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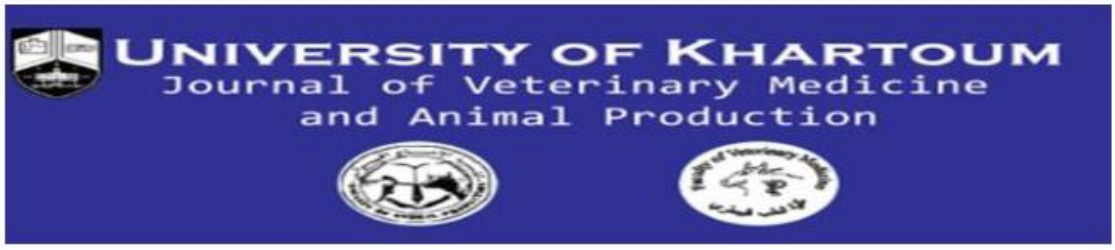

Assessment of Production and Marketing of Camel Milk in Khartoum State

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Abstract

This study aimed to investigate the economics of production and marketing of camel milk in Khartoum State, Sudan focusing on factors affecting the production and marketing of camel milk. Primary data were collected by means of a questionnaire using a stratified random sample of 30 herdsmen, 30 marketing centers and 30 consumers, selected from Khartoum State. The secondary data were collected from different related sources of information. The collected data were analyzed by descriptive statistics and budgetary analysis. Descriptive statistical analysis result revealed that the socioeconomic characteristics of the herdsmen were more or less homogenous as about 84% of the herdsman shared the same socioeconomic characteristics. The results showed that the cost of feeding constitutes the highest proportion of the total cost of milk production. Also, the results indicated that the most important factors affecting the marketing of camel milk were high milk prices (43.3% of the sample of milk consumers), remote camel milk marketing centers from consumers (40% of the sample) and low camel milk production (16.7% of the sample). Budget analysis results showed that the average total variable cost of production for camel milk was found to be about SDG 1.090 per pound. The breakeven shows that the percentage of income before taxes equals SDG 5.000 (28.1%) of total sales. The taxes percentage is calculated at 1.8%. Hence the net income percentage is 26.4%, which equals SDG 4.910. The result revealed that the business was profitable at camel milk producers' level in Khartoum State. The quantity of milk that should be produced to recover the cost for each she camel is calculated according to the same formula is 1.09 pounds. The study recommended availing extension services and feed concentrate rations for camel milk producers, increasing the number and locations of camel milk selling centers and increasing the awareness of the consumers on the medicinal and nutritional values of camel milk.

Key words: Camel Milk, Economic, Production

المستخلص

هدفت الدراسة إلى معرفة اقتصاديات إنتاج و تسويق لبن الابل في ولاية الخرطوم، مع التركيز على العوامل التي تؤثر على إنتاج لبن الإبل وتسويقه وربحيته. واعتمدت الدراسة على البيانات الأوليه التي جمعت من الرعاة ومراكز التسويق والمستهلكين في ولاية الخرطوم، والبيانات الثانويه من مصادر معلومات مختلفة ذات صلة. وأخضعت البيانات للتحليل الإحصائي الوصفي وتحليل الميزانية. أظهرت نتائج التحليل الإحصائي الوصفي تجانس فى الخصائص الاجتماعية والاقتصادية لرعاة الابل في ولاية الخرطوم (أكثر من 84٪ منهم يشتركون في نفس الخصائص الاجتماعية والاقتصادية). وكذلك أظهرت نتائج الدراسة أن تكلفة التغذية تشكل أعلى نسبة فى التكلفة الكلية لإنتاج لبن الابل. وكانت أهم العوامل المؤثرة على إنتاجية لبن الإبل التغذية الجيدة والإدارة الجيدة. وأهم العوامل المؤثرة على تسويق لبن الإبل هى ارتفاع اسعار لبن الابل 43.3%)من عينة المستهلكين للبن الابل)، و بعد مراكز تسويق لبن الإبل عن المستهلكين (40% من العينة المختارة) وقلة انتاج لبن الابل (16.7%من العينة المختارة). وأظهرت نتائج تحليل الميزانية أن لبن الإبل مربح (2جنيه سودانى للرطل) للرعاة، و نقطة التعادل 1.090 رطل من لبن الابل للناقة الواحدة. أوصت الدراسة بتوفير خدمات الإرشاد و توفير الاعلاف المركزة لمنتجي لبن الإبل، وزيادة عدد ومواقع مراكز تسويق لبن الإبل ورفع مستوى الوعي للمستهلكين حول الفوائد الطبية والغذائية لبن الإبل.

الكلمات المفتاحية: لبن الابل، االقتصاديات، الانتاج

Introduction

Camel milk has an important role in the nourishment of the pastoralists as it contains all the essential nutrients found in bovine milk. However, most of camel milk produced is consumed locally as it does not reach the urban markets because of many constraints (El Zubeir, 2015). Similarly, Yaqoop and Nawaz (2007) reported that most of camel milk produced in the far-off mountainous and desert areas and does not reach the urban markets. However, they added that camel milk is sold in big cities as pure milk, or mixed with milk of cows and buffaloes especially when the supply of cows and buffaloes milk does not meet the market demand. Although the concept of camel milk marketing is traditionally unaccepted among camel herders in Darfur, Sudan (Musa *et al.*, 2006), some nomadic families in Kordofan showed however, more flexibility concerning selling camel milk (Shuiep *et al.*, 2014a). El Zubeir and Nour (2006) reported that camel husbandry makes a significant contribution to the national economy in Sudan. However, they reported that it is very difficult to evaluate the economic significance of camel milk production, since almost all milk produced is to satisfy the households and herders.

Camel milk marketing relies upon networks of people and organizations (the marketing agents) entailing a variety of socio-economic activities and entertaining complex relationships, all revolving around camel milk marketing (Nori *et al.*, 2006). Ibrahem and El Zubeir (2016) concluded that sheep milk to that of camel improves the composition of yoghurt made from camel milk, which indicated the possibilities of processing and marketing of both milk especially because the health benefits of camel milk and the fermented products are well documented. Hence it is possible to commercialize camel milk from remote areas to urban consumers in both national and international markets. However, this necessitates initiation of milk collection centers and milk processing units equipped with facilities and to draw the attention of camels' herders' communities to accept marketing of their milk, which would

result in improving their lifestyle (El Zubeir, 2015).The main objective of this study is to analyze the economics of camel milk production and marketing in Khartoum State by estimating camel milk profitability using budget analysis and to recommend some measures for promotion production and marketing of camel milk in Khartoum State.

Material and methods

The study area

This study was conducted in Khartoum State. The majority of the camel herds in the state are Rashaidi, Annafi and Bushari ecotypes. Numerically, camels are not the most abundant domestic animals in Khartoum State. Khartoum has an area of 22,122 km^2 and an estimated population of approximately 7,152,102 (2008).

Climate

Khartoum features a hot desert climate, with only the months of July and August seeing significant precipitation. Khartoum averages a little over 155 millimeters (6.1 in) of precipitation per year. Based on annual mean temperatures, Khartoum is one of the hottest major cities in the world. Temperatures may exceed 53° C (127° F) in mid-summer. Its average annual high temperature is 37.1° C (99° F), with six months of the year seeing an average monthly high temperature of at least 38° C (100° F). Furthermore, none of its monthly average high temperatures falls below 30° C (86° F). Temperatures cool off considerably during the night, with Khartoum's lowest average low temperatures of the year just above 15° C (59° F).

Methods of data collection

This study was carried out during 2011/ 2012. The study was based on well-designed questionnaire to cover most of camel management, production system, consumer and marketing e.g. herd's composition and herd structure, feeding, sales and marketing. Also the data include problems that faced camel production such as diseases and quantity of the milk production. The questionnaire also covers consumers and marketing for camel milk e.g. price, quality, storage, transportation and marketing problems.

Two types of data were collected:

Primary data

Getting information from herdsmen was not easy especially from illiterate ones, therefore questionnaire was written in simple Arabic. Some questions closed with limited of possible answers and they were mostly short. Questions designed in a way for easy and quick response

Field visits

The required data was collected during several planned visits in different days during the week.

Questionnaire

Three different sets of questionnaire were distributed targeting three different samples; consumers, camel herders, traders.

Secondary data

Supportive secondary data were collected from different source such as Ministry of Animal Resources and Fisheries, etc...

Sample design

A pilot survey was conducted to identify the target population, camel milk producers and channels for selling camels milk in Khartoum State. Purposive sampling was chosen as an appropriate design for the selection of camel milk producers and channels selling camels milk. This method of selection was used to achieve a high degree of precision.

Sampling method

Traditional handling practices, preservation methods and utilization of camel milk and camel milk products by pastoralists in Khartoum State who owned camels and who are familiar with camel husbandry were selected using purposive sampling technique. The selection was based on accessibility of the willingness of the camel owners to take part in the interview. Information sought included consumption patterns, preference and therapeutic properties of camel milk, traditional products and traditional preservation methods. Milk marketing data were also collected with purposive sampling by means of another questionnaire.

A sample of 30 herdsmen, 30 marketing centers and 30 consumers was selected randomly, the sample size was distributed over the three cities proportionate to the size namely Khartoum, Khartoum North and Omdurman.

Statistical analysis

Descriptive statistical analysis for production and marketing of camel milk was used. The descriptive statistical analysis was used to explain the socioeconomic characteristics of the herdsmen.

Breakeven Analysis

There are two types of costs to consider when conducting a breakeven analysis:

Fixed costs: These are costs that are the same regardless of how many items you sell. All start-up costs, such as rent, insurance, are considered fixed costs since you have to make these outlays before you sell your first item.

Variable cost: which are items of cost change with the level of production.

Formula:

Breakeven point = fixed costs/ (unit selling price – variable costs)

This calculation will figure out how many units of a product will be needed to sell to breakeven. Once this point is reached, all costs associated with producing the product (both variable and fixed) will be recovered. The breakeven point every additional unit sold increases profit by the amount of the unit contribution margin which is defined as the amount each unit contributes to covering fixed costs and increasing profit. As an equation this is defined as:

Unit contribution margin = sales – variable costs

Results and discussion

Analysis of socio-economic characteristics of the camel milk producers

Pattern and reasons of purchasing camels milk

The results showed that the consumers buy camel milk daily (36.7%), weekly (20.0%) and biweekly (20.0%), while other (23.3%) stated that they buy it on different days for nutritional or medical purpose. Moreover, the main reason for camel milk consumption is the medical and the frequency was as follows 50% for medical, 33.3% for nutrition and 16.7% for other reasons (Table 1). This supported El Zubeir and Nour (2006) and El Zubeir (2015) who reported that currently there are increasing demands for camel milk among the urban settlers in Sudan because of the increase awareness on its medicinal values.

Quality of the camel milk product

The quality of milk is a questionable agenda quoted by respondents in three categorical levels, those who perceive it as excellent denoted 36.7%, 50.0% cited the quality as good, while the rest (13.3%) figured it out as fair quality (Table 2).

Table 1: Camels milk valuation according to target group opinion

Reasons	Percentage	Cheap	Suitable	Expensive	Very expensive
Medicine care	50	1	3	9	2
Nutrition	33.3	0	6	3	1
Others	16.7	0	4	0	1
Total	100	1 (3.3%)	13 (43.3%)	12 (40.0%)	4 (13.3%)

Source, field survey 2011/ 2012

The good keeping of camel milk is due to its longer keeping quality. The shelf life of camel's milk is longer compared to other livestock's (Kappeler *et al.*, 1999; Wernery *et al.*, 2005 and Mohamed and El Zubeir, 2014), Moreover Babiker and El Zubeir (2014) reported that cooling facilities were available at the intensive and semi/intensive camel farming systems, as the newly introduced practices indicated transitional stage towards modern dairy camel farming at the commercial basis. However, the high ambient temperature prevailing in the area coupled with lack of cooling facilities reduces the shelf life of the milk thus makes delivery of raw camel milk to the urban market not applicable (Shuiep *et al.*, 2014b). Moreover, Desta and Coppock (2003) concluded that when the economic links between rural areas and urban areas is not well developed, camel milk can't reach the urban markets in acceptable quality.

Table 2: Packaging and quality of the camel milk

	Excellent	Good	Fair or Poor
Packaging method	26.7%	60%	13.3%
Quality of camel milk	36.7%	50.0%	13.3%

Source, field survey 2011/ 2012

Marketing profile

The camels' milk marketing problems out looked by respondents showed triple sided feature, high commodity price, remote accessibility market (consumer side), and eventually low production levels with 43.3%, 40.0% and 16.7%, respectively (Figure 1). El Zubeir and Nour (2006) reported that management, reproduction, nutrition and diseases were the most encountered constraints for camel herders in Khartoum State. The results of the questionnaire showed that the majority of camel milk consumers surveyed stated that the biggest problems facing them are the high prices (43.3%) due to weak purchasing power and limited quantity produced for marketing, remote market (40.0%) due to the lack of marketing channels and their concentration in certain places and low production (16.7%) because there are no large farms and also the quality of farm species with low productivity. Similarly, Shuiep *et al.* (2014a) concluded that the semi intensive system provides urban dwellers with camel milk which has high market demand.

Nevertheless, considerable amount of milk that produced in the nomadic production system could not get to the market

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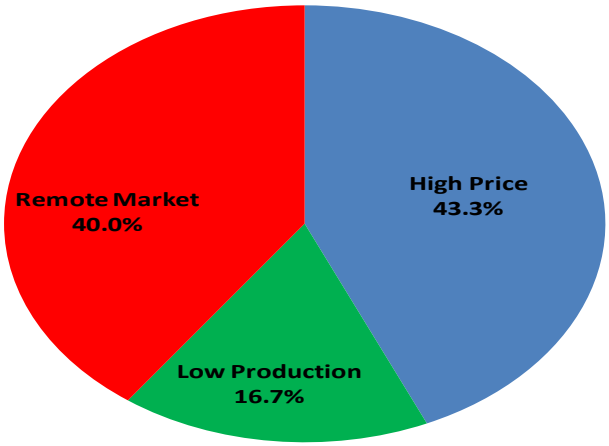
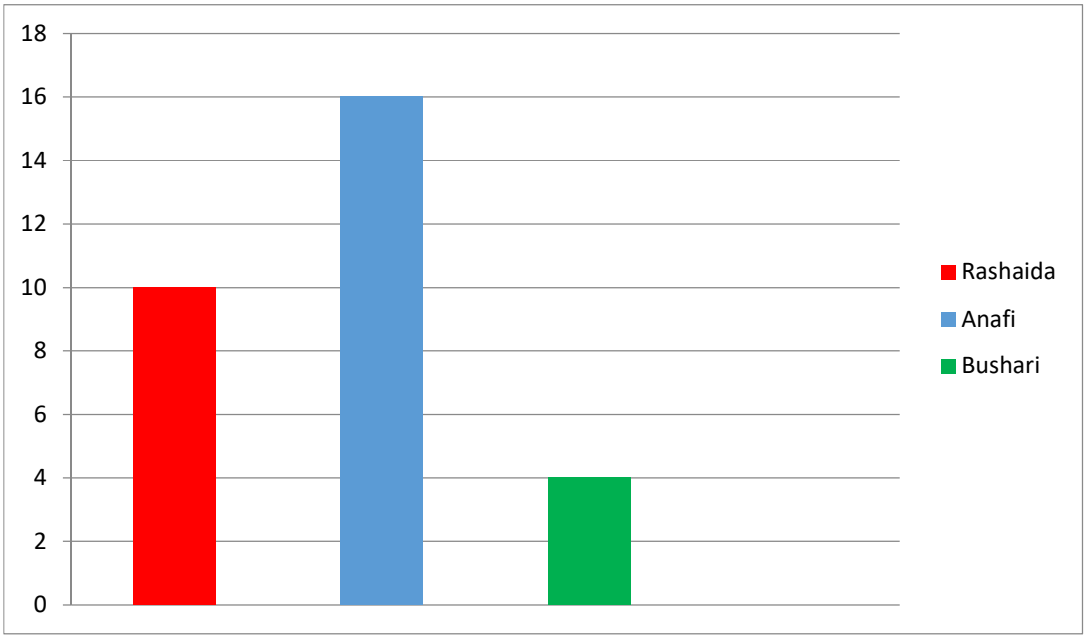


Figure (7) marketing profile

Source, field survey 2011 / 2012

Figure 1: The marketing constraints of camel milk in Khartoum StateProducers' side

The opportunity cost of investing in camels' milk production reveals that cheap camel's species are more likely to be reared for milk production, while the opposite is quite true. However, Dowelmadina *et al.* (2015) reported that the goals of keeping camels for milk production (74.3%) ranked first among the respondents in Khartoum State, followed by breeding for racing (51.4%). Beyond any doubt Bushari type is of high market value due to its usage in local and international camels racing; therefore, the sampled producers reflect the low numbers of Bushari followed by Rashayda and Annafi types according to their market value corresponding to their higher magnitude of relative advantage in other usage (Figure 2). The results showed that camel Annafi (53.3%) are more species reared in Khartoum was Rashaida (33.3%) and Bushari (13.3%). This result agreement with Babiker and El Zubeir (2014) who reported the camel types predominant in Khartoum State are Kenani, Anafi, Bishari and Arabi. However, Abdelatif (2009) reported that many camel types exist and some are named according to color and tribe. They mentioned that the five basic types and sub types available in Gedarif area include Arabi, Anafi, Bishari, Bashandi and Kenana types.



Source, field survey 2011/ 2012

Figure 2: The predominant types of camel in Khartoum State

Camel herd size

The maximum herd size of camels reared for milk production do not exceeds 50 heads with minimum of 4 heads /herd (Table 3). This range shows the small scale of camel's milk production in Khartoum State. The results showed that the camels in Khartoum state kept at the farms unit does not exceeding 20heads.Shuiep *et al.* (2014b) reported the average herd sizes in Khartoum as 8.6±4.42. Similarly, Dowelmadina *et al.* (2015) reported that the herd size under semi-intensive system was significantly ($P \leq 0.05$) smaller than that kept under the nomadic systems (61.5±40.1 vs. 132.5±117.6 and 71.3±34.3). Variations in herd structures and composition were reported in the different management systems practiced in Khartoum State (Babiker and El Zubeir, 2014). Moreover, Shuiep *et al.* (2014b) reported that the herd size and structure of camels were different according to the main objectives of breeding camels in Sudan.

Table 3: Percentage distribution of herd size of camels in Khartoum state

Species	Number	Percent
< 20	18	60.0
20-50	12	40.0
Total	30	100.0

Source, survey result 2011/ 2012

Veterinary services

Access to veterinary services in Khartoum State is more or less arbitrary. Due to the presence of such services for animal population however, the samples reports availability for 40% of the producers, while the rest (60%) experience either lack of such services or inaccessibility to it. Lack of veterinary

services accompanied by disease problems were the most commonly encountered problems facing camel pastoralists in Northeastern Sudan (Abbas *et al.*, 1993).

Market channels

The results showed that the majority of camel breeders sell milk through marketing centers (56.7%) or farm gate (43.3%) as shown in Table 4. Shuiep *et al.* (2014a) reported thatit is possible to purchase either raw or heat boiled camel milk directly from dairy camel farms.

Marketing of camels' milk in Khartoum State is characterized by lack of organized channels. Normally the majority of producers serve as distributors or they eventually convey their products to their own marketing channels for direct transaction. Similarly, in Kenya, the bulk of marketed milk reaches the consumers through informal marketing channels (Younan, 2006). However camel milk marketing networks were established in southern Somalia to serve demand from the capital city, Mogadishu (Herren, 1992). Camel milk has increasingly high market demand in the urban area of Sudan; nevertheless, lack of roads and organized transportation systems is constraining marketing of this product (Shuiep *et al.*, 2014b). El Zubeir (2015) suggested that some of the governmental strategies should be directed towards supporting and providing facilities and services for camel milk marketing and to state regulatory standards in order to cope with the international milk quality measures.

Table 4: Percentage distribution of marketing channels availability

Species	Number	Percent
Farm gate	13	43.3
Distribution centers	17	56.7
Total	30	100.0

The descriptive statistical analysis result revealed that the socio-economic characteristics of herdsmen were more or less homogenous, about 84% of the herdsmen were of more than 50 years, while 10% between 40-50 years old and 6% less than 40 years old. Only 12% of camel herds are illiterate, 79% attended *khalwa* and about 9% attended the primary school. However, Shuiep *et al.* (2014b) reported that the illiterate camel herders were 24% and 88%, and their averages ages were 51.4±9.8 and 30.2±7.2 years, in the semi intensive and the nomadic production system, respectively.

The study showed wide variations in camel milk yield among animals. The average camel milk yield was reported as 7-8 L per day, which supported results obtained by Babiker and El Zubeir (2014). Dowelmadina *et al.* (2015) that the overall mean in the semi-intensive system was 3.49±0.89 L/day compared to that reported in traditional nomadic system (2.73±0.65 L/day and 3.30±1.12 L/day for Butana camels and Nefidia camels, respectively). The milk yield was significantly ($P \leq 0.05$) affected by production systems and types of camel. Moreover, camel milk yield was significantly ($P<0.05$) affected by husbandry, stage of lactation and parity number (Babiker and El Zubeir, 2014 and Dowelmadina *et al.*, 2015).

The results showed that camel diseases in Khartoum State eg. Mange, tick infestation, internal parasites, mastitis, diarrhea, and A vitaminosis and mite infections) have effect on camel milk production, which is similar to the result obtained by Dorsa (2005). The level of camel milk production was also affected by some factors such as camel type,

nutritional level, drinking water availability as was stated previously by Wernery *et al.* (2004). Also the result showed the separation from or death of the calf has negative effect on milk yield which are in support to the result obtained by Wernery *et al.* (2004). Similarly, Bekele *et al.* (2002) reported that camels that lost their calf give less milk (3.8 l/d).

The result showed that the main reasons which affect the marketing of milk camels include adequate camel milk prices, lack of adequate knowledge of health and nutrition benefits of camel milk and lack of marketing channels of camel milk. Shuiep *et al.* (2014b) reported that the main cost items associated with camel herding are feed, taxes and medications (Shuiep *et al.*, 2014b).

Camel farm was chosen in West Omdurman to calculate production costs per camel farm, there are 13 she camels, including 7 in the lactation period, 4 in dry period, 2 calves and one male camel. The average production per camel in the farm is 7 liters per day and the estimated lactation is about 300 days. The milk is sold for 1.5 pounds per liter of milk

Table 5: Production costs for one she camel

Variable	Value per SDG
The price(annual cost) of camel	2,000
Feeding + Feeding equipment	5,000
Farm rental	350
Electricity + water	150
Veterinary services	500
labors	500
Total cost of production	8,500

Table 6: Breakeven analysis

Variable	Value
quantity of milk produced per year	2250 liter
Revenues	13.500SDG
Gross profit	5.000 SDG
Gross profit %	37.0%
Breakeven point quantity	1.200
Breakeven point revenue	3.600 SDG
Breakeven point cost	2.400
Breakeven point Gross profit	1.200
Breakeven point Gross profit %	33.3%

Quantity of milk produced per year = the quantity of milk produced per day × number of days in the lactation period

Revenues = quantity of milk produced per year × price

Gross profit (GP) = Revenue – cost of sales

Gross profit % = GP/Revenue × 100%

Breakeven point quantity (BEPQ) = Fixed cost / price - unit cost

Breakeven point revenue (BEPR) = BEPQ × price

Breakeven point cost (BEPC) = BEPQ × Unit cost
Breakeven point Gross profit (BEPGP) = BER –BEPC
BEPGP % = BEPGP/ BEPR × 100%

Break-even result

The quantity of milk that should be produced to recover the cost for each herd is calculated according to the same formula is SDG 1.090.

The result shows that the cost of production is 63%, while the gross profit is 37% out of the total costs caterers for this type of investment. The allocated fixed expenses are as low as 8.9%. The percentage of income before taxes equals to SDG 5.000 (28.1%) of the total sales. The taxes percentage is calculated at 1.8%. Hence the Net income percentage is 26.4% which equals SDG 4.910.

Conclusion

The analysis of the herdsmen socio-economic characteristics revealed that they were more or less homogenous. The feeding cost presented the main cost item for the production of camel milk in Khartoum State. Although undefined and undeveloped marketing channels prevail in Khartoum state, camel milk production and marketing was found to be profitable to the herdsmen. The study recommended provision of extension services to camel herders on animal feeding and keeping records for the improvement of the camel milk production. Developing of marketing channels and increasing of distribution centers coupled with raising awareness among the consumers on the nutritional and medicinal benefits of camel milk are needed.

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