Impact of Socio-economic Factors on Milk Production and Consumption in Irrigated Agriculture in the Sudan The Gezira Scheme

Raga, M. Elzaki[1], Hashim A. Elobied[2] and H. A. [3] Shams Eldien

SUMMARY

The impact of socio-economic factors on milk production and consumption in the Gezira scheme was described. It was based mainly on primary data collected directly from sampled tenants. Structured and unstructured questionnaire were distributed among target groups. Related supportive secondary data were collected from official and governmental offices. Primary information data about socio-economic characteristics of the tenants included:- gender, family size, education, year of farm experiment and off- farm employment. The information pertaining milk production, milk consumption, number and type of animals owned by the tenants were collected. Matrix correlation approach and statistical test of significance and independence test (Chi-square) were used to identify the relationship between the socioeconomic factors and milk production and consumption. Results drawn were that: tenant's age, family size, number of years experiences and off-farm employment significantly affected milk production and consumption in the scheme. The education level had a significant effect on milk production, however there was no relationship between level of education and milk consumption, while there were less effects of the tenancy size and were gender independent.

INTRODUCTION

Livestock in the Sudan is largely in the hands of the traditional sector (Khair, 1999) which owns about 85% of the total animal population and the remainder is owned by the modern sector (Elsaid, 1999). However, many observers at the international development level are looking towards the Sudan as a major future supplier of food for Africa and the Middle East (Sidahmed and Koong, 1984). This trend is likely to continue in the light of the fact that dairy products in developing countries are demand and income- elastic i.e. consumption increases rapidly when prices decrease or consumers' income levels increase, (Delgado *et al*., 1999). Moreover, per capita milk consumption in developing countries is much lower than developed countries.

Milk production from the local breeds in Sudan was lower than that reported from breeds in temperate climates, but was higher than production reported from most African breeds (Ageeb and Hillers, 2002). Per capita consumption of milk in Sudan is 81 kg in 1999 (Ministry of Animal Resources, 2000). In fact, a long-term view shows that milk and meat production were sharply increasing during 1987-2000: from 1913 and 320 thousand tons, respectively in 1987 to 6879 and 1522 thousand tons in 2000 (Fig. 1).

This study was conducted in the Gezira irrigated scheme. It constituted 12% of the total cultivated area and 50% of the total irrigated sector in the country (Mirghani *et al*., 2001). Livestock production systems were characterized as influenced by climate, the predominance of various livestock and crop species and the relative importance of livestock and crops to the framing system (De Boer *et al.,* 1994). The smallholder ruminant livestock production systems considered in the study were nomadic pastoral system, agro-pastoral system, and mixed crop-livestock farming (Tangka, *et al.*, 2000).

The most common livestock production system throughout the scheme is the rearing of relatively small mixed herds of animals kept within the vicinity of the village for the greater part of the year. Livestock production systems are varied, including agropastoralism and nomadism. The most important livestock species reared within the scheme were cattle, which were predominately

of Zebu origin Mohamed, 1995), small ruminants (sheep and goats), donkeys, horses and the local breeds of chicken (Abdelmagid, 1995).

Livestock population in the scheme was estimated at (1.75×10^4 heads) distributed at 41, cattle; 65, goats; 58, sheep; 0.3, camels; 11 donkeys; and 0.66, horses; (SGB, 1999).

Data and sample design:

To assess the impact of socio- economics factors on milk production and consumption in the Gezira scheme, Nateriak & lrebcode primary data including the demographic and socioeconomic characteristics of the surveyed farmers and quantities of milk produced and consumed were collected.

Structural questionnaires were distributed among target groups which were mainly the Scheme's tenants. A personal interview with regard to sampling, multi-stage stratified random sampling technique was adopted as it gives more precise results because the variation within each stratum is less than the variation in the whole population, (Sudman, 1976, Abdelmagid, 1986 and Elbushra 1998). The first step, the Gezira scheme was divided into two main parts (Strata), namely Gezira main and Managil Extension. In the second step, four Blocks from each part were selected randomly. From Gezira main, Barakat, Hamid Elniel, Durwish and NurElhuda, and from Managil extension Wada abed, Nasieh, Hashaba and Affan Blocks were selected (stratum).

Estimated number of farmers in the scheme were 124027 at the time of survey, distributed as 65082 and 58945 in Gezira main and Managil extension, respectively, (SGB, 2000). The sample sizes of this study were 120 farmers. 60 farmers were selected from Gezira main and 60 farmers from Managil extension which constituted about 3.2% and 1.3% of the total farmers in the surveyed villages in Gezira Main and Managil Extension, respectively. 15 farmers were randomly selected from each Block.

3. Methods of statistical analysis:

To fulfil the objective of the study, the following analytical techniques were used:
Descriptive statistical analysis was used such as average, percentages and standard deviation. Simple correlation was used to measure the degree of relationship between two variables, sought to determine how well a linear or other equation described or explained the relationship between variables (Spiegel, 1972).

**Fig. 1: Trend of meat and milk production, 1987/2000
('000 tons)**

Season
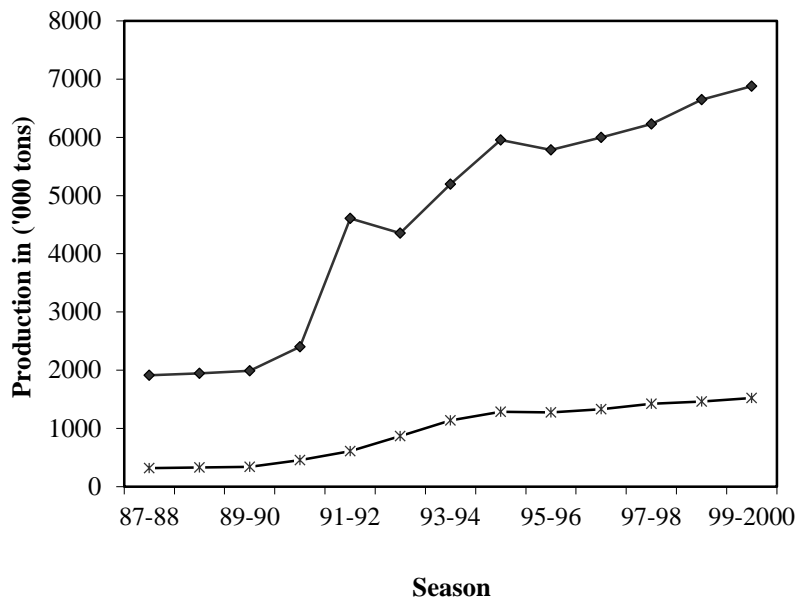
Source: Ministry of Animal Resources, 2000.

Rank matrix correlation was used to show the relationship between quantitative variables (tenant's age, family size, years of experience and how far was the farm from residence) and milk production and consumption.

Chi-square test was used to analyze the impact of qualitative variables (education, gender, marital status and employment) on milk production and consumption.

RESULTS AND DISCUSSION

Primary data collected from the field survey were processed and analyzed. The socioeconomic characteristics of the tenants were expected to have a great effect on the production process in the scheme. They were expected to have a direct and indirect effect on the farmers' performance and output (Ali, 1999).

95% of the tenants owned animals. The average herd size was 73 heads, composed of different species of animals, including local breeds of cattle. Goats comprised 50% of the herds.

The average milk production was 20.7 pounds per tenant per day. It was distributed as 10.2, 5.6 and 4.9 pounds from cows, sheep and goats simultaneously (Table 1). Dairy sheep and goats produce considerably less milk per animal, as argued by Coffey (2001). The local breeds of cows owned by tenants were Butana and Kenana. Ageeb and Hillers (2003) found that the mean lactation period for the local breeds of cows were 256 ± 32 days. It was affected by ($P< 0.05$) sire, year of calving and parity number. The survey result revealed that the mean lactation period of cows was 7.5 months (225 days), while the average lactation period for sheep and goats were 3 and 3.5 months, respectively (Table 1).

Table 1. Average production of milk per tenant in the season of
2001/2002

Animal	Milking animals / tenant	Lactation period (months)	Average milk production / head / day (lbs.)
Cows	7	7.5	10.2
Sheep	16	3	5.6
Goats	23	3.5	4.9
Total	46	-	20.7

One pound (1 Lbs) = 0.5 Kg.

The surveyed tenants confirmed the lack of marketing channels. The quantity of milk produced was not enough for small-scale commercial operation, there must be several flocks be kept by the tenant, or otherwise milk should be stored until commercial marketable amount accumulates.

The study indicated that tenants were facing feed shortages problems, which were reported to be quite significant during the dry months of May, June, July and August.

Three types of veterinary services were received by the surveyed tenant, comprising treatment, prevention and some veterinary advices through extension office. About 61% of the surveyed tenants reported that they had not received veterinary services, while 39% had received veterinary services from different sources.

Table 2 displays the rank matrix correlation analysis of socioeconomic factors (quantitative variables) as they affect milk production and consumption. The most important effect of tenancy size is its impact on farmers' individual saving capacities (Berent, 2000). The Table depicts that there are less effects of the tenancy size on milk production and consumption with correlation coefficients of 0.036 and 0.173, respectively. This explained why milk production depends more on green fodder and concentrates feed, rather than large-size supply of roughage feed like crop residues. It therefore indicates that there is no fodder cultivated in the Scheme in the surveyed season.

Age has an important effect on farm productivity and the out- put of individuals because of its effects on mental and manual abilities (Ali,1999). The average age of the surveyed tenant is estimated to be 52.37 years. Age has positive impact on milk production ($r = 0.583$, $P<0.01$), and also a slight positive relationship to milk consumption ($r = 0.244$, $P<0.05$). There were strong relationships between age, family size and farm experience with correlation coefficients of 0.616 and 0.765, respectively ($P<0.01$).

Table 2. Rank matrix correlation analysis of socioeconomic factors (quantitative variables) and milk production and consumption at surveyed sample area in season 2001/2002.

Variables	Tenancy size	Age	Family size	Farm experience	Farm distance	Total milk production	Total milk consumption
Tenancy size							
Pearson correlation	1						
Sig. (2-tailed)	-						
N	120						
Age							
Pearson correlation	0.146	1					
Sig. (2-tailed)	0.112	-					
N	120	120					
Family size							
Pearson correlation	0.105	0.616**	1				
Sig. (2-tailed)	0.254	0.00	-				
N	120	120	120				
Farm experience							
Pearson correlation	0.057	0.765**	0.638**	1			
Sig. (2-tailed)	0.539	0.00	0.00	-			
N	120	120	120	120			
Farm distance							
Pearson correlation	-0.115	0.057	-0.077	0.080	1		
Sig. (2-tailed)	0.210	.0550	0.452	0.386	-		
N	120	120	120	120	120		
Total milk production							
Pearson correlation	0.036	0.510**	0.583**	0.640**	-0.021	1	
Sig. (2-tailed)	0.710	0.00	0.00	0.00	0.825	-	
N	110	110	110	110	110	110	

Total milk consumption	0.173	0.244*	0.212*	0.291*	0.011	0.331**	1
Pearson correlation	0.440	0.10	0.025	0.024	0.909	0.00	-
	115	115	115	115	115	110	115
Sig. (2-tailed)							
N							

** *(P<0.01), 2- tailed.*

* *(P<0.05), 2- tailed.*

The average family members were 8.4 persons. In agricultural communities in most areas of the world, large families were pronounced phenomena, and were considered an advantage in such communities like Gezira scheme (Eltayeb, 2000).

The family size has significant positive effect on milk production and consumption in the Scheme, with respective correlation coefficients of 0.580 (P<0.01) and 0.212 (P<0.05). Years of experience (farming experience) refers to the total number of years the farmer spent working on field. It was expected that the farmer acquired experience from his farm by time. The acquired experience may create awareness of good cultural practices and animal raising (Hussein, 2002). The survey results revealed that, the average number of years spent in the field work were 24.5 years. However there was a weak relation between farm experience and milk consumption (r = 0.291 P<0.05) and it has a strong relationship with milk production (r = 0.640 P<0.01). The distance between the farm and residence has a negative weak relationship with milk production (r = -0.021), while it has no effect on milk consumption.

The range of milk production and consumption and qualitative characters are illustrated in Table 3 and Table 4. The total milk production and consumption were divided into five categories: less than 100 lbs, 100-200 lbs, 200-300 lbs, 300-400 lbs and greater than 400 lbs per month per family. The qualitative variables are gender (in term of male and female), education (in term of educated and non educated), and occupation (in term of occupation and no occupation).

Table 5 show the results of the test of association between qualitative factors and milk production. The level of education and off-farm employment had significant positive effects on milk production. The chi-square values of those two factors were 27.97 and 11.569, respectively.

Milk consumption was strongly dependant on the off-farm employment (P<0.01) while it was weakly dependant on the level of education.

Milk production and consumption were gender independent, the estimated chi-square values were 2.77 and 3.50, respectively (Table 5 and Table 6).

Table 3. Frequency distribution of qualitative socioeconomic factors
and range of milk production/month/family.

Items	Range of milk production (N = 110)									
	<100 lbs		100-200 lbs		200-300 lbs		300-400 lbs		>400 lbs	
	Count	%	Count	%	Count	%	Count	%	Count	%
Gender										
Male	1	100	11	100	35	92.1	14	82.4	39	90.7
Female	0	0	0	0	3	7.9	3	17.6	4	9.3
Total	1	100	11	100	38	100	17	100	43	100
Education										
No educated	1	100	9	81.8	9	23.77	4	23.5	4	9.3
Educated	0	0	2	18.2	29	6.3	13	76.5	39	90.7
Total	1	100	11	100	38	100	17	100	43	100
Occupation										
No occupation	1	100	3	27.3	29	76.3	10	58.8	32	74.4
Occupation	0	0	8	72.7	9	23.7	7	41.2	11	25.6
Total	1	100	11	100	38	100	17	100	43	100

Source: Study survey, 2001/2002.

Table 4. Frequency distribution of qualitative socioeconomic factors

and range of milk consumption/month/family

Items	Range of milk consumption (N = 115)									
	<100 lbs		100-200 lbs		200-300 lbs		300-400 lbs		>400 lbs	
	Count	%	Count	%	Count	%	Count	%	Count	%
Gender										
Male	11	15.4	28	87.5	43	91.5	4	100	19	100
Female	2	84.6	4	12.5	4	8.5	0	0	0	0
Total	13	100	32	100	47	100	4	100	19	100
Education	6	46.2	7	21.9	7	14.9	1	25	6	31.6
No educated	7	53.8	25	78.1	40	85.1	3	75	13	68.4
	13	100	32	100	47	100	4	100	19	100
Educated										
Total										
Occupation	4	30.8	19	59.4	33	70.2	3	75.0	18	94.7
No occupation	9	69.2	13	40.6	14	29.8	1	25.0	1	5.3
	13	100	32	100	47	100	4	100	19	100
Occupation										
Total										

Source: Study survey, 2001/2002.

Table 5. Impact of qualitative socioeconomic factors on milk production.

Variables	Pearson chi-square	Degrees of freedom	Asmp. sig. (2- sided)
Gender	2.77	4	0.596
Level of education	27.97	4	0.000

Occupation	11.569	4	0.21

Table 6. Impact of qualitative socioeconomic factors on milk consumption.

Variables	Pearson chi-square	Degrees of freedom	Asmp. sig. (2- sided)
Gender	3.508	4	0.477
Level of education	6.393	4	0.172
Off-farm employment	15.49	4	0.004

CONCLUSION

   - Tenants were found to be homogenous in most of their characteristics.
- Milk production and consumption in the sampled area were relatively low. The poor feeding conditions were realized as the major factor affecting milk production, i.e. low quality animal feed resulted in low output.

- Milk production and consumption were mainly affected by family size, age and farm, experience and ware strongly dependant on the level of education and off-farm employment, while there were less effects of the tenancy size and are gender independent.
- Improvement of milk marketing through the activation of the Gezira Co-operative Milk Society is highly recommended.
- Extension and veterinary services are strongly needed by tenants.

REFERENCES

Abdelmagid, S. A. (1986). An Economic Analysis of Dairy/Forage Enterprise in the Rahad Agricultural project. M. Sc. Thesis, University of Gezira, Wad Medani, Sudan.

Ageeb, A.G. and Hillers, J.K. (2002). Production and Reproduction Characteristics of Butana and Kenana Cattle of the Sudan. Department of Animal Science, Washington State University, Pullman, Washington 99164, U.S.A.

Ali, S.A.E (1999). An Economic Evaluation of the Crop Combination in Rahad Scheme, University of Khartoum, M. Sc., Thesis, Faculty of Agricultural, Department of Agricultural Economics, Khartoum, Sudan.

Berent, T. (2000). Farmers Perspectives, Development Strategies and Policy Options. Ph. D Thesis, Institute of Technology Zurich, Swiss Federal.

Coleman, J.R. (1999). Industry and Trade Summary-Dairy Products. USITC publication 3080, office of Industries, International Trade Commission, Washington D.C., U.S.A.

Coffey, L. (2001). Dairy Sheep. National Center for Appropriate Technology, under a grant from the Rural Business-Cooperative Services, Department of Agriculture. U.S.A

De Boer, J.; Yazman, J.A. and Raun, N.S.(1994). Animal Agriculture in Development Countries. Technological Dimensions. Development studies paper series. Winrock International Institute for Agricultural Development, 43 P.

Delgado, C., Rosegrant M., Steinfeld H.; Ehui S., Courbois C. (1999). Livestock to 2020: The Next Food Revaluation. Food, Agriculture, and Environment Discussion Paper 28, International Food Policy Research Institute (IFPRI), Washington D.C., USA.

Elbushra, A.A.(1998). Economic Impact of Liberalization Policies on Vegetable Producers in the Gezira Province. M. Sc. Thesis, University of Gezira, Sudan.

Elsaid, S. S. A. (1999). Agriculture and Global Trading. The Center of Strategies Studies, Khartoum, Sudan.

Eltayeb, A.M. (2000). Assessment of Socioeconomic Factors that contribute of Yield Variability of Wheat in the Gezira Scheme. Department of Agricultural Economics, University of Gezira, Sudan.

Hussein, A.A.T. (2002). The Impact of Some Personal Characteristics on the Adoption of Mixed Feed Technique by Small Dairy Cattle Farmers in wad Medani. M. Sc. Thesis, faculty of agricultural science, university of Gezira, Wada Medani, Sudan.

Khair, M. A.M. (1999). Principle of Fodder Production in Sudan. Gezira Research Station, Wad Median, Sudan. (In Arabic version).

Ministry of Animal Resources (2000). Statistical Bulletin for Animal Resources, issue No. (10), Khartoum, Sudan.

Mirghani, A.M; Elhaj, T. S. and Ahmed, M.S. (2001). Socio–Economic Impact Study of the Pilot Program at Al/Hakam Block. Raising Productivity Through Broadening Farmer's Choice on Farm Systems and Water Management, Sudan Gezira Board, Sudan.

Mohamed, M. A. (1995). Estimation of Milk Quantities in Gezira. National Research Center, Ministry of Animal Resources, Wad Medani, Sudan.

Sidahmed, A. E. And Koong, l. J. (1984). Application of Systems Analysis to Nomadic Livestock Production: Livestock Development in Sub-Saharan, Constraints, Prospects, Policy. Boulder, Colorado, USA.

SGB (1999). Sudan Gezira Board. Financial and Social Analysis of Gezira Scheme and Managil. Department of Planning and Socio-Economic Administration, Wad Medani, Sudan.

SGB (2000). Department of Animal Production, Wad Medani, Sudan.

Spiegel, Murray. R.(1972). Schaum's outline of the Theory and Problems of Statistics. Polytechnic Institute, Hill International Book Company, first edition, New York, USA.

Sudan Bank (1999). Annual Report. Ministry of Finance, Khartoum,

Sudan.

Sudman, S.(1976). Applied Sampling. New York, Academic Press.

Tangka, F.K; Jabbar, M.A. and Shapiro, B.I. (2000). Gender Roles and Child Nutrition in Livestock Production Systems in Developing.

Authors:

RAGA MOHAMMED ELZAKI

HASHIM AHMED ELOBIED

SHAMAS ELDEIN AHMED

أثر العوامل الاجتماعية-الاقتصادية على إنتاج واستهلاك الألبان في المناطق المروية في مشروع الجزيرة

رجاء محمد الزاكي[1]، هاشم أحمد عبيد[2]، شمس الدين حسب الله أحمد[3]

[1] كلية الإنتاج الحيواني–جامعة الجزيرة، [2] كلية الزراعة–جامعة الخرطوم ، [3] كلية الإنتاج الحيواني والطب البيطري–جامعة السودان

ملخص البحث:

هذه الورقة تهدف لوصف أثر العوامل الاجتماعية–الاقتصادية علي إنتاج واستهلاك الألبان في مشروع الجزيرة. اعتمدت الدراسة على جمع البيانات الأولية مباشرة من المزارعين. تم توزيع الاستبيانات على المجموعات المستهدفة. أيضآ تم جمع البيانات الثانوية من الجهات الرسمية والمكاتب الحكومية. البيانات الأولية شملت المعلومات عن الصفات الاجتماعية–الاقتصادية للمزارعين ، الجنس ، حجم الأسرة ، التعليم ، الخبرة ، عدد سنين الخبرة في المزرعة والعمل خارج المزرعة. أيضآ تم جمع المعلومات التي تتعلق بإنتاج واستهلاك الألبان وعدد ونوع الحيوانات التي يمتلكها المزارعون. استخدم تحليل مصفوفة الارتباط والاختبار الاحصائي والاستقلالي (مربع كاي) لمعرفة العلاقات بين الصفات الاجتماعية–الاقتصادية على إنتاج واستهلاك الألبان. أهم النتائج التي تم الحصول عليها من هذه الدراسة بان أعمار المزارعين ، حجم الأسرة وعدد سنوات الخبرة والعمل خارج المزرعة يؤثر معنويا على إنتاج واستهلاك الألبان ومستوى التعليم له أثر معنوي على إنتاج الألبان بينما لا توجد علاقة بين استهلاك الألبان ومستوى التعليم في المشروع. لا يوجد تأثير معنوي بين حجم الحيازة وإنتاج واستهلاك الألبان ، كما و لا يعتمد إنتاج واستهلاك الألبان على الجنس.