LIVESTOCK PRODUCTION SYSTEMS UNDER ENVIRONMENTAL CONDITIONS IN NORTH WESTERN COASTAL ZONE OF EGYPT, CONSTRAINTS AND OPPORTUNITIES

By

Ahmed Mohamed Ali Hassanin

B. Sc. Agric. (Animal Production), Ain Shams University, 1990

Master in Environmental Sci., Ain Shams University, 2010

A Thesis Submitted in Partial Fulfillment
of
The Requirement for the Doctor of Philosophy Degree
In
Environmental Science

Department of Agricultural Science
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APPROVAL SHEET

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ABSTRACT

Climatic changes, especially changes in rainfall, has profound effects on pasture production. The relationships between the variation in pasture on one hand and livestock production and farm economic on the other are not clearly quantified in Egypt. The northwestern coastal zone of Egypt (NWCZ) is characterized by the availability of different water sources with varied distributions among regions. This study is undertaken to generate baseline information on sheep and goat production systems ; to asses' small ruminant reproductive and economic performance; to determine the influence of socio-economic factors on sheep and goats profitability ; and to identify *small ruminants' production constraints under different management systems using a structured questionnaire*. The studied areas include the following regions: (i) the irrigated region which is located 40-60 km east to Alexandria, (ii) the rain fed regions (RR) in the west, Dabaa (DA) , Matrouh (MT) and Sidi - Barani (SB) (140–430 km to Alexandria) . The average annual rainfall was 209 mm for SB, 150 mm for MT and 108 mm for DA, during the years 2005-2014. Between March 2014 to February 2015, the study collected primary data from one hundred households. Descriptive statistics such as the mean, relative frequencies and percentages were calculated. The General linear model was used for analyzing factors affecting small ruminants profitability. The fixed effects in the model included location of herd size, farm size, family size, education level, age of household head, household experience, employment and all possible two-way interactions with flock location. The economic performance of sheep and goats production was evaluated on the basis of net income. All monetary values of inputs and outputs are given in Egyptian pounds (LE) with the prevailing exchange rate of 1 USD = 10.15 LE at the time of the field study (year 2016). The study revealed that the average age of the head of the family ranges between 40.8 and 48.4 years. about 58% of family heads had

experience in livestock keeping for more than 10 years. Nearly two-thirds of the surveyed families consist of 4-10 persons. The majority of the respondents (52%) had basic education. Only 28% of respondents in DA region identified themselves as full-time farmers; in the sense that household income comes mostly from the sale of crops and/or animals. Across the four regions, Bedouins' raise several animal species among which small ruminants are the dominant livestock . The herd size varied from 65.68±49.4 to 165.68±143.1 heads. The largest herd size was observed in SB region. The contribution of livestock to household income ranges from 50.34 % to 74.3%. Sheep alone contribute up to 74.56 % of the net cash income derived from livestock production in the DA region. The contribution of rangelands in DA region was lower due to the poor condition and degradation of grazing resources. Green fodder and crop residues were more important in IR region than in other regions. Household cash needs were the most common criteria used for culling both ewes and does in DA district. Locations of flocks affected significantly ($P<0.05$) all reproductive traits except litter size. The average age at first parturition ranged from 13.24 ±1.0 to14.8 ± 0.0 months and from 13.24 ±1.0 to 16.56 ±0.7 months for sheep and goats, respectively. It was the lowest among SB flocks and the late among DA flocks. The average parturition interval ranged from 8.36 ±1.03 to 11.08 ±0.9 months and from 8 ±1.82 ±1.0 to 9.8 ±1.63 months for sheep and goats respectively. It was the lowest among SB flocks and the highest among DA flocks. Overall litter size was 1.04 and 1.53 in Barki sheep and Barki goats respectively. Higher lamb and kids' mortality were observed in DA compared to other districts. The average weaning weight ranged from 19.7 ±2.2 to 21.4 ±1.84 kg and from 12.9±1.6 to 14.14±1.5 kg for sheep and goats respectively. Lambs born in SB district showed higher growth rate indicating that feed is available for lambs and lactating ewes. The lowest sheep productivity and the largest increase in production costs occurred in DA region which, in turn, was

reflected in the profitability of sheep production. On the other hand, sheep production in the IR region is the most profitable among all three regions. Total variable costs across the four regions were significantly different. The results of ANOVA showed that location, household experience, family size, farm size and employment had a significant ($P<0.05$) impact on sheep profitability. On the other hand, only location, household experience and family size, influence goats production profitability, Our findings support the nation that livestock, particularly sheep, are of considerable economic importance in NWCZ and it plays an important role for the livelihood of rural households. Therefore emphasis should be placed by researchers and decision makers on possibilities to improve sheep reproductive performance. However, respondents indicated that high cost of input, insufficient veterinary services and feed shortage were major constraints to small ruminants production. Profitability of sheep production in rain- fed regions is affected by the presence of proper strategies to lower animal feeding costs. The standards of flock hygiene and disease monitoring needs improvement in order to lowering mortality rates. There is also a significant positive correlation between experience of the household head and sheep profitability in the study region. A greater attention should be paid to enhancing the households' skills of modern techniques of sheep production. The findings of the study indicate that farmers in the NWCZE are in need of financial and technical support in order to increase their incomes. It is recommended that appropriate extension services should be put in place in order to enhance the know-how of farmers on improved husbandry practices.

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List of Abbreviations

NWCZ	North Weastern Costal Zone
IPCC	Intergovernmental Panel on Climate Change
SCA	Standing Committee on Agriculture
FAO	Food and Agriculture Organization
SR	Small Ruminants
AFP	Age at first Parturition
PI	Parturition interval
IR	Irrigated region
RR	Rain fed region
DA	Dabaa center
MT	Matrouh center
SB	Sidi-Barani center
LS	Litter size
MR	Mortality rate
WM_4	Weight at 4 months

INTRODUCTION

The climate change can be expected to have several impacts on fodder crops and grazing systems Hopkins and Del Prado, (2007). Baltenweck et al., (2003) found that the environmental characteristics play a significant role in determining the nature and evolution of crop–livestock systems .Factors such as economic opportunities, cultural preferences, climatic events, lack of capital to purchase animals, and labor bottlenecks may prevent farmers from adopting certain technologies .IPCC, (2007) summarized the impacts on grasslands for different temperature changes. Warming of 2 °C had positive impacts on pasture and livestock productivity in humid temperate regions .SCA, (1990) mentioned that warming alters heat exchange among animal and environment, and subsequently impacts on feed intake, mortality, growth, reproduction and production .The effects of rainfall changes, on pasture production and hence on livestock production have been widely reported (Burton and Peoples 2008; MAF 2008; Li *et al*. 2011). Large variation in pasture production across years and zones can be buffered through management adaptations. However, the smaller variation in animal production achieved through management adaptations may not necessarily lead to a smaller variation in farm profitability Gray *et al*., (2008). In Egypt, agro-pastoral and pastoral areas received less attention because of their marginal contributions to economic growth and food security. Vast areas of the North Western Coastal Zone of Egypt (NWCZ) are classified as rangelands dominated by arid and semi-arid climate, with low and erratic precipitation, high risks of severe drought and critical shortage of grazing and water FAO ,(2010). In addition, the zone has witnessed major changes over the last 50 years; demographic growth, urbanization, touristic development and agro-ecological diversification. Such a changes have affected farming systems and household livelihood World Bank (1994), Igue *et al*. (2000);

Manyong and Houndekon (2000). To help alleviate poverty as well as to improve nutrition of villagers, activities should be undertaken to increase the number of sheep and goats in NWCZ and more importantly to improve their productivity. To improve the productivity of small ruminants (SR), attention should be given to factors such as their reproductive and economic performances. However, development of sheep and goats enterprises will only be successful when accompanied by a good understanding of the different production systems and constraints within different production systems in order to plan and design appropriate research and development interventions that are relevant to the specific systems Workneh *et al*., (2003); Baker and Gray,(2004). The number of animals in Marsa-Matrouh governorate of sheep is 396690, goats 137464 camels 17607 , cows 8731 , and buffalo 1290 ,the source : Animal wealth development sector (2016), (Economic Affairs sector). The general objective of the thesis was, therefore, to generate baseline information on sheep and goat production systems in NWCZ of Egypt. The specific objectives of the study were to asses small ruminant reproductive and economic performances , to determine the influence of socio-economic factors on sheep and goats profitability and to identify small ruminants' production constraints among households under different water availability conditions in Egypt .