatly report that 25–33% of farm income is acquired from off-farm resources. The absence of adequate drainage and sewage facilities has had a negative impact on the health of the residents, as well as on agriculture. The mixing of irrigation water and sanitation water has led to a high incidence of disease. In both villages, residents report that potable water is not available.

The New Valley

Village	Reclaimed area (fed)	Cultivated area (fed)	No. of holders
Kharga:			
El Mostakbal	1200	534	126
Paris	252	252	45
Dakhla:			
Kharb El Mouhob	1492	1492	961
Farafra:			
Aisha Abd El Rahman	1280	1280	112
El Loaa Sobih	1443	307	1543
Abo El Hoel	2200	52	99
El Kfaah	1300	630	76

Problems and constraints

- Marketing represents the major problem for all graduates, small farmers, and investors. This is due to the unavailability of markets for various products, lack of transportation and the long distance between reclaimed areas and governorate districts, and the prohibition of transferring plant and animal products outside the governorate.
- Drainage is a common problem within all of the reclaimed areas because of the lack of regular maintenance for the main drains.
- The only source of financing is PBDAC, which has a high rate of interest on loans, and a short period for repayment, which means that the graduates and small farmers are unable to get loans.
- There is an inadequacy of irrigation water and a need for high capacity pumps to lift water as much as 400-1000 m. Therefore, the frequent pump stoppages affect the total cultivated area.

South Tahrir

The area of western South Tahrir was selected for field study by Fahmy (1991). The reclaimed area is about 128,600 fed (54,033 ha). The available records indicate that the actual cultivated area is about 89,400 fed (37,563 ha), 70% of the total reclaimed area. Available water from various resources is estimated at about 483.5 million m^3 annually.

Land tenure in the area can be classified into five categories, namely: beneficiaries (2.7%), employees (7%), graduates (11.6%), private sector investors (39.6%), and public corporations (8.5%).

Three major methods of irrigation are used in western South Tahrir: flood, drip and sprinkler. The study found that sprinkler is considered the most convenient for field crops and vegetables.

The beneficiaries are considered the most efficient farmers in South Tahrir, according to revenue and cost comparisons, followed by employees and graduates. Beneficiaries and employees also have higher efficiency in growing medicinal and aromatic plants than other

producers. The investors are considered the most capable of bearing heavy costs, especially in constructing wells and leveling lands.

General Characteristics of the Survey Sites

- Water management (which includes both irrigation and drainage) problems vary from one area to another. For instance, the drainage problem seems to be most severe in the New Valley and, to a certain extent, in the Sugar Beet area.
- The problem of credit, both in terms of adequacy and appropriate interest rates, seems to be very critical to both small farmers and graduates.
- The lack of adequate information and statistics about the New Lands is critical. This should motivate the Ministry of Agriculture and Land Reclamation to accelerate the establishment of an effective database system for the New Lands. This system needs to be structured and implemented differently than for the Old Lands.

A summary of the characteristics of the seven sites is shown in Table 29.

Table 29. Characteristics of some sites in the New Lands.

Project area	First year	Types of land holder				State farms	Squat-ters	Soil type	Water source	Irrigation system	Water quality
		Graduate	Small holder	Private investor	Coop-erative						
1. W. Nubaria, Sugar Beet	1979	Yes	Yes	Yes	No	Yes	No	Calcareous	Nasr Canal	Surface	Good
2. W. Nubaria, El Bustan	1985	Yes	Yes	Yes	Yes	No	No	Sandy	Nasr Canal	Various	Good
3. Menoufia, El Khatatba	Past 10	Yes	Yes	Yes	No	Yes	No	Sandy/Alluvial	Well	Various	Varies
4. Kafr El Sheikh, El Hamoul	1976	Yes	Yes	Yes	No	No	No	Alluvial/Clay	Canal	Surface	Good
5. Ismailia, El Manief	1980	No	Yes	Yes	Yes	No	Yes	Sandy	Canal/Well	Drip/Surf	Good
6. Fayoum, Tamia	1980	No	Yes	Yes	Yes	No	Yes	Sandy/Loam	Canal	Surface	Varies
7. New Valley, Kharga, Dakhla and Farafra	1982	Yes	Yes	Yes	No	No	Yes	Calcareous	Well	Surface	Good

Source: NARP (1994).

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