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THE ROLE OF LIVESTOCK PRODUCTION ON FOOD SECURITY IN SUDAN: RURAL WHITE NILE STATE

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ABSTRACT: *Food security status is determined by the combination of aggregate food availability, household food access and utilization. In Sudan, given climate extremes and insecurity, food availability is a crucial component of household food security status. Communities that rely on raising livestock are most vulnerable to hunger when drought or other disaster strikes. The general objective of this study was to assess the role of livestock production on food security in the White Nile State. Specifically it aims to identify the main factors that may be responsible for food insecurity among livestock producers. It also attempts to identify the livestock conditions in the region. The study was depends on primary data collected during 2009/2010. Statistical tools of data analysis are implemented focusing on correlation analysis and food security indicators. The SPSS (1983) and Excel software programs are used for data analysis. The study results show that majority of the surveyed animal producers are illiterate, and landless. It also indicates that there was instability in food security using the coefficient of variation of producers' income (CV) as a proxy for food consumption. There was positive correlation between education level, food availability and accessibility. Furthermore, the food utilization was significantly affected by family size and number of males in the households and it is significantly affected by milk production and animal selling in the region*.

Keywords: *Food Security, Livestock, Socioeconomic factors, Sudan*

ORIGINAL ARTICLE

INTRODUCTION

The livestock sector is extremely important to the livelihoods of many developing countries households, and in many areas it also plays an important cultural role. For instance, it has been estimated by the World Bank (2008) that around 10% of the population of Sub-Saharan Africa is primarily dependent on their livestock whereas another 58% depend to varying degrees on their livestock (Ziervogel, et al., 2006). In Sudan an approximately 30% of Sudan's total population rear livestock and it's contributed as 46% from the share of agriculture growth domestic product (Sudan Bank, 2009). Beside there is traditional conflict between pastoralists and agriculturalists (Elzaki, 2005) and this is normally threatened by changes in agricultural practices (WFP, 2006). The expansion of farming into livestock migration routes is also a source of conflict between farmers and herders.

Food security is a major or central objective of food and agriculture development policies in Sudan. During the 1970s Sudan has probably done more to develop its agriculture, many projects were carried to boost agriculture development and achieving food security and poverty reduction (GNU, 2010). In the 1990s, a policy of self sufficiency is reflected in increasing area under sorghum and wheat production in the irrigated scheme (Mubarak et al., 2011). This is also supported with promotion of the recommended technological packages and supply of inputs and credit by banks.

One of three Sudanese suffered from food deprivation in 2009, based on the 2009 Sudan NBHS data. The prevalence of undernourishment was 31 and 34 % for the urban and rural populations, respectively (NBHS, 2009). The depth of hunger, which refers to the amount of daily dietary energy consumption per person required by the undernourished population to reach the minimum dietary energy requirement, was 344 Kcal at the national level and 343 and 344 Kcal in urban and rural areas, respectively. Inequality, as measured by the (CV) of daily dietary energy consumption due to income were similar for urban and rural populations, 31.2 and 32.2 % respectively;

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however, it was higher in male than in female headed households, 35.1 and 29.6 percent, respectively (Ministry of Agriculture, 2010).

Research justifications and goals

Food insecurity problems in Rural Sudan regions are largely due to drought, poor soil fertility, weak market infrastructure and poor access to farm inputs (e.g., fertilizers). In most rural areas there are shortage of poultry products and dramatically increasing cost of food items. Communities that rely on raising livestock are most vulnerable to hunger when drought or other disaster strikes e.g. White Nile. Drought has been critical in increasing the number of animal death in the region. The animal producers in the White Nile are exposed to unexpected disasters of natural changes of climate, spread of diseases and lack of the resources and capability. In addition, lowering productivity e.g., internal parasites, trypanosomes, brucellosis, tuberculosis, hemorrhagic septicemia, anthrax, black quarter, and malnutrition. Livestock rising was overwhelmingly in the traditional sector, and, although initial steps had been taken to improve productivity and develop market orientation for the modern monetized economy, the sector represented largely a potential asset.

In spite of the great potential of livestock and Sudan's self-sufficiency in meat and other livestock products, the following summarized constraints on production are important:

- Overgrazing in some areas, particularly around settlements, while vast areas are under-grazed because of lack of water for the animals.

- The great distances those animals often have to walk from water points to graze; lack of infrastructure and market access.

- Prevalence of disease, poor veterinary services and poor husbandry.

- Inefficient utilization of crop residues, including poor integration of livestock in the rotation of acacia (A. Senegal) and arable crops and lack of processing of feeds and export of by-products

The general goal of this research is to study the influence of selected demographic and socio-economic characteristics of the animal producers on food security and to assess the role of livestock production on food security in Sudan. The precise goals of this study are as follows:

1. To address the main factors that may be responsible for food insecurity creation or intensification related to livestock production.
2. To illustrate the livestock conditions in the rural areas.
3. To examine the role that livestock play in food security in rural areas

MATERIALS AND METHODS

Data Sources and Sampling

This study was conducted in the White Nile State in central Sudan. The State was divided into southern and northern regions where the livestock was concentrated, since these regions are most vulnerable and wealthy in livestock. One province within each of these regions, are selected according to vulnerability and importance of livestock production on the livelihood of the farm households. The study is focusing on the rural areas of the State. Data employed in study is collected by using structural questionnaire from the Household Budget Survey carried out by the researchers during the period 2009- 2010. This survey is based on the sampling method which allows for the generalization of the results to the whole population of households within a margin of an error. The data from household budget survey covered information on households representing:

- Information about the household demographic and socio-economic attributes of the households (e.g. age, employment patterns, and educational attainments)
- Inputs and output items from the livestock and agricultural activities and Livestock information (e.g. compositions, prices, production and consumption pattern, diseases as well as marketing and livestock income aspects).
- Food security indicators.

Additionally supported secondary data related to the study is collected.

ANALYTICAL METHODS OF DATA ANALYSIS

Simple Analysis

The study used different methods to achieve it stated objectives. These include descriptive analysis and rank matrix correlation analysis. The collected data was subjected to statistical analysis programs in the SPSS (1983) and Microsoft offices Excel 2003.

Instability of food security

The instability of food security for livestock producers in the White Nile in this study is measured by variation in their income. The income of livestock producers is used as it is a good indicator of the relative purchasing power of people to buy food and have access to other resources. Accordingly, the coefficient of variation of producers' income (CV) is used as a proxy for food consumption variability as follows:

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CV = (Qta – Qtt / Qtt)) / 100,
Where:
Qta = actual income,
Qtt = trend level income.
A higher value indicates higher instability in food consumption and thus higher instability in food security.

RESULTS AND DISCUSSION

The influence of the dietary protein level on feed intake, weight gain and feed efficiency is shown in table Table 2. Feed intake increased with increasing protein levels of 16% and 18 % crude protein respectively.

Association of Socioeconomic, Biophysical Characterization and Food Security in the White Nile State

The predominant socioeconomic grouping in the State is consists of a mix of agro-pastoralists and transhumant who are extremely vulnerable to drought. In the case study sites, the two major forms of agricultural production are arable farming and pastoralism. The surveyed results show that households in the Nile State community consist of large compound houses headed by male (95%) and 5% of the household headed by female. The mean of the household headed age is 52 years with the mean of the family size of the animal producers is 8 members and this is normal in rural Sudan as quoted by many researchers. The results also indicate that more than half of the animal producers do not received education (55.7%). About 63% of the animal producers have no other secondary occupation beside the farming occupation.

Naturally the food availability is significantly affected by food access and utilization. Availability of livestock products contributes 7-16 percent in daily diet of rural people (Khan and Gill, 2009). In this study the availability of the livestock products estimates 5-10% in the common daily diet of rural households. Additionally the rural households who have livestock in dairy farming may have good food availability (Kassa, et. al., 2002).

As observed in Table 1, there is positive correlation between education level and food availability and the food access have a negative impact on secondary occupation. Furthermore the food utilization is significantly affected by the family size and number of males in the households. The result also was shown instability in food security indicated by the coefficient of variation (3.4%).

Livestock Conditions and Food Security in the White Nile State

In general the livestock provides an important source of farm income to the people of this State. Cattle, sheep, goats and camels constitute the animal wealth in the area. Milk and cheese- making are providing food and source of income generation. Natural pastures and sugar cane supplemented by concentrates provide the animal feed in the State.

The field crops can provide food when rains are good, but it is not uncommon for whole crops to fail when the rain is insufficient and irregular. Animal producers who produce surplus are able to sell some of their vegetables, but marketing is a key constraint, and there are not big consistent markets. Animal producers reported strong increases in small ruminant and cattle populations and declines in traveling and draft animals.

Table 2 shows that the majority of animal producers in the State owned goats (62.3%) which named in various literatures are poor household animal. A few proportions of the animal producers are kept horses (3%) and camels (5.7%). Most of the farmers owned donkey (63%). The total livestock population of the surveyed regions is 31244 heads. 5.7 % of the animal producers owned the cross breed of animal and those cross breed are cows while 64.3 % of the animal producers owned the indigenous breed for all types of the animals. 44.3 % of the animal producers kept their animals in fences in home side. The fences are mainly constructed from the crops residues and wild shrubs. One percentage of the animal producers kept their animal inside home. Throughout droughts months and during the rainy season they send their animal to natural pasture with shepherd management. The remainder (54.7%) of the animal producers kept their animal in natural pasture near their villages under the household head and/or under one of the family members and shepherd management.

The average of the milk production per week is 11.6 Kg form sheep, 21.5 Kg from cattle, 7.9 Kg from goats and 9.15 Kg from camels. Normally no milk gets from donkeys and horses. The most of milk production are consumed in houses or contribution with their relatives those who have no milk product. The camels milk are used for medicinal issues, the households headed believe that is treated some infection (e.g. childhood diseases), contaminated (e.g. diarrhea) and chronic diseases (e.g. diabetes mellitus and hypertension).

All the surveyed producers indicate that various diseases are affecting their animal during the surveyed period. A few proportions of the animal producers (4.3%) calling the veterinarian doctor to village for treatment of their sickness animal, and they pay for him high fees than usual when they contact to veterinary offices. 8.3% of the animal producers get the medicines from the villages, that some producers who have experts in animal diseases they trade the medicines for others with prices some extra higher than the veterinary pharmacy in the town. While majority of the animal producers (86%) get the medicines from neighboring town.

Some animal producers (17.7%) sold their animals inside villages for urgent issues. While majority of them (76%) sold their animals outside village mainly in big and famous markets of animal in the towns and at this cases some

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time they obligated to travel along distances to catch these markets for high prices and some animal unable to reach healthy. The famous marketing towns in the region are *Getina, Kosti and Gaballen*.

Table 1 - Rank matrix correlation of the socioeconomic factors and food security factors in the while Nile state

item	Sex	Age	EL	MS	SO	FS	NM	NF	FV	FA	FU
1. Sex											
Pearson Correlation	1	-0.005	-0.006	0.220**	0.223**	-0.103	-0.148*	-0.163	0.087	-0.095	0.111
Sig. (2-tailed)	-	-0.005	0.924	0.000	0.000	0.075	0.010	0.284	0.135	0.102	0.084
2. Age											
Pearson Correlation	-0.005	1	-0.323**	-.308**	-0.085	0.264**	0.286**	0.105	-0.024	0.082	0.098
Sig. (2-tailed)	0.933	-	0.000	0.000	0.144	0.000	0.000	0.076	0.676	0.157	0.127
3.EL											
Pearson Correlation	-0.006	-0.323**	1	0.077	0.056	-0.086	-0.116*	-0.074	0.166**	-0.077	-0.014
Sig. (2-tailed)	0.924	0.000	-	0.184	0.334	0.136	0.046	0.210	0.004	0.185	0.823
4. MS											
Pearson Correlation	0.220*	-0.308**	0.077	1	0.124*	-0.336**	-0.261**	-0.159**	-.143*	0.004	-0.144*
Sig. (2-tailed	0.000	0.000	0.184	-	0.031	0.000	0.000	0.007	.014	0.945	0.025
5. SO											
Pearson Correlation	0.233**	-0.085	0.056	0.124*	1	-0.143*	-0.081	-0.147*	0.059	-.303**	0.073
Sig. (2-tailed)	0.000	0.144	0.334	0.031	-	0.013	0.166	0.013	0.313	.000	0.256
6.FS											
Pearson Correlation	-0.103	0.264**	-0.086	-0.336**	-0.143*	1	0.749**	.876**	0.100	0.099	0.134*
Sig. (2-tailed)	0.075	0.000	0.138	0.000	0.013	-	0.000	0.000	0.086	0.088	0.037
7. NM											
Pearson Correlation	-0.148*	0.286**	-0.116*	-0.261**	-0.081	0.749**	1	0.363**	.021	0.062	0.151*
Sig. (2-tailed)	0.010	0.000	0.046	0.000	0.166	0.000	-	0.000	.721	0.286	0.019
8. NF											
Pearson Correlation	0.-063	0.105	-0.074	-0.159**	-0.147*	0.076**	0.363**	1	0.086	0.111	0.083
Sig. (2-tailed)	0.284	0.076	0.210	0.007	0.013	0.000	0.000	-	0.151	0.062	0.234
9. FV											
Pearson Correlation	0.087	-0.024	0.166**	-0.143*	0.059	0.100	0.021	0.086	1	-0.347**	0.335**
Sig. (2-tailed)	0.135	0.676	0.004	0.014	0.313	0.086	0.721	0.151	-	0.000	0.000
10. FA											
Pearson Correlation	-0.095	0.082	-0.077	0.004	-0.303**	0.099	0.062	0.111	-0.347**	1	-0.327**
Sig. (2-tailed)	0.297	0.157	0.185	0.945	0.000	0.088	0.286	0.062	0.000	-	0.000
11. FU						.					
Pearson Correlation	0.111	0.098	-0.014	-0.144*	0.073	0.134*	0.151*	0.083	0.335**	-0.327**	1
Sig. (2-tailed)	0.084	0.243	0.823	0.025	0.526	0.037	0.019	0.207	0.000	0.000	-

Source: Authors calculation, 2009/2010. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Note: EL= education level, MS = marital status, SO= secondary occupation, FS = family size, NM= number of male, NF= number of female, FV= food availability, FA= food access, FU= food utilization.

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Table 2: Livestock in the White Nile State

Livestock Types	Owned (%)	Mean owned	Population (Head)	Mean no. of male sold	Average price of male in SDP	Mean no. of female sold	Average price of female in SDP
Camel	5.7	11.8	200	5.6	1871.4	13	1789
Cattle	55.7	32.6	5454	7	632	29	909.5
Sheep	43.7	82.1	10667	27.2	193.7	69.2	169.7
Goats	62.3	41.7	7806	17.5	135.4	31.5	141.7
Donkey	63	1.8	343	7.5	451	1.6	365.2
Horses	3	1.4	13	1	578.7	1	1800
Poultry	28.3	79.5	6761	7	52	13	51

Source: Field survey, 2009/2010.

It clears that from Table 3 the food security factors (food utilization) are significantly affected by milk production and animal selling in the region. Additionally the milk produced from goat and animal selling are negatively affected by food access and positively affected by food availability. Molden (2008) indicated that for enhancing income and food security, livestock play a big role in livelihood strategies for 70% of the world's rural

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poor. In the White Nile State the livestock contributed about 30% of the total income of the household. Also this result in confirmed by Elzaki (2005), she reported that the livestock contributed about the 36% of the total income in the irrigated areas in Sudan.

Table 3- Rank matrix correlation of the food security factors, milk production and live animal selling in the while nile state

Item	CMP	SMP	GMP	LAS	FV	FA	FU
1. CMP							
Pearson Correlation	1	0. 322*	0.060	0.180	0.002	-0.036	0.198*
Sig. (2-tailed)	-	0.026	0.665	0.130	0.983	0.707	0.049
2. SMP							
Pearson Correlation	0.322*	1	0.585**	0.381**	-0.034	-0.195	0.298**
Sig. (2-tailed)	0.026	-	0.000	0.002	0.755	0.067	0.007
3.GMP							
Pearson Correlation	0.060	0.585**	1	0.393**	0.353**	-0.327**	0.501**
Sig. (2-tailed)	0.665	0.000	-	0.001	0.000	0.000	0.000
4. LAS							
Pearson Correlation	0.180	0.381**	0.393**	1	0.266**	-0.377**	0.643**
Sig. (2-tailed	0.130	0.002	0.001	-	0.001	0.000	0.000
5. FV							
Pearson Correlation	0.002	-0.034	0.353**	0.266**	1	-0.347**	0.335**
Sig. (2-tailed)	0.983	0.755	0.000	0.001	-	0.000	0.000
6.FA							
Pearson Correlation	-0.036	-0.195	-0.327**	-0.377**	-0.347**	1	-0.327**
Sig. (2-tailed)	0.707	0.067	0.000	0.000	0.000	-	0.000
7. FU							
Pearson Correlation	0.198*	0.298**	0.501**	0.643**	0.335**	-0.327**	1
Sig. (2-tailed)	0.049	0.007	0.000	0.000	0.000	0.000	-

Source: Authors calculation, 2009/2010. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Note: CMP = Cattle milk production, SMP= Sheep milk production, GMP = Goat milk production, LAS = Live animal selling, FV= food availability, FA= food access, FU= food utilization.

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