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The contribution of livestock to farm income in different agro-ecological zones of Egypt

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Abstract. This study was conducted to explore the economic importance of livestock enterprises in different agro-ecological zones of Egypt. Based on soil characteristics and water resources, four different agro-ecological zones were identified: (i) Rainfed area; (ii) Old land; (iii) Reclaimed desert; and (iv) Oases. Structured surveys were conducted, with 162 households to elicit information on income-expense details of each farm enterprises. The profitability of farm enterprises was estimated using the whole farm budgetary analytical method. Livestock herds differed in size and composition among different agro-ecological zones. Although irrigated zones have a similar farming system, they form a marked contrast. The areas cultivated with animal fodder around the year ranged from 26.5 to 47%. On the other hand, the main animal feed resources are natural rangelands in rainfed areas. Livestock makes a substantial contribution to the economy of farmers. Livestock contribution ranges from 32.3% in the oases to 66.76% in the new land. The study concludes that livestock enterprises are economically viable. They provide returns on investment ranging from 17.64 to 28.33%. These findings have important implications for the improvement of livestock enterprises. Making farmers aware of the financial benefits of livestock may convince them to consider it as a better alternative to crop production in the study areas in terms of income generation. This will probably influence their decision on the allocation of their limited resources to competing alternatives.

Keywords. Farm income – Household surveys – Cropping – Agro-ecological zones.

La contribution de l'élevage au revenu agricole dans les différentes zones agro-écologiques de l'Egypte

Résumé. *Cette étude a été menée afin de déterminer l'importance économique des entreprises d'élevage dans les différentes zones agro-écologiques de l'Egypte. Sur la base des caractéristiques du sol et des ressources en eau, quatre zones agro-écologiques différentes ont été identifiées : (i) Pluviale ; (ii) Vielle terre ; (iii) Désert récupéré ; et (iv) Oasis. Des enquêtes structurées ont été menées, avec 162 ménages pour obtenir des informations sur les détails de revenus dépensent de chaque entreprise agricole. La rentabilité des entreprises agricoles a été estimée en utilisant toute la méthode d'analyse budgétaire agricole. Les troupeaux de bétail diffèrent en taille et en composition entre les différentes zones agro-écologiques. Bien que les zones irriguées aient un système d'exploitation similaire, ils forment un contraste marqué. Les surfaces cultivées avec du fourrage autour de l'année variait de 26,5 à 47%. D'autre part, les principales ressources de l'alimentation animale sont des aires naturelles dans la pluie zone nourris. Élevage apporte une contribution substantielle à l'économie des agriculteurs. L'élevage contribue variait de 32,3% à l'oasis de 66,76% à la nouvelle terre. L'étude conclut que les entreprises d'élevage sont économiquement viables. Il a fourni de retour varie de 17,64 à 28,33% du capital investi. Ces résultats ont des implications importantes pour l'amélioration des exploitations d'élevage de ménages. Faire agriculteurs conscients des avantages financiers de l'élevage peut les convaincre de le considérer comme une meilleure alternative à la production agricole dans les zones d'étude en termes de génération de revenus. Ce sera probablement influencer leur décision sur l'allocation de leurs ressources limitées pour les alternatives concurrentes.*

Mots-clés. *Revenu agricole – Suivi d'exploitation – Culture – Zones agro-écologiques.*

I – Introduction

The suitability of an area for either animal or crop production, and the type of animal or crop to be produced in the area depends on the agro-ecological conditions of the area (Tolera and Abebe, 2007). The extent of cropping and the type of crop, in turn, determine the quantity, quality and distribution of animal feed resources throughout the year. On the other hand, the feed resource bases determine the animal production system of the area. Egyptian farming systems vary with agro-ecological zones. Based on soil characteristics and water resources, four agro-ecological zones can be identified in Egypt:

(i) Old land is located in the Nile Valley and Delta Regions. It covers a total area of 2.25 million ha and is characterized by good quality soils (silt-clay mixtures), deposited during thousands of years of Nile flooding. The land is intensively cropped and yields are relatively high. The Nile is the main source of water for irrigation;

(ii) New land is located mainly on both East and West of the Delta and scattered over various areas in the country. It covers 1.05 million ha. Reclamation of this land was started in the early 50s and is continuing. Nile water is the main source of irrigation water but in some desert areas underground water is the only source of irrigation water. Sprinkler and drip irrigation regimes are practiced;

(iii) Rain fed areas are more common in the north-western coastal zone (NWCZ) and Sinai where rainfall fluctuates between 100-200 mm annually; and

(iv) Oases are characterized by alluvial, sandy and calcareous soils. In geography, an oasis is an isolated area of vegetation in a desert. They cover a total area of 40,000 ha. Underground water is the main source for irrigation.

Seré and Seinfeld (1996) stated that a livestock production system is considered as a subset of the farming system, which has different impacts under differing locations and managerial conditions. In Egypt, livestock forms an important component of the agricultural sector, representing about 24.5% of the agricultural gross domestic product (SADS, 2009). Sheep and goat population represent around 50% of the total ruminant population (Alary, 2010). Their contribution to the total red meat produced in Egypt is about 12%, shared equally between the two species (Galal *et al*., 2002). This study was initiated to identify the general features of the agro-ecological zones studied and to investigate the role of livestock in the generation of farm income in each zone. Sainfoin (*Onobrychis viciifolia* Scop.) is a forage legume much appreciated by farmers due to its high palatability, high nutritional value and non bloating properties (Delgado *et al.*, 2002).

II – Materials and methods

This study was conducted to explore the economic importance of livestock enterprises in four agro-ecological zones of Egypt. Three of the four zones are located in NWCZ which extends from Alexandria East to the Libyan west border for about 500 km. The western area is a rainfed area with low erratic rainfall (<150mm/yr). Raining seasons start from mid October to mid March. Average farm size (with the exclusion of rangelands) is 51.3 acres (Table 1). Green fodders are not grown in this region. The main animal feed resources are natural rangelands, which show marked variation in availability and quality based on variability of rainfall. Lately, natural ranges have deteriorated due to overstocking and repeatable drought incidence. Cropping is limited to barley, beside cultivation of some fruits such as olives and figs. Mean livestock holdings are larger than in the other zones with limited cattle population (Table 1).The eastern area is a new reclaimed land. Wheat, maize and groundnuts are the dominant cereal crop in this farming system. The main fruits are citrus fruits and grapes. The average livestock holding consists of 22.76

large ruminants and 100.25 small ruminants. The areas between west and east are mainly mine fields from World War II, with limited livestock activities. Siwa Oasis is located in the Western Desert near the Libyan border, 550 km west of Cairo and 350 km from Matrouh city. In Siwa oasis, farmers depend for their water resources on springs and groundwater. The lack of drainage system there results in soil salinity problems. Due to scarcity of water, about 47% of the total farm size is left fallow in summer. Wheat is the main cash winter field crop besides the cultivation of the date palm tree. Cattle comprises around 53% of the herd. The forth studied zone located in Sharkie governorate, east of the Nile Delta, representes the old lands agro-ecological zone. The average farm size is 2.8 acres. The main crops are wheat, corn and rice. On average, a household owns 3.4 large ruminants and 4.9 small ruminants. However, Egyptian irrigated zones can have two crops per year, usually planted in winter and harvested in the spring and again planted in the spring and harvested in late summer. The areas cultivated with animal fodder around the year ranged from 26.5 to 47% (Table 1).

Table 1. General features of the agro-ecological zones studied

General features	Agro-ecological zones			
	Old land	New land	Rain fed	Oasis
Average land holdings/Farm, acre	2.80	12.70	51.3	7.55
Land holding distribution:				
Green fodder	0.74 (26.5)	5.96 (47.0)	0.0 (0.0)	2.26 (29.93)
Field crops	1.89 (67.5)	4.52 (35.6)	33.35 (65.0)	3.25 (43.04)
Vegetable	0.17 (6.0)	0.44 (3.44)	1.39 (2.7)	0.26 (3.44)
Fruit, %	0.00 (0.0)	1.77 (13.96)	16.57 (32.3)	1.05 (13.90)
Mean livestock holdings/farm, head	8.30	123	149.7	7.8
Livestock type, head:				
Cattle	1.36 (16.38)	18.0 (14.63)	3.80 (2.7)	4.18 (53.12)
Buffalo	2.04 (24.57)	2.77 (2.25)	0.0 (0.0)	0.07 (1.25)
Camel	0.00 (0.0)	1.99 (1.62)	6.75 (4.8)	0.05 (0.62)
Total large ruminants	3.40 (40.96)	22.76 (18.5)	10.55 (7.5)	4.3 (54.99)
Sheep	2.39 (28.79)	75.18 (61.12)	113.4 (74.2)	1.74 (22.44)
Goats	2.51 (30.24)	25.07 (20.38)	25.75 (18.3)	1.76 (22.57)
Total small ruminants	4.90 (59.03)	100.25 (81.5)	130.15 (92.5)	3.5 (45.01)

Figures within parentheses indicate percentage contribution.

Egyptian clover (*Trifoluim alexandrinum*) is the major winter fodder, while green maize or sordan grass fodders are important sources of animal feed in summer. Crop residues and farm by-products contribute feeding animals especially in the autumn months. 59.44, 23.5, 19.74 and 32.1% of the households interviewed utilize it in autumn, winter, spring and summer seasons, respectively. This study was implemented in 2011 based on household interviews and secondary data from published and unpublished resources. Eight villages were selected for each zone and a total of 162 households were interviewed.

A questionnaire was designed and submitted to the above-mentioned households. It provided information on current and past crops and income-expense details of each farm enterprise. The profitability of farm enterprises was estimated using the whole farm budgetary analytical method. Total costs were obtained by estimating both the operating cost and fixed cost. The fixed cost was obtained by valuing the family labour. The returns were obtained by estimating the total value of production which included each product sold and consumed. Farm gate prices for a unit of each product were used.

III – Results and discussion

Table 2 shows that livestock enterprises are economically viable. They provide returns on investment ranging from 17.64 to 28.33%. Thus, livestock production remains to be the main means of livelihood. Hence, more emphasis should be given to improving livestock productivity and proper utilization of farm resources. The net income per farm per year averaged LE 12387.2 in old lands and LE 15780.2 in the oases, of which 38.38% and 32.2%, respectively, were contributed by livestock production. Despite the low contribution of livestock under these zones, this investment is sound; the annual rate of return on investment for livestock production is estimated at 28.33% and 25.81, respectively. The herds are integrated with cropping systems. Integration of livestock into cropping systems plays an important role for the efficient utilization of farm input resources where fodder crops and agriculture residues provide the feed for animals and animal manure makes the soil more productive (Metawi, 2011; Singh *et al.,* 2006). In Oases, there is a wide utilization of non-conventional feed sources such as palm dates leftovers. According to the households interviewed, 73.5% fed their animals with palm dates leftovers. Within the livestock sector; cattle contributes the highest (53.1%) in this zone. Devendra (2000) showed that the contribution of cattle to gross income ranged from 21% to 41% on natural pastures, and from 42% to 71% with cattle on improved pastures. Old lands are more productive and intensively cultivated than the other irrigated zones. The annual rate of return on investment for crop production is estimated at 24.05%. The contribution of livestock to farm income ranged from 41.63 % in the new land and 66.76% in rainfed area (Table 2). Animals are purchased and sold according to cash flow needs. Farm cash incomes should therefore not necessarily be considered as a proxy for wealth accumulation. As crop yields fail, farmers are forced to sell animals to purchase agricultural inputs. In view of the importance of livestock as a source of security and investment, there is some evidence that farmers with larger livestock holdings derive a relatively smaller proportion of their cash income from livestock production.

Table 2. Farm household income analysis

Income source	Agro-ecological zone							
	Old land		New land		Rain fed		Oases	
	LE†††	RCI%††	LE	RCI %	LE	RCI%	LE	RCI%
Net income†:								
From crops	8423.3	24.05	19263.2	19.08	34315.5	13.37	10685.0	18.34
From livestock	4755.2	28.33	38690.9	23.46	24483.6	17.64	5095.2	25.81
Total	12387.2	57954.1	58799.1	15780.2				
% from livestock	38.38	66.76	41.63	32.2				

† Green fodder was not included in the analysis as it was not considered in most cases as a cash crop.
†† The annual rate of return on investment. ††† US$ = LE5.8.

IV – Conclusions

Although irrigated zones have a similar farming system, they form a marked contrast. Old land is more productive and intensively cultivated than the other irrigated zones. It provides returns on investment of 24.05%.

Livestock makes a substantial contribution to the economy of farmers. Livestock contribution ranges from 32.3% in the oases to 66.76% in the new land. The study concludes that livestock enterprises are economically viable. It provides returns on investment ranging from 17.64 to 28.33%. These findings have important implications for the improvement of livestock enterprises

of households. Making farmers aware of the financial benefits of livestock may convince them to consider it as a better alternative to crop production in the study areas in terms of income generation. This will probably influence their decision on the allocation of their limited resources to the competing alternatives.

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