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Implications of resource availability and use for the economic success of the farming families settling west of Lake Nasser, Egypt

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Abstract

Egypt has extremely limited arable land and scarce water resources. The national development policies are directed to establish new settlements by extending the cultivated area through desert land reclamation. Lake Nasser area is a major target for such policies. In this study, the most important resources and prominent factors affecting the economic success of the settling families will be investigated. It is of prime importance for the successful establishment of a sustainable farming community in the area.

A sample of 100 households was selected using systematic random sampling. The families were then classified according to their settling behaviour into three groups: (a) permanent families, (b) seasonal farmers and (c) occasional farmers. Descriptive, comparative and econometric analyses were applied using the Farming Systems Approach to tackle differences in resource capacities and problems of the three groups. Correlation and multiple regression were used to analyze the most important resources and factors affecting the farmers' decision-making.

The family labour is limited for all classes but can easily be supplemented by hired labour. The land resources exert no considerable limitation. The lake water is the main source for both domestic and agricultural uses. The reduction in lake level reduces the availability of water to irrigation and results in considerable yield losses. It also increases the cultivation costs by increasing the required irrigation equipments. Capital resources are the most important factors that determine the success of the economic activities of the farmers in the study area. Cash is needed to provide the required inputs (fertilizers, manure and pesticides). Farmers with sufficient cash resources can also improve the irrigation facilities and overcome the irrigation problems. Farmers with proper access to capital resources particularly informal credit were found to be the most economically successful. However, the area was originally planned to attract poor landless families. Higher education of household members and more experience with the cultivation in the area provide significant contribution to the economic success of the farmers. To improve the chances of success of the poor farmers in the area, this study suggests promoting the cultivation of low input crops such as medicinal plants. These crops will reduce the cash requirements by decreasing irrigation requirements and the applied chemical additives which has important environmental significance. It could also solve marketing problems by having the best market in the nearest town.

1. Introduction

Egypt imports nearly 50% of its grain requirements annually to help feed a population of more than 70 million people (WFP, 2001). Additionally, Egypt is virtually all desert and has extremely limited arable land due to scarce water resources. The Nile Valley and Delta are narrow with limited capacity for further expansion to increase agricultural land (Kishk, 1997). Therefore, the national development policies were directed towards establishing new settlements in potential areas such as the Western Desert Oases, the Sinai and the Lake Nasser region (Kamel and Dahl, 2005). The settlements act as focal points to attract inhabitants, redistribute the Egyptian demographic map and provide new opportunities for economic development through arid land reclamation and cultivation.

The Lake Nasser region was selected for this study. It is a potential area for the new settlements because it has high economic and population absorption capacity due to the availability of many unexploited potentials (UNDP/MOP, 2002). The settlement of farming families with all consequences on rural development requires not only the approval of a technical feasibility but also a socio-economic assessment of such a strategy. This assessment is of primal importance because it will enhance the understanding of the problems and the potentials of the existing population, whose success may in turn encourage other people to settle in the area.

The main objective of this study is the assessment of the actual socio-economic status of the different social groups settling in the area. It will provide a basis of information that will allow for identifying the potential problems and problem-solving-measures defined as future socio-economic strategies.

2. Study area and data collection

Most of the settlements in The Lake Nasser area have new development activities and limited population. Therefore, Kalabsha and Garf Hussein were chosen as the study locations because of: (a) the availability of different socio-economic groups; (b) the better accessibility compared to other villages; and (c) the presence of mature agricultural activities.

A systematic sampling technique was used to sample 100 farming families settling in the study area in 2004. The sampling was done using the updated lists of the registered farmers, which were randomly arranged. A variety of data from different sources was required to conduct the analyses towards achieving the objectives of the current research study. These data were collected at the micro (farm-household), village and regional levels with special emphasis on the micro level. The primary sources of the socio-economic data of the settlers in the Lake Nasser area were family surveys, informal interviews with key persons and group discussions with the settlers.

3. Methods

The methods adopted in this study focused mainly on the analysis of the resource capacities and problems as well as the explanation of the decision making process of the farming families. The farming systems approach was applied in the analysis of socio-economic characteristics, development potentials and living standard of the farming families. The comparative analysis of the different farming systems was based on statistical and econometric methods. Correlation and multiple regression were used to analyse the most important resources and factors affecting the farmers' decision-making.

4. Results and discussion

4.1. Farming systems classification

For the purpose of agricultural development and to devise meaningful measures in agricultural policy it is advisable to group farms with similar structural properties into classes (Ruthenberg,

1980). A criterion explaining the settling behaviour of the farmers was used to classify the farming systems in Lake Nasser area. The settling behaviour of the farmers is an indicator of the degree of their settlement in the area. It was defined according to the following information: (i) the location of the permanent household, (ii) the family members come to the area; and (iii) the length of the period of stay. The settling degree is a very relevant criterion to the objectives of the current research work. It is also used by the local authority to differentiate between farmers.

These classes are permanent families (17 household), seasonal farmers (59 household) and the occasional farmers (24 households). The number of households included in each class reflects the actual proportional distribution of the settling groups in the area. The following is a brief and general description of the groups:

1. *Permanent families*: The permanent household and economic activities of the families in this group are in the study area. Most of these families are young families with small children. This class is characterized by families who have medium cultivated land size and medium farm investments as well as medium farm income. The availability of infrastructure and social services (especially schools and health care) has the highest impact on this group.
2. *Seasonal farmers*: Male members of the household come to the area for farming only for a certain period (mostly 9 months a year from September to May). Their main households are in their home villages. They are mostly extended families with the main economic activities are still in their hometown. Their main purpose of coming to Lake Nasser area is not settling but investment in farming activities. They have the largest farming area. They also have the largest farm investments and the largest farm income.
3. *Occasional farmers*: Some family members come to the area on an irregular basis a few times a month especially during autumn and winter. The main household and the economic activities are in the hometowns. They cultivate small land areas. Most of the cultivation activities are done by hired farmers to manage the land. They provide only cash, inputs and sometimes family labour. They have the smallest farming investment.

4.2. Resource analysis

The socio-economic analysis of these groups indicated that seasonal farmers have the largest family size and the highest labour capacity. Most of their labour is devoted to farming activities. The permanent families have smaller family size and the youngest household heads. They divide their family labour capacities almost equally between their farm and off-farm activities. Female-headed households comprise more than two thirds of the occasional farmers. Their farm labour capacity is significantly lower than off-farm labour. The hired labour plays a very important role in the farming activities in the study area as it compensate for the shortages in the available family labour for farming activities.

Land use rights are the only land title given to the farmers in the Lake Nasser area. The land is not given to individual farmers but to a group of beneficiaries. The cultivated land size is limited by the farmers' investment capacities and by the lake boundary. Seasonal farmers have the largest cultivated land size (Table 1). They are followed by the permanent families. The occasional farmers have comparatively much smaller cultivated land than the other two groups. Watermelon and tomato are the major cultivated crops. Farmers consider the land very productive but have several problems that reduce the yield such as: the fluctuation of the lake water level; pests and diseases; and the high requirement of inputs particularly chemical fertilizers.

The lake water is the main source for both domestic and agricultural uses. Less than 25% of the beneficiaries get domestic water from the project facilities. The other farmers bring water either directly from the lake or from their hometowns. The lake water level and quality decline during summer and most of the farmers consider it a major cause for many health

problems they have. The decrease of the lake water level does not only cause health problems but also is one of the most important causes of reduction and losses of crop yield (Figure 1).

Table 1: Land and land use, Kalabsha and Garf Hussein, Lake Nasser region, Egypt, 2004

Farming System	Permanent Families n = 17	Seasonal Farmers n = 59	Occasional Farmers n = 24
- Average total cultivated land (in ha/family)	3.21 ^a (± 1.57)	10.14 ^b (± 2.16)	0.62 ^c (± 0.23)
<i>Land use and intensity</i> (% of agricultural land)			
Land use intensity index *	91.54	97.02	40
- Watermelon	16.15	40.70	0
- Tomato	31.54	27.51	0
- Wheat	3.85	3.09	19.86
- Vegetables	21.54	22.14	5.76
- Medicinal plants	0.38	2.04	8.51
- Others	18.08	1.54	5.67

Figures in parentheses are 95% confidence interval of the mean

^{a,b,c} Groups with similar letters have no significant difference at 95% and groups with different letters have significant difference according to Mann-Whitney test

* Land use intensity = (cropped area/cultivated area)/100 (KITCHAICHAROEN, 2003)



Figure 1: Farmers' opinion on causes of irrigation problems, Kalabsha and Garf Hussein, Lake Nasser region, Egypt, 2004

The scale and intensity of the agricultural activities the farmers in the Lake Nasser area depend largely on the availability of capital resources particularly cash. The seasonal farmers have the highest capital endowment compared to the other two groups. They possess significantly much more agricultural equipment especially water pumps and tractors. They are also the only farmers owning vehicles. Permanent families have the second highest level of capital endowment especially those related to farming equipment. The occasional farmers have significantly much less equipment compared to the other two groups.

Informal credit in the study area is almost exclusively provided by whole-sale traders and is given basically to watermelon and tomato cultivators. The seasonal farmers are the largest cultivators of these crops and receive the largest amount of informal credit. They are followed by the permanent families and the occasional farmers have no access to this credit type. WFP is the

sole formal credit provider in the area and the farmers in the three groups have equal access. The majority of farmers prefer formal credit (Figure 2).

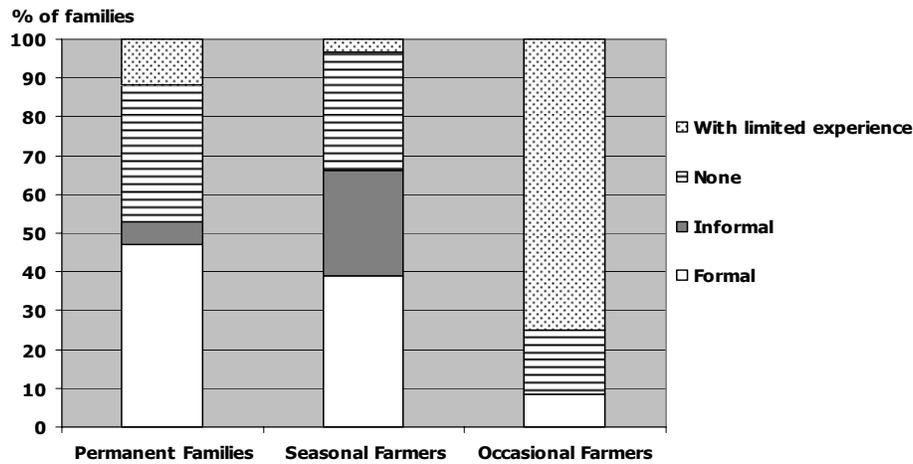


Figure 2: Farmer's opinion on credit types, Kalabsha and Garf Hussein, Lake Nasser region, Egypt, 2004

Livestock is considered a productive and profitable activity by most of the surveyed families. However, it is still a minor resource for the farming families in the Lake Nasser area, because most of the farmers are not settled in the area. Except for sheep and poultry, livestock rearing is practiced not only by few farmers; it is also practiced in a small scale.

4.3. Income analysis

The seasonal farmers have the highest farm income followed by the permanent families. The occasional farmers have considerable losses in their farming activities and had negative value of their farm income. The off-farm income was the highest in the occasional farmer group and the main source of income for this group. It is as important as the farm income for the permanent families. Off-farm income played a minor role for the seasonal farmers. The seasonal farmers have the highest family income and they were the best in fulfilling their financial obligations. Therefore, they were the most economically successful group. Nevertheless, they were more subjected to risk factors and control of resource owners.

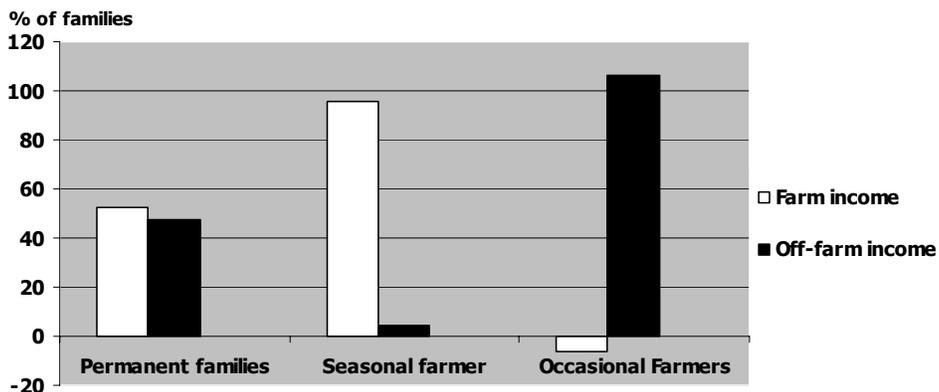


Figure 3: Family income composition, Kalabsha and Garf Hussein, Lake Nasser region, Egypt, 2004

4.4. Social conditions

The social infrastructure and conditions in the study area are generally poor. The education facilities are restricted only to a one-classroom primary school in each village. More than 85% of

the seasonal farmers live with their hired labour in small reed huts near their land. These huts are usually located away from the village centre and the main roads. Most of permanent families and about half of the occasional farmers live in houses that are made either of mud or of stony bricks and reed roofs. Most of these houses have no electricity, water supply or proper sanitary equipment. The farmers considered the housing conditions in the area as discouragingly unsafe. The health care in the study area is limited to irregular round visits of a doctor and/or a nurse. The established health care unit lack in all villages the proper equipments, facilities and most importantly personnel.

4.5. Effects of resource availability and use on the economic success of the families

The unsatisfactory normality assumption of the data advocated the use of Spearman's rho (ρ) correlation coefficient, a non-parametric version of Pearson (r) correlation coefficient, as a tool to examine the correlation between the available resources and the living standard of the families represented by family and farm income. The results of the correlations are presented in Table 2.

The correlations among all variables are positive and statistically significant. The high correlation coefficient values between the farm income and the area cultivated with tomato indicates the importance of this crop as a major contributor to the farm income. The family income has also a highly significant positive correlation with the land area cultivated with tomato. The correlation coefficient between the tomato area and farm investment is not only statistically significant and positive. It is because tomato requires very considerable amounts of inputs. The coefficients of the family and farm income with the farm investments indicate that cropping activities in the area are capital intensive. Such argument is emphasized by the highly significant positive correlation between the credit availability and farm investment.

Table 2: Correlation between income parameters and resources availability and use, Kalabsha and Garf Hussein, Lake Nasser region, Egypt, 2004

Parameter	Family income	Farm income	Family labour	Hired labour	Total land	Tomato land	Farm investment	Credit	Used pumps
Family income	1.00								
Farm income	0.82**	1.00							
Family labour	0.37**	0.42**	1.00						
Hired labour	0.26**	0.37**	0.59**	1.00					
Total land	0.35**	0.38**	0.65**	0.82**	1.00				
Tomato land	0.56**	0.60**	0.75**	0.74**	0.75**	1.00			
Farm investment	0.47**	0.51**	0.80**	0.82**	0.81**	0.86**	1.00		
Credit	0.23*	0.28**	0.26*	0.45**	0.35**	0.41**	0.49**	1.00	
Pumps used	0.21*	0.31**	0.67**	0.76**	0.77**	0.69**	0.76**	0.3**	1.00

* and ** indicate significance at 5% and 1% levels respectively

4.6. Effects of sources of use on the family income

Available resources such as labour, land and capital can be used in the farming activities such as crop production and livestock keeping. The family can also use some of their available resources in off-farm activities (Doppler, 2000). The impact of the different types of resource use on the family income is an important indicator of the economic success of the families. Multiple

regression was used to analyze the relationships between the incomes from the major activities and the total family income.

As shown in table 3, the values of multiple coefficient of determination (R^2), adjusted R^2 and the F-ratio indicate high significance and reliability of the model used.

Table 3: Effects of farm and off-farm activities on the family income

Variables	Coefficient	S.E	T Stat	Sig.
Intercept	1157.433	916.42	1.263	0.211
Income from tomato production (euro)	1.004	0.09	11.131	0.000
Income from vegetable production (euro)	1.525	0.075	20.443	0.000
Income from livestock production (euro)	1.16	0.628	1.848	0.069
Off-farm income (euro)	0.291	0.725	0.401	0.689
R = 0.985 $R^2 = 0.918$ Adjusted $R^2 = 0.913$ F-ratio = 197.728 Sig. = 0.000				

The biggest contribution to the family income is from the cropping activities particularly tomato and vegetables. The livestock production has less considerable contribution to the family income as compared to the other farming activities included in the equation. The off-farm income does not exert any substantial effect on the farm income. Tomato is a much more important crop compared to vegetables in terms of the total cultivated area and the number of cultivating farmers. However, the regression coefficient and significant level of the income from vegetable production suggest a more sizeable and significant contribution to the family income. Therefore, promoting the cultivation of these crops will result in improving the family income and consequently the living standard of the families. These crops have much lower fertilizers and pesticide requirements compared to tomato which will also protect the environment.

4.7. Effects of resource use on the farm income

Multiple regression was also used to establish the most important factors contributing to farm income. The most significant variables affecting the farm income are the fertilizer cost, transportation cost, credit fees and the maximum education level in the family (Table 4).

Table 4: Effects of resource use on farm income

Variables	Coefficient	S.E.	T Stat	Sig.
Intercept	-7781.595	2672.234	-2.912	0.005
Fertilizers cost (euro)	0.681	0.075	9.071	0.000
Transportation costs (euro)	0.292	0.063	4.67	0.000
Use of bio-control methods (dummy)	1589.196	2603.996	0.61	0.543
Use of chemical pesticides (dummy)	1286.075	2809.376	0.458	0.648
Livestock keeping (dummy)	2336.853	2238.022	1.044	0.299
Credit fees (euro)	-8.9	1.853	-4.802	0.000
Maximum education in the household	1839.971	598.7	3.073	0.003
R = 0.865 $R^2 = 0.748$ Adjusted $R^2 = 0.729$ F-ratio = 39.016 Sig. = 0.000				

The highly significant value of the coefficient of this variable indicates a very strong influence of fertilizer use on the farm income. Such conclusion is very alarming regarding the impacts of the farming activities on the surrounding environment. It also urges the suggesting of more

environmentally friendly practices with safer alternatives such as bio-fertilizers or the cultivation of crops with low fertilizers needs.

The significance of the coefficient of transportation costs implies that selling crops in far markets would substantially increase the farm income. This could contribute significantly in suggesting strategies for cultivation of organic crops because Cairo and Alexandria are the biggest markets for these products. Additionally, the crops in the Lake Nasser area ripe earlier than other places in Egypt which will provide marketing advantage for the area. The increase in credit fees could significantly reduce the farm income. Such conclusion provides additional explanation of the farmers' preference to the credit provided by the projects which has no fees. The education level has important impacts in improving the family income. The use of bio-control methods and the use of pesticides have insignificant positive impacts on the farm income. The livestock keeping was found to be insignificant in increasing the farm income which is similar to the lower significant impact of this variable on the family income.

5. Conclusion and recommendations

The family labour is limited for all classes but can easily be supplemented by hired labour. The land resources exert no considerable limitation. The lake water is the main source for both domestic and agricultural uses. The reduction in lake level reduces the availability of water to irrigation and results in considerable yield losses. It also increases the cultivation costs by increasing the required irrigation equipments. Capital resources are the most important factors that determine the success of the economic activities of the farmers in the study area. Cash is needed to provide the required inputs (fertilizers, manure and pesticides). Farmers with sufficient cash resources can also improve the irrigation facilities and overcome the irrigation problems. Farmers with proper access to capital resources particularly informal credit were found to be the most economically successful. However, the area was originally planned to attract poor landless families. Higher education of household members and more experience with the cultivation in the area provide significant contribution to the economic success of the farmers. To improve the chances of success of the poor farmers in the area, this study suggests promoting the cultivation of low input crops such as medicinal plants. These crops will reduce the cash requirements by decreasing irrigation requirements and the applied chemical additives which has important environmental significance. It could also solve marketing problems by having the best market in the nearest town.

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