

Transformation of traditional pastoral livestock systems of Egypt

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Abstract: Background: The Northwestern coastal region of Egypt extends about 500 kilometers along the Mediterranean coastline. The pastoral livestock production systems prevail in this area. The zone has witnessed major changes over the last 50 years; demographic growth, urbanization and degradation of rangelands. More recently, the zone has faced by drought that has become more frequent. **Objective:** to assess the effect of drought on livestock farming systems and Bedouins socio-economic vulnerability and to identify the most frequently adaptive process developed by Bedouins to reduce the negative impact of drought. **Methodology:** A semi-structured questionnaire was used for interviewing 162 randomly selected Bedouins. **Result:** Analysis of data showed that drought produce a large number of impacts that affects Bedouins economical standard of living. The annual sheep and goat productivity declined by 18.03 and 8.33%, respectively. Furthermore, the returns on capital invested in sheep and goat production were significantly reduced by around 47 and 34%, respectively. The analyses showed a significant relationship exists between the Bedouins socioeconomic characteristics and the encountered challenges ($p < 0.05$). Breeders have developed different adaptive mechanisms against drought conditions such as decreasing flock size, supplementary feeding, changing herd composition, early marketing of their lambs/kids and migration of family members to urban areas. **Conclusion:** Hence, more emphasis should be given to improving livestock productivity and proper utilization of Bedouins resources. It is important to take into consideration socio-economic factors that influence small ruminant development programs to enhance their success.

Keywords: Agro-pastoral system, survey, drought vulnerability and adoption process.

1. Introduction

The Coastal Zone of Western Desert, Egypt (CZWD) is historically a pastoral zone, and the raising of livestock is the main socioeconomic activity. Economic survival of the people of the region depends on management of sheep and goats, beside cultivation of barley and some fruits as olives and figs. There are several million heads of sheep and goats, which contribute substantially to the Bedouins' income and nutrition, and are used as subsistence and survival reserve in years of drought. The zone has witnessed major changes over the last 50 years; demographic growth, urbanization, touristic development and agro-ecological diversification. More recently, the zone has faced a long drought period from 1995 to 2011, with low erratic rainfall (< 150 mm). Scarcity of rainfall has affected farming systems and household livelihood. The study analyzes the impacts of this long drought period on the livestock farming systems, and the adaptive processes developed by breeders to cope with it, highlighting the socioeconomic factors that affect sheep and goat enterprises profitability.

2. Material and methods

3.1 Study Design

The primary data that were collected from a total of 162 households from June to February 2010 to August 2011 using a survey based on structured questionnaires. The structured questionnaire contained questions regarding socio-economic characteristics of households, flock management and dynamics, animal productivity, input and output parameters and annual production costs and revenues. Secondary data are based on the Animal Production Research Institute survey which was fielded in 1995 in approximately 240 households. This was a year of average rainfall.

3.2 Study Area

The study was carried out at the coastal zone of Western Desert of Egypt (CZWD), which extends from Alexandria in the East to the Libyan border in the West. It is classified as arid zone. Pastoralists and agro-pastoralists are the dominant economic activity.

3.3 Data Analysis

Microsoft Excel was used to analyze the data. Descriptive statistics such as percentages and frequencies were conducted. The profitability of sheep and goats enterprises were evaluated on the basis of returns on capital invested. The general linear model (GLM) in SAS 9.3 (SAS Institute 2012) was used to evaluate the effect of the different socioeconomic factors on sheep and goat enterprises profitability.

3. Results and Discussion

3.1. The effects of drought on livestock farming systems and Bedouins socio-economic vulnerability

3.1.1. Effects of drought on animal feed resources.

Grazing months ranged from 3.39 to 4.12 in average year (Table 1). In the dry year, grazing months ranged between 0.34 and 1.23 months. More seriously, with the poor range conditions, breeders had to provide supplementary feeding during the grazing period (0.55 kg/head in average). Consequently the breeders rely on concentrates for animal feeding for all the year around, plus available roughages (mainly wheat and barley straw). The unit cost of feeding has been multiplied, with the high increase of the prices of the imported concentrates. Digambar (2011) reported that as a result of severe drought, there was direct impact on the growth of palatable grass species and that regeneration of fodder species in pasture.

Table 1. The effects of drought on animal feed resources

Character	Average year	Dry year
Grazing period ,month:		
Natural ranges	3.39 -4.12	0.34-1.23
Crop residues	2.28-2.77	0.0
Supplementary feeding, kg		
During grazing on:		
Natural ranges	0.0	0.55
Crop residues	0.49	0.96
Out of grazing	0.91	0.96

3.1.2. Effects of drought on livestock holdings.

Bedouins have developed different adaptive mechanisms to reduce the negative impact of drought such as, decreasing flock size, raising more goats and , selling their lambs / kids after weaning directly (Table 2).Over the drought period, average flock size has been decreased from 140.7 to 87.23 heads (-38%, Table 2). Most of the breeders limit the sale of animals to cover urgent needs such as the purchase of animal feeds or the family basic expenditures. Mature female percentage in the flocks increased from 33.20 to 46.81. Goat percentage in the flocks increased from 13.25 to 29.84%. The proportion of immature males (13.58%) in average year was about five times higher than that in dry year (2.77%).

Table 2. Effects of drought on livestock holdings.

Character	Average year	Dry year
Herd size ,heads	140.7	87.23
Herd composition: %		
Cattle	2.70	0.0
Sheep	79.23	64.18
Goat	13.25	29.84
Camel	4.82	5.98
Flock age structure: %		
Mature females	33.20	46.81
Mature males	1.90	1.68
Immature females	21.73	16.66
Immature males	13.58	2.77
Progeny <4 months	29.86	32.08

3.1.3. Effects of drought on animal performance.

The effects of drought on the sheep and goats' performance are presented in Table 3.The annual sheep and goat productivity declined by 18.03 and 8.33%, respectively. Furthermore, the returns on capital invested in sheep and goat production were significantly reduced by around 47 and 34%, respectively. Findings from Abate (2009) showed that the drought and delay of rainfall led to increased mortality of livestock, vulnerability to diseases and physical deterioration due to long distance travel for water and pastures. The study revealed that goat production was more profitable than that of sheep in dry year. According to Ahuya et al. (2005), the profitability of goat production emanates from the fact that goats require less feed and eat agricultural by-products that are of low value, hence the low production costs.

Table 3. Effects of drought on small ruminant performance.

Character	Average year	Dry year
Productivity		
Sheep (kg lambs/ewe/year)	25.35 ^a	20.78 ^b
Goat (kg kids/doe/year)	20.66 ^a	18.94 ^b
Return on capital		
Sheep (%)	17.91 ^a	9.39 ^b
Goat(%)	15.73 ^a	10.38 ^b

Means in the same row with different superscript letters differ significantly at $p < 0.05$

3.1.4. Effects of drought on household source of income.

Under dry year condition, livestock production contributed 71.6% % to the household income. The contribution of crop production to household income in dry year is practically zero, while off-farm incomes contribute 25.9%. La Rovere and Aw-Hassan, 2005 reported that the country's most vulnerable households are those that depend solely on livestock production.

Table 4. Effects of drought on household source of income

Source of income	Average year	Dry year
Agriculture	39.4	2.5
Livestock: ,%	52.1	71.6
Off-farm income	8.5	25.9

3.2. The effect of the different socioeconomic factors on sheep and goat enterprises profitability.

Most of farm and household characteristics showed a positive and significant relationship with the profitability of sheep and goat enterprises in the dry year (Table 5). Prokopy et al. (2008) showed that education levels, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and utilization of social networks were positively associated with adoption and use of technology. Sulo et al. (2012) showed that primary occupation, annual income and household size had a positive and significant associated with agriculture technologies adoption. On the other hand, results indicate that whatever differences in characteristics between the farms in the average year they did not seem to cause significant variation in the profitability of sheep and goat enterprises.

Table 5. Factors affecting the profitability of sheep and goat enterprises

Factors	Average year		Dry year	
	Relationship	P	Relationship	P
Farm characteristics:				

Farm size	Positive	P<0.05		NS
Flock size		NS	Positive	P<0.01
Financial incentives		NS	Positive	P<0.01
Extension services		NS	Positive	P<0.05
Marketing distance		NS		NS
Household Characteristics:				
Age		NS	Positive	P<0.05
Education levels		NS	Positive	P<0.01
Family size		NS	Positive	P<0.05
Off –farm job		NS	Positive	P<0.05

NS=not significant

4. Conclusions

Under the situation of dry years, the contribution of crop production to household income is practically zero, small ruminant provide the main source of household income, drought adversely affected sheep and goats productivity and feed expense is a major small ruminant production constraint limiting profitability. This explains why very large farmers are fallen below the poverty line these years. Therefore, Bedouins make adjustment in their expenditure items of his budget to reduce the negative impact of drought. Household budget in an average rainfall year was spent purchase of food (36%), followed by clothing (16%), school fees (14%), medical expenses (10%), social activities (7%), and other items (17%). On the other hand, income in a drought year was spent mostly on purchase of food 78%. Subsidized feed and government supported animal diets may lead to additional revenue for Bedouins through the activity of fattening lambs/kids. Reducing animal feed cost by enhancing crop by-products nutritive value is also recommended during drought periods. However, there are many different kinds of agro-industrial byproducts available in the region, which is seriously under exploited. Investment in rural education can increase return to labor as well as help diversify income. Using poor quality underground water and drip irrigation system is considered in drought years.

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