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Characterization of Camel Milk Marketing and Opportunity for Market Orientation in East and Central of Sudan

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Abstract: ***This study was conducted at states of Red Sea, Kasala, Gadarif, Gezira and Khartoum- in the Sudan. The study was based on well designed questionnaires to obtain information on camel milk marketing using complete random design. A total of 376 questionnaires were filled during meeting with the (camel owners, camel milk consumers and camel salesmen) through field visits at production areas and sell points of the camel milk. Result revealed that most of the camel owners 68.7% in the studied states do not sold the camel milk while, 27.6% of the owners sold the camel milk. The majority of the respondent owners (68.3%) stated that they do not sold camel milk because of the restricted tradition and customs of their societies. More than half of the respondent owners (57.9%) stated that they sold 75% of their camel milk yield. Result reported that the amount of camel milk purchased by salesmen were very few, however, the daily ratio of camel milk purchased between 10 – 20 kg was 73.8%. Moreover, The purchase price of a liter of camel milk ranged from 2 to 20 SDGs. Additionally, the daily sold amount of camel milk ranged between 5 - to 40 kg. The sold amount of camel milk between 10 – 20 kg ranked at the percentage of 65.9%, while, the sold amount between 5 – 10 kg ranked third by 28.9%. Small proportion of respondent salesmen (5.2%) reported that they daily sold between 20 – 40 kg of camel milk products. Concerning the constraints facing camel milk distribution, most of salesmen (79.3%) stated that the high selling Prices was one of the major obstacles limiting the distribution of camel milk in the study area, followed by the limited camel milk processing (81.6%), then came the limiting of demand (55.3%), while the limiting of profits and Taxation fees (23.7.4% and 5.3%, respectively came last.***

Keywords: Camel, milk, marketing, distribution, Sudan

1. Introduction

Market orientation of the agricultural production system would secure food supply to the rapidly growing non-farming community, create employment opportunities and promote economic development in rural societies. Marketing service is critical to rural as well as to urban food security [10]. Commercialization of camel milk is expanding and increasingly represents a vital asset to ensure food security and promote the socio-economic development of a larger number of pastoral households. The camel milk trade shows a high degree of complexity, flexibility and effectiveness. It is complex as it involves a variety of agents, interests and relationships that continuously remold over time. It is flexible as it has to change through seasons, and adapt to a variety of uncertain conditions (e.g. erratic rainfall or insecurity). It efficiently serves a variety of different needs and interests on a continuous basis ([4]. Recently, camel milk has also found potential markets in large cities. Many pasteurization plants and units have been established by private sector. Examples for that are in Nouakchott and Nouadhibou in Mauritania, Laayoune in southern Morocco, Riyadh in Saudi Arabia and El Ain in the United Arab Emirates. The success achieved by Tiviski camel dairy plant in Mauritania over the past 15 years, highlights the commercialization possibilities for camel milk. The opportunity for increasing incomes of rural poor through the fulfillment of a growing demand for camel milk products is evident but requires further investigation. Therefore, the objective of this study is to consolidate existing knowledge and deepen understanding of camel milk marketing potentials and constraints to increasing incomes of the poor herders in east and central Sudan.

2. Material and Methods

2.1. Description of the Study Area

This study was conducted at states of Red Sea, Kasala, Gadarif, Gezira and Khartoum- in the Sudan.Butana plain is a semiarid clay region, which encompasses part of the present Kassala, Gedaref, Gezira, River Nile, Blue Nile, Sennar and Khartoum States. It lies between Latitude 13 40' and 17 50' North and Longitude 32 40' and 36 00' East. It is bound by the Main River Nile on its northwestern border, the Blue Nile on its southwestern edge, the Atbara River in the northeast and by the railway connecting Kassala and Sennar in the south [3].

2.2. Methodology

This study was carried out during May, 2015. The study was based on well designed questionnaires to obtain information on camel milk marketing using complete random design. A total of 376 questionnaires were filled during meeting with the (camel owners, camel milk consumers and camel salesmen) through field visits at production areas and sell points of the camel milk. Some of the information collected during interview probably supported by observations. Before initiating the survey, the questionnaires were developed and

pre-tested in the field. The filled questionnaires were reviewed in the field by the survey team before proceeding to data entry. The entered data were checked for errors and consistency before undertaking analysis.

2.3 Statistical Analysis

To give sense out of the data collected different statistical tools were employed based on the available data obtained. The computer software Excel was used for data managing and the data were analyzed with SPPS version 21 software. Simple descriptive statistics such as mean, range and percentages were used.

3. Results

3.1. Marketing of camels

3.2. The marketing of camels during the season of the study:

It was noted that the highest percentage (63%) of camel marketed during the season of the study were between 1 – 5 head followed by (13%) marketed amount ranging between 16 – 20 head, then those ranged between 6 – 10 head (11%), then, 9.2% to those ranged between 11 – 15 head and the lowest (3.8%) amount marketed in order for slaughtering or for breeding purposes (Table 1).

Table 1: Camels sold during the study period:

Numbers of Camel sold	State				
	Red Sea	Kassala	Gedarif	Gezira	Percent
1 – 5	90%	26.9%	48.1%	87.1%	63%
6 – 10	3.4%	15.4%	22.2%	3.2%	11%
11 – 15	3.3%	7.7%	25.9%	0%	9.2%
16 – 20	3.3%	42.3%	0%	6.5%	13%
Above 21	0%	7.7%	3.8%	3.2%	3.8%
Total	100%	100%	100%	100%	100%

3.3. Seasons of camel selling

Result revealed that, winter and summer together were the most preferred seasons for camel marketing (Table 2).

Table 2: Seasons of camel selling:

Marketing seasons	State				
	Red Sea	Kassala	Gedarif	Gezira	Percent
Autumn	16.7%	19.2%	0%	9.7%	11.4%
Winter	66.7%	34.6%	63%	12.9%	44.3%
Summer	16.6%	46.2%	37%	77.4%	44.3%
Total	100%	100%	100%	100%	100%

3.4. Investment in camel:

3.4.1. Investment intention

High percentage of the surveyed owners (92%) stated that they had a desire to invest more in the scope of camel breeding and production, while (8%) of the owners had no desire to invest (Table 3).

Table 3: Investment desires:

Investment	State				
	Red Sea	Kassala	Gedarif	Gezira	Percent
Yes	96.7%	73.1%	100%	96.8%	92%
No	3.3%	26.9%	0%	3.2%	8%
Total	100%	100%	100%	100%	100%

3.4.2. Reasons for investment

Highly percentage of respondent owners (96.6%) revealed that they had a desire to invest in order to increase income, while, 3.4% of the owners they had to increase the productivity of camel (Table 4).

Table 4: Reasons of investment

Reasons of investment	State				
	Red Sea	Kassala	Gedarif	Gezira	Percent
Increasing income	93.3%	96.2%	100%	96.8%	96.6%
Increasing production	6.7%	3.8%	0%	3.2%	3.4%
Total	100%	100%	100%	100%	100%

3.4.3. Sources of financial investment:

Most of the surveyed owners (61.3%) revealed that they had the ability to self financed their camel productivity process, followed by 21.2% for (rural development programs and foundations), then 14.8 for banking opportunity, additionally (2.7%) for partnership investments (Table 5).

Table 5: Sources of financial investment:

Financial investment Sources	State				
	Red Sea	Kassala	Gedarif	Gezira	Percent
Self financed	83.3%	76.9%	81.5%	3.2%	61.3%
Banking loans	6.7%	3.8%	3.7%	45.2%	14.8%
Development foundations	3.3%	3.8%	11.1%	6.5%	6.2%
Rural development	6.7%	7.7%	3.7%	41.9%	15%
Partnership	0%	7.8%	0%	3.2%	2.7%
Total	100%	100%	100%	100%	100%

3.5. Marketing of camel milk

3.5.1. Do you sell the camel milk?

The majority of the camel owners 68.7% in the studied states do not sold the camel milk while, 27.6% of the owners sold the camel milk (Table 6).

Table 6: Do you sold the camel milk?

Sold	State				
	Red Sea	Kassala	Gedarif	Gezira	Percent
Never	13.3%	61.5%	100%	100%	68.7
Sometimes	3.3%	11.5%	0%	0%	3.7%
Usually	83.4%	27%	0%	0%	27.6%
Total	100%	100%	100%	100%	100%

3.5.2. Reasons of not sold camel milk:

The majority of the respondent owners (68.3%) stated that they do not sold camel milk because of the restricted tradition and customs of their societies, followed by 27.6% for reason that, the income attained from selling of camel milk products do not covered the production cost, while, small proportion of the interviewed owners (4.1%) referred that to the problems of marketing camel milk products (Table 7).

Table 7: Reasons of not sold camel milk:

Reasons of not sold milk	State				
	Red Sea	Kassala	Gedarif	Gezira	Percent
Traditions	0%	73.1%	100%	100%	68.3%
Not covered the Production cost	83.7%	26.9%	0%	0%	27.6%
No marketing	16.7%	0%	0%	0%	4.1%
Total	100%	100%	100%	100%	100%

3.5.3. Ratios of camel milk selling:

The majority of the respondent owners (57.9%) stated that they sold 75% of their camel milk yield, followed by 30.8% sold their entire milk produced, while, small proportion of the interviewed owners (11.3%) sold half of camel milk produced (Table 8).

Table 8: Ratios of camel milk sold:

Ratios (%) of Milk sold	State				
	Red Sea	Kassala	Gedarif	Gezira	Percent
25	0%	0%	0%	0%	0%
50	11.5%	11.1%	0%	0%	11.3%
75	27%	88.9%	0%	0%	57.9%
100	61.5%	0%	0%	0%	30.8%
Total	100%	100%	100%	100%	100%

3.5.4. Prices of one litter of camel milk in Sudanese pound (SDG) during 2015

The purchase price of a liter of camel milk ranged from 2 to 20 SDGs. The purchase price of 8 - 15 SDGs constituted 92.8% of answers of the surveyed consumers (Table 9).

Table 9: Prices of one litter of camel milk in SDG during last 2014:

Price (SDG)	State					
	Red Sea	Kassala	Gedarif	Gezira	Khartoum	Percent
2	2%	0%	0%	0%	0%	0.4%
6	2%	7.4%	0%	0%	0%	1.9%
8	46.9%	33.3%	0%	2%	0%	16.4%
10	34.7%	48.1%	2%	20%	6.1%	22.2%
12	10.2%	3.7%	0%	64%	28.6%	21.3%
14	4.2%	7.5%	87.8%	14%	6.1%	23.9%
15	0%	0%	0%	0%	44.9%	9%
16	0%	0%	10.2%	0%	10.2%	4.1%
20	0%	0%	0%	0%	4.1%	0.8%
Total	100%	100%	100%	100%	100%	100%

3.5.5. Market prices evaluation of one liter of camel milk (SDG):

Most of the surveyed consumers (52.8%) admitted that the current price of one liter of camel milk was expensive, while 22.8% of the respondents indicated that the current price for one liter of camel milk was reasonable, and 17.2% of surveyed people indicated that the current price was very high, and 7.2% of them mentioned that the current price for one liter of camel milk was low (Table 10).

Table 10: Market prices evaluation of one liter of camel milk (SDG):

Prices evaluation	State					
	Red Sea	Kassala	Gedarif	Gezira	Khartoum	Percent
Low	10.2%	19.5%	4.1%	2%	0%	7.2%
Reasonable	49%	24.2%	22.4%	6%	12.2%	22.8%
High	36.7%	52.3%	73.5%	22%	79.6%	52.8%
Very high	4.1%	4%	0%	70%	8.2%	17.2%
Total	100%	100%	100%	100%	100%	100%

3.6. Salesmen of camel milk

3.6.1. Salesmen seniority of camel milk selling

High percentage of respondent owners in Khartoum state (44.7%) confirmed that they were working in the process of camel milk selling since less than 2 years ago, followed by the owners (31.6%) of less than 1 year ago, then followed by (18.4%) for seller that had been working for more than 3 years, while, a small proportion of the seller (5.3%) had newly adopted the process of camel milk selling since less than 3years ago (Table 11).

Table 11: Salesmen seniority of camel milk selling in Khartoum state:

Duration of camel milk marketing	Khartoum state
Less than 1 year	31.6%
Less than 2 years	44.7%
Less than 3 years	5.3%
More than 3 years	18.4%
Total	100%

3.6.2. Assistant labors for camel milk selling process

High percentage of respondent sellers (84.2%) in Khartoum state revealed that they did not had relative assistant labors, while, the study showed that 15.8% of the herders were assistant labors included son, brother and father (Table 12).

Table 12: Assistant labors for camel milk selling process:

Assistant labors	Khartoum state
Relatives	15.8%
Not relative	84.2%
Total	100%

3.6.3. Camel milk wholesale Providers:

The interviewed sellers (71.1%) stated that they bought their whole allowances of camel milk directly from the owners, and, (28.9%) of the surveyed seller bought from general mobile (Table 13). There were no collaborated societies or conveying companies work in scope of camel production and marketing process.

Table 13: Camel milk wholesale Providers

Wholesale Providers	Khartoum state
Direct from the owner	71.1%
Mobile bought	28.9%
Collaborated societies	0%
Conveying companies	0%
Total	100%

3.6.4. The daily amounts of camel milk purchased by salesmen (kg):

As shown in (Table 14), the amount of camel milk purchased by salesmen were very few, however, the daily ratio of camel milk purchased between 10 – 20 kg was 73.8%.

Table 14: The daily amounts of camel milk purchased by salesmen (kg):

Amounts purchased in (kg)	Khartoum state
10	18.4%
14	2.6%
15	13.4%
18	2.6%
20	36.8%

25	2.6%
30	7.9%
36	2.6%
40	2.6%
50	2.6%
60	2.6%
70	5.3%
Total	100%

3.6.5. Types of milk products sold by salesmen in Khartoum state

Table (15) showed that the targeted group responded stated that they sold more than one type of milk, and in general, the proportion of 89.5% of the targeted salesmen sold fresh milk, followed by proportion of 28.9% of the respondents salesmen sold fermented camel milk, while, 2.6% of the respondent sold boiled milk.

Table 15: Types of milk products sold by salesmen in Khartoum state:

Type of milk products	State of Khartoum sample	
Fresh milk	Yes	89.5%
	No	10.5%
Boiled milk	Yes	2.6%
	No	97.4%
Fermented milk	Yes	28.9%
	No	71.1%

3.6.6. The daily sold amounts of camel milk (kg):

The majority of daily sold amount of camel milk ranged between 5 - to 40 kg. The sold amount of camel milk between 10 – 20 kg ranked at the percentage of 65.9%, while, the sold amount between 5 – 10 kg ranked third by 28.9%. Small proportion of respondent salesmen (5.2%) reported that they daily sold between 20 – 40 kg of camel milk products (Table 16).

Table 16: The daily sold amounts of camel milk (kg) in Khartoum state

Daily sold amounts of camel milk (kg)	Khartoum state
5	18.4%
6	5.3%
7	2.6%
8	2.6%
10	47.5%
12	2.6%
15	5.3%
20	10.5%
25	2.6%
40	2.6%
Total	100%

3.6.7. The purchasing rate prices of one kilogram of camel milk in Sudanese pound (SDG)

The purchase price of a liter of milk ranged from 8 to 20 Sudanese pounds which was a wide range. The purchase price of 15 Sudanese pounds constituted 73.7% of the surveyed consumers and the purchase price of 8 Sudanese pounds ranked second by 13.2% while, the price at 12 Sudanese pounds was third at 5.3%, and the price of 9, 16 and 20 Sudanese pounds were at 2.6 (Table 17).

Table 17: The purchasing rate prices of one kilogram of camel milk in Sudanese pound (SDG) in Khartoum state

Daily prices of one kilogram of camel milk	As % from total in Khartoum state
8	13.2%
9	2.6%
12	5.3%
15	73.7%
16	2.6%
20	2.6%
Total	100%

3.6.8. Claiming medical benefits of camel milk

More than half of interviewed salesmen (52.6%) stated that, they promoted camel milk as to gain new customers, while, 21.1% of them promoted milk as to compensate the lost customers. While, 26.3% of salesmen confirmed that, they had no need to promote because they had permanent customers already knew the benefits of camel milk (Table 18).

Table 18: Promoting medical benefits of camel milk:

Promoting	Khartoum state %
Yes, to gain new customers	52.6%
Yes, to compensate lost customers	21.1%
No, I have permanent customers	26.3%
Total	100%

3.6.9. Constraints facing camel milk distribution

Most of salesmen (79.3%) stated that the high selling Prices was one of the major obstacles limiting the distribution of camel milk in the study area, followed by the limited camel milk processing (81.6%), then came the limiting of demand (55.3%), while the limiting of profits and Taxation fees (23.7.4% and 5.3%, respectively came last (Table 19).

Table 19: Constraints facing camel milk distribution

Constraints	Khartoum State %	
Limited of camel milk processing	Yes	81.6%
	No	18.4%
Reduction of selling Prices	Yes	97.3%
	No	2.7%
Increasing in prices of supplied milk	Yes	42.1%
	No	57.9%
Limited demand	Yes	55.3%
	No	44.7%
Taxation and fees	Yes	5.3%
	No	94.7%
Limited profits	Yes	23.7%
	No	76.3%

4. Discussion

The camel is a dairy animal whose dairy vocation has been known for a long time, but camel dairy products have only recently integrated the market. The implementation of mini-dairy plant has been maintained for many years in spite of difficulties related to milk collection among populations in constant mobility [6]. Smallholder dairy producing units has a number of benefits to the poor families who raise these animals. Availability of highly nutritious products for home consumption by the family is a major advantage for these resource-poor and mal-nourished people. Milk and milk products supply much of the needed quality proteins, minerals and vitamins to the family. Poor rural-dwellers without livestock suffer more from nutritional deficiencies than those having livestock and they cannot afford to purchase dairy products. These deficiencies are usually more

pronounced in children and women. The presence of camels around marketing areas, while at autumn (rainy season), camels were at far away areas searching for water and grazing lands. The market integration of camel products represented the most outstanding change in recent years. This evolution does nothing but obey a general tendency on the area which under the effect of urbanization, demographic growth and progress of cash-crop agriculture, fits more and more in a globalized economy [5]. Thus, regarding camel rearing, since export of live animals toward Egypt and Libya had been a common activity for a long time, the increase in camel meat demand on other markets stimulated mainly informal but efficient trade-circuits. In the absence of well-developed marketing infra- structure and resources (transport cost, etc.), the herders prefer to dispose off their camels at the village level, because it was uneconomical for a producer to take one or a few animals for a long distance market and the producer would sell his animals as per his occasional cash needs. The situation encourages middlemen to travel as buyers of camels and camel products and make personal contacts with herders. Producers were generally at a bargaining disadvantage because middlemen had a wider experience and more knowledge of stock market conditions. Middlemen in mountainous areas were reported to make a profit as high as 35 to 40% and it was in reality a big loss to the producer [9]. The price of a male camel depends on its health status, quality and milking capacity for she-camel. The limited sold amount of camel milk may be attributed to shortage and unavailability of camel milk in the market[8]. Most of the consumers agreed that the current prices of milk and milk products, were high, this might be attributed to that milk being perishable and demand being high for urban consumption in addition to camel milk product marketing was limited by the distance of the market from producers, lack of transport facility, and seasonal variation in the volume of milk production which led to increase prices. Seasonal price fluctuations and consumer interference in price setting were the two major factor affecting milk marketing. The problems associated with traditionally managed milk groups needed be studied and solutions need to be sought to make them more efficient and effective. Camel milk products sold directly to consumers and the rest sold to other mediators. The livestock were kept under traditional management conditions and generally obtained most of their feed from local pastures, harvest aftermath grazing and crop residues [10].The type of production system type was not market oriented and most of the milk produced is retained for home consumption [1] or household processing. Enhancing the development of stockholder milk producers to reach markets and be engaged in marketing activities pose a pressing development challenge. Difficulties in market access restricted opportunities for income generation. Remoteness resulted in reduced farm gate prices, increased input costs and lowered returns to labour and capital. That in turn, reduced incentives to participate in economic transaction and resulted in subsistent rather than market oriented production systems. In Sudan milk marketing system is not well developed. Market access in pastoral production system is a critical factor. This has resulted in difficulties of marketing fresh milk where infrastructures were extremely limited and market channel has not yet being developed. In the absence of organized rural fresh milk market, marketing in any volume is restricted to peri-urban areas. Milk being a perishable commodity and demand being high for urban consumption, efficiency in collection and transportation bulk milk from widely scattered rural sources, requires a well-defined method of preservation and distribution. This would put an impact on the amount that could be available for consumption through losses in quality [1]. Dairy product marketing is limited by the distance of the market from the producers, lack of transport facility, and seasonal variation in the volume of milk produced lead to seasonal fluctuation in prices. The scattered nature of the production units, the poor communication system and the low rate of urbanization concomitant with weak infrastructure to road facilities may not warrant the establishment of processing plants [7]. A pastoral community depends mainly on milk and milk products for its survival, and therefore, these items are not perceived to before commercial purposes. Thus it's only the households who are in a walking distance from the urban centers who sell milk and milk products to urban consumers [7] and [10]. Additionally, The lack of migratory routes for the camels when crossing the expanded and encroached agricultural schemes as well as the difficulties in marketing the camels and camel products to meet the ever increasing life expenditure are examples of the constraints experienced during the rainy season.

5. Conclusion

Owners, recently, are already starting to organize their herd management practices to orient production towards market requirements, particularly in relation to keeping the lactating herd near market or milk collection points. With efforts towards building on this trend and better organization of producers, significant milk volumes can be achieved in the immediate to short-term. But the scattered nature of the production units, the poor communication system and the low rate of urbanization concomitant with weak infrastructure to road facilities may not warrant the establishment of processing plants. With proper market development strategies,camel milk from Sudan can effectively penetrate the international health market which would make camel milk a high value commodity with sufficiently high returns to playersto justify the enormous investment resources required to get the sub-sector up and running.

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