PERFORMANCE OF BARKI SHEEP PRODUCTION UNDER CLIMATE CHANGE CONDITIONS IN EGYPT

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ABSTRACT

This study was conducted in the NorthCoastal Zone of Egypt (NCZE); with the objective of identifying the socio-economic characteristics of the small ruminant breeders .This study aims to assess the economic performance of sheep production and to determine influence of socio-economic factors on sheep production performance under different wateravailability. A total of 100 breeders were interviewed. A structured questionnaire was designed to obtain information regarding socio-economic characteristics of households, animal productivity, input and output parameters and annual production costs and revenues. Barkisheep are the main prevailing breed raised in the study area. The contribution of livestock to household income ranges from 50.34 % to 74.3%. Sheep contribute up to 74.56 % of the net cash income derived from livestock production in the rain fed region. Flock location, household experience, occupation, family size and farm size had a significant (P<0.05) impact on sheep profitability. On the other hand, farmer's age,education and livestock holding had no effect on the profitability of sheep production. The findings of the study indicate that farmersin the NCZE are in need of financial and technical support in order to increase their income.
Key words: socio-economic factors, Sheep production,climate change, economic performance.

INTRODUCTION

The effects of climate change, especially in rainfall, on pasture production and hence on livestock production have been widely reported (Burton& Peoples 2008; MAF 2008; Li *et al.* 2011).Large variation in pasture production across years and zones can be buffered through management adaptations, thus the variation in livestock production can be smaller than thatof pasture production. 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).On the other hand, differences in farmer and farm household characteristics often result in management variations which affect the financial outcomes of farm activities, notwithstanding that they share a similar resource base and production systems (Ford and Shonkwiler ,1994). Livestock and specifically small ruminants contribute to the development of areas where others activities are not possible (Al Baqain and Valle Zárate, 2011). In Egypt, small ruminant and camel constitute the most valuable activities in the northern coastal zone due to their resistance to dry conditions. Therefore, this study aims to identify the socio-economic characteristics of the households in the studied area and to determine the effect of these socioeconomic factors on sheep production performance under different water availability

MATERIAL AND METHODS:

Study area: In general, the north western coastal zone of Egypt (NWCZ) is characterized by availability of different water sources with varied distribution between regions .The studied area consisted of the following

regions : (i) the irrigated region Borg-Elarab (IR) in the East, (40-60 km to Alexandria), (ii) the rain fed regions (RR) in the West, Dabaa(DA),Matrough(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 2005-2010 (rainfall data obtained from Aboul-Naga et al., 2008; Ahmed ,Kamel, 2011). Small ruminants, with different production systems, represent the main activity in NWCZ and the main source for family income. The main breed of sheep in Egypt isBarki, which has shown great adaptability to the harsh environmental conditions of the area.

Data collection: A field survey was implemented in 2015 (from April to end of October) for 100 flock owners distributed all over the study area.A list of all sheep keepers in each region of the study area was obtained from officials of the Ministry of Agriculture. Sheep keepers with less than 10 adult sheep were excluded from the list. Three villages were randomly selected from each of the four purposively selected regions, resulting in a total of 12 villages. Systematic random sampling was used to select sheep keepers for interviewing from the list of sheep keepers compiled from each village. Before conducting the full scale survey, a pre-test was undertaken with 4 farmers, and adjustments in the questionnaire were made accordingly. A structured questionnaire was designed to obtain information from respondents regarding socio-economic profiles, total variable costs, annual revenues, net income and animal productivity.

Economic performance of sheep production: The economic performance of sheep production was evaluated on the basis of net income referring to the sheep species only, irrespective of whether the flock composition of household was mixed of sheep and goats. All monetary values of inputs and outputs are given in Egyptian pound (LE) with the exchange rate of 1 USD = 18 LE at the time of the study (year 2016). The total variablecostsand the total annual revenues were calculated on a yearly and per head basis. Income was derived from the sale of lambs, and culled cows. The farm gate price for a unit of each product was used for the calculation of home consumption.The variable costs included were feed (purchased feed and fees for stubble grazing), veterinary service and hired labor costs. Information on veterinary costs (based on charges for treatment and vaccination of animals by the veterinarian) was given directly by the farmers.

Statistical analysis: The general linear model (SAS, 2004) was used for analyzing the data. Average annual profit per ewe was used as a dependent variable. The fixed effects in the model included location of flock, flock size, farm size, family size, education level, age of household head, household experience, employment and all possible two-way interactions with flock location.

RESULTS AND DISCUSSION

Household socio-economic characteristics: The average age of household head is 44.6±3.8 years old,44% of them have medium age between 31 to 40 years (Table 1).Khalil etal.,(2013) reported that the average farmer`s age in the north western coastal zone of Egypt is around 51 years old which is

higher than the current results. The study showed that 58% of the respondents had experience in keeping livestock of more than 10 years while 42% had less than 10 years of experience .Households experience across the four regions was significantly different.It was also observed that 13% of the respondents had household sizes of 1-3 persons, 32% had 4-6 persons, 35% had 7-10 personsand 20% had more than 10 persons,respectively.The high proportion of family size in IR is relevant for subsistent agriculture given that such agricultural system requires extensive family labor to carry out farming activities.Metawi (2015) showed that the average family size was 7.8 and 5.7 person under rain fed and irrigated farming systems of north coastal zone of Egypt, respectively.Therewere an average of 3.1±0.03 males and 2.2±0.04 females from which 2.0±1.0 participation in agriculture activities.The majority of the respondents (52%) had basic education, 11% had tertiary education and 37% had no formal education. Education is relevant if farmers are to access and apply livestock technology appropriately (Marinda etal., 2006). However, the data suggest a high illiteracy rate (37%) among households across the four regions.Given the high illiteracy rates in the study area, farmers are forced to rely heavily on traditional methods of livestock rearing.Only 28% of respondents in DA region identified themselves as full-time farmers, derived that household income from the sale of crops and and/or animals only.

Table(1): Socio-economic characteristics of respondents

Parameter	Districts								
	IR [1]		DA [2]		MT [2]		SB [2]		mean
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	%
Age									
31-40	6	24	12	48	11	44	15	60	44
41-55	14	56	9	36	10	40	6	24	39
>55	5	20	4	16	4	16	4	16	17
Average	48.2±5.7		39.3±2.1		46.4±9.9		44.6±13.4		44.6±3.8
Experince									
< 10	8	32	16	64	12	48	6	24	42
≥10	17	68	9	36	13	52	19	76	58
Education									
No formal	11	47	9	36	10	40	7	28	37
Basic	12	48	12	48	12	48	16	64	52
Tertiary	2	8	4	16	3	12	2	8	11
Total	50	100	50	100	50	100	50	100	
Household size(person)	6	12	8	16	8	16	4	8	13
1-3	12	24	18	36	12	24	22	44	32
4-6	24	48	12	24	22	44	12	24	35
7-10	8	16	12	24	8	16	12	24	20
>10	5.9±4.3		5.4±3.4		4.7±3.3		5.2±3.1		5.3±.5
Female	2.6±2.5		2.4±2.3		2.0±1.3		1.8±2.1		2.2±0.4
Male	3.2±2.4		3.0±1.8		2,8±1.5		3.4±1.7		3.1±0.3
F. labor	3.2±2.6		0.8±1.4		1.9±1.7		2.1±2.4		2.0±1.
Employ.									
In farm	76 %		28 %		40 %		60 %		51±21.3
Off-farm	24 %		72 %		60 %		40 %		49±.21.2

[1] Irrigated region(IR)Borg-Elarab [2] The average annual rainfall was 209 mm for (SB)Sidi-Barani, 150 mm for (MT)Marsa-Matruh, and 108 mm for (DA)Dabaa, during the years 2005-2010 ,Employ(Employment) ,F.(family)

Table 2 showedthat thelowest sheep productivityand the largest increase in production costs occurred in DA which, in turn, was reflected in the profitability of sheep production. On the other hand, sheep production in the IR is the most profitable among the other three regions. Totalvariable costs across the four regions were significantly different.The variations in the dependence in each region on

rangelands is the main reason of the variability of feed costs in the three rain fed regions .However, feed expenses for the flock in IRare the lowest. Full dependence on green fodder and crop residues resourcesand a minimum amount of supplemental feeding are the major reasons for this low feeding cost. The households in DA region have a permanent base and move seasonally to take advantage of agro-pastoral and urban areas. Due to the high movement, and longer grazing in this region, the health and labor costs are much higher than those in the other regions. In SB and MTregions, animal movement is restricted to certain distances around the farm base.

Table(2): Profitability of Sheep production under climate variability of Egypt

Item	Region			
	IR[1]	DA[2]	MT[2]	SB[2]
Grazing performance: 1- Grazing period (month):Natural ranges	-	1.25	1.8	2.3
Green fodder and crop residual(month)	8	1	2.5	3.5
2- Supplementary feeding:During grazing (kg/head/day)	-	0.5	0.25	-
Out grazing (kg/head/day)	0.5	1.25	0.75	1
Feed(LE)	298.33	513.21	446.91	390.95
Labour(LE)	114.05	38.41	25.35	29.73
Veterinary(LE)	15.55	18.96	8.48	14.36
Total cost(LE)	427.93	570.6	480.74	435.04
Productivity(Kg)	$27.57^a \pm 0.65$	$19.19^b \pm 0.95$	$28.25^a \pm 0.48$	$29.70^a \pm 0.37$
Net income(LE)	$656.83^a \pm 202.8$	$159.078^d \pm 87.1$	$468.47^c \pm 128$	$564.7^b \pm 74.8$

[1] Irrigated region [2] The average annual rainfall was 209 mm for SB, 150 mm for MT and 108 mm for DA, during the years 2005-2010 .Within the same row, means with different superscripts are significantly different at 5% the level of significance (rejection of null-hypothesis), Sd=standard deviation

Source of household Income: Table(3)Across the four regions, the contribution of livestock to household income ranges from 50.34 % to 74.3%.Sheep contribute up to 74.56 % of the net cash income derived from livestock production in the DAregion.

Table(3): Household source of Income under climatechange of Egypt

Types	Region			
	IR[1]	DA[2]	MT[2]	SB[2]
1-Agriculture % Fruits	49.746 0.28	25.720 80.93	49.71 64.79	33.99 20.83
Crops	54.73	19.07	35.41	79.20
Vegetables	45.01	0	0	0
2-Livestock production% Sheep	50.253 54.47	74.279 74.56	50.289 72.50	66.00 58.24
Goat	5.77	24.93	11.07	13.3
Camel	0.46	0.50	1.10	28.33
Cows	30.82	0	5.37	0.47
Buffloes	8.35	0	0	0

[1] Irrigated region [2]The average annual rainfall was 209 mm for SB, 150 mm for MT and 108 mm for DA, during the years 2005-2010 .The cropping system in the irrigated region is based on green fodder (mainly Egyptian clover in winter or maize in summer), cereal (mainly wheat in winter) and vegetables in summer. The production system in the rain fed regions   is characterized by varied agricultural activities including raising small ruminant's flocks, beside cultivation of barley and little of wheat, and some fruits as Olives and Figs.

Factors affecting profitability of sheep enterprises: Table 4 indicated that only location, household experience,occupation, family size and farm size had a significant ($P<0.05$) impact on sheepprofitability. On the other hand, farmer's age, education and livestock holding had no effect on the profitability of sheep production. Age and experience are often interrelated,

given that experience is accumulated over time, older farmers have a greater farming experience. They are thought to be more likely to manage a farm better and to achieve healthy financial results. Contrary to this expectation, age and farming experience were found to be insignificant (Gloyetal. 2002 a; McBride and El-Osta 2002). A larger household is assumed to overcome labor constraints and provide economical labor input. Household size has been described as the most important source for family labor (Ngongonietal 2006). However, this factor was proved insignificant in Fernandez-Cornejo etal. (2005). The study suggests that involvement in off-farm economic activities may potentially compete with on-farm involvement. Thus, this factor is expected to have a negative correlation with sheep profitability.However, off –farm employment was found to be insignificant in the work of McBride and El-Osta (2002).A higher education level is suggested to have a positive impact on economic performance. However, in the present study, education was found to be an insignificant factor in relation to sheep profitability

Table (4): Socio economic factors effecting on ewe profitability

Traits	Ewe profitability	Pr>F
	LSM ±SE	
Location [1] :		
Borg Arab	656.83[a]±202.8	
Dabaa	159.078 [d]±87.1	.0001
Matruh	468.47 [c]±128.0	
Sidi Barani	564.70 [b]±74.8	
Education:		
illiterate	486.76±250.3	
Basic	461.16±205.9	0.3615
Tertiary	396.50±259.2	
Experience:		
≤10	301.41 [b] ±173.2	
>10	586.97 [a]±250.3	0.0001
Family size:		
1 - 3	439.77 [c] ±236.48	
3 – 7	431.33 [b] ±226.11	0.001
7-10	624.88 [a] ±131.61	
> 10	539.54±417.67	
Farm size:		
1-20	432.06 [c] ±252.03	
21-50	479.48 [b] ±190.23	0.0001
51-100	488.9[b]±72.04	
>100	638.09 [a] ±180.5	
Flock size:		
1-50	463.01 ±248.12	
51-100	450.56 ±226.11	0.2276
> 100	481.25 ±197.09	
Age:		
1	474.47±235.7	
2	436.12±209.85	0.445
3	465.03±248.63	
Employment	501.54[a] ± 204.74	0.0014
	420.81 [b]±246.78	

[1] Irrigated region [2]The average annual rainfall was 284 mm for Sidi Barani, 150 mm for Matruh and 76 mm for Dabaa (DA), during the years 2010-2012 .Within the same row, means with different superscripts are significantly different at 5% the level of significance (rejection of null-hypothesis), SD=standard deviation

CONCLUSIONS AND RECOMMENDATIONS:

According to our survey of thefour regions, our findings support that livestock, particularly sheep, are of considerable economic importance in NWCZ and it plays an important role for the livelihood of rural household. So, emphasis should be given by researchers and decision makers to improvesheep reproductive performance. Profitability of sheep production in rain-fed regionsis affected by the presence of the proper strategies to decrease animal feeding costs.There is also a significant positive correlation between experience of the household head and sheep profitability in the study area.A greater attention should be paid to enhancing the households' skills in modern techniques for sheep production.

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دراسة أداء إنتاج أغنام البرقي تحت ظروف التغيرات المناخيه في مصر

[٦]

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المستخلص

١– أجريت هذه الدراسة في المنطقة الساحلية الشمالية الغربيه لمصر

٢– وتهدف الي تحديد الخصائص الاجتماعية والاقتصادية لمربي المجترات الصغيرة دراسه أثر هذه العوامل على إربحية إنتاج الأغنام في ظل اختلاف الظروف المناخيه؛ وتقديم توصيات بناء على هذا النتائج

٣- تم عمل استبيان لعدد ١٠٠ مربي، من خلال تصميم استماره استبيان للحصول على معلومات حول الخصائص الإجتماعية والاقتصادية للمربين، والتكاليف الإجمالية، والإيرادات السنوية، والإنتاجية لقطعان ألأغنام

٤- كانت المؤشرات المستخدمة لتقييم الأداء الاقتصادي هي صافي الدخل، حيث تنتشر سلاله الأغنام البرقي في منطقه الدراسه

٥- وقد أظهرت النتائج ان مساهمة الثروة الحيوانية في دخل الأسرة تتراوح من ٥٠.٣٤ ٪ إلى ٧٤.٣٪.

٦- تساهم الأغنام بنسبة تصل إلى ٧٤.٥٦ ٪ من صافي الدخل النقدي المستمد من الإنتاج الحيواني في المناطق التى تعتمد على الأمطار

٧- لقد كان الموقع وخبرة المربى والمهنة وحجم الأسرة وحجم المزرعه تأثير معنوي على اربحية انتاج الأغنام فى حين لم يكن عمر المربي أي تأثير

٨- تشير نتائج الدراسة إلى أن المربين في منطقة الدراسة يحتاجون إلى الدعم المالي والتقني من الحكومة لزيادة دخلهم

الكلمات الرئيسية: العوامل الاجتماعية الاقتصادية، نشاط انتاج الأغنام، التقلبات المناخية، الأداء الاقتصادي