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VALUE CHAIN OF *Balanites aegyptiaca* IN NORTH KORDOFAN STATE IN SUDAN

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ABSTRACT

Balanites aegyptiaca (L.) is considered as one of the valuable tree species in Sudan. This study interrogated different actors involved in *B. aegyptiaca* value chain to estimate the gross margins associated with their segments. The study was conducted during season 2019 in Sheikan Locality, North Kordofan State in Sudan, and involved 86 household head (10% of the population). Results indicated that value chain actors of *B. aegyptiaca* included fruit collectors, village traders, city merchants, wholesalers, retailers and consumers. Based on gross margins, the wholesalers were the most benefited (36.4%) in the chain, followed by village traders (33.4%), city merchants (17.6%), collectors (9.65%) and lastly retailers (2.94%). It is clear that *B. aegyptiaca* value chain is mostly influenced by actors at local level.

Key Words: City merchants, gross margins, wholesalers

RÉSUMÉ

Balanites aegyptiaca (L.) est considérée comme l'une des espèces d'arbres les plus précieuses au Soudan. Cette étude a interrogé différents acteurs impliqués dans la chaîne de valeur de *B. aegyptiaca* pour estimer les marges brutes associées à leurs segments. L'étude a été menée au cours de la saison 2019 dans la localité de Sheikan, dans l'État du Kordofan du Nord au Soudan. L'étude a impliqué 86 chefs de ménage (10 % de la population). Les résultats ont indiqué que les acteurs de la chaîne de valeur de *B. aegyptiaca* comprenaient des collecteurs de fruits, des commerçants de village, des commerçants de ville, des grossistes, des détaillants et des consommateurs. Sur la base des marges brutes, les grossistes ont été les plus avantagés (36,4 %) de la filière, suivis des commerçants villageois (33,4 %), des commerçants de la ville (17,6 %), des collecteurs (9,65 %) et enfin des détaillants (2,94 %).

Il est clair que la chaîne de valeur de *B. aegyptiaca* est principalement influencée par des acteurs au niveau local.

Mots Clés : marchands de la ville, marges brutes, grossistes

INTRODUCTION

Balanites aegyptiaca (L) is a high value tree crop in Sudan, particularly as a source of food and medicine. It belongs to the *Balanitaceae* family and is used as an agroforestry tree component in Sudan (Tesfaye, 2015; Mohammed *et al*., 2021). Moreover, apart from being traded for income by the locals, its leaves and young twigs serve as fodder for livestock in agro-silvo-pastoral systems, particularly during the dry season (Elfeel *et al*., 2007).

In Egypt, herbalists use the fruits to treat hyperglycemia, as well as an antioxidant (Hassanin *et al*., 2018; Mohammed *et al*., 2021). The fruits are also high in oil content, which can be used for biodiesel production (Chapagain *et al*., 2009). *Balanites aegyptiaca* is widely distributed in Sudan, ranging from sandy soils to clay and heavy clay soils in arid and semi-arid areas. However, knowledge regarding the economic benefits of *B. aegyptiaca* fruits among value chain actors in Sudan is limited (El Tahir *et al*., 2010; Taha *et al*., 2015); moreover, this knowledge is essential for the development the value chain. The objective of this study was to trace different actors involved in the value chain of *B. aegyptiaca* fruit*;* and to estimate the gross margin of each actors across the chain.

METHODOLOGY

Study area. The study was conducted in *Sheikan* locality in the North Kordofan of the Sudan. The locality is found between latitudes 25' 12°, 45' 13° North and longitudes 35' 29°, 30' 30° east. It is located in the Savannah area and is mostly used for agriculture and grazing activities (Salih *et al*., 2019). The area is famous for producing *B. aegyptiaca* fruit; with high tree densities and yet it is close to one of biggest central market of NWFPs (El Obeid). Two rural markets, namely *Abu Haraz* and *Tena* West; and two central markets, *Ibn Masoud* and *Wad Ekaifa*; were selected purposively and used for this study.

Sampling procedure. Due to homogeneity of respondent in the area, 86 household head (10%) respondents were purposively chosen. Only household who collected and traded in *B. aegyptiaca* fruit were selected and interviewed. In central and rural markets, 25 traders and 15 processors were interviewed. Three semi-structured questionnaires were used for data collection, one each for collectors, trader and processors.

Data analysis. The data collected were statistically analysed using Microsoft Excel 2010 and SPSS version 22.00. Descriptive statistics, frequency, comparison and construction of diagrams were also done. Gross margin analysis was used for cost and benefits analysis of *B. aegyptiaca value chain actors* (Ibrahim *et al*., 2017) as follows:

GM = TR – TVC while TV = sale volume × unit price

Where:

GM = Gross margin

TR = Total revenue or total value of output from the *B. aegyptiaca* fruits production

TVC = Total variable cost or the costs that are specific in Producing *B. aegyptiaca* fruits

$$\text{Gross margin (\%)} = \frac{\text{(revenue - total cost)}}{\text{revenue}} \times 100$$

RESULTS AND DISCUSSION

Household farm land covered by *B. aegyptiaca*. The proportion of community land cover by *B. aegyptiaca* in the study area was classified at three levels, namely >50, 33 and <33% (Table 1). A total of 83.3% of respondents stated that *B. aegyptiaca* cover <33% of their farm land. On the other hand, 16.7% stated that *B. aegyptiaca* covers 33% of their arable land (Table 1). It was also apparent that the conservation of *B. aegyptiaca* species was largely using agroforestry systems. Similar observations were made by Abdel Magid *et al*. (2014) in relation to tree planting and forest protection. This species is grown as an orchard crop in pure stands and in agroforestry systems like home gardens, or as a hedgerow (Gebauer *et al.,* 2007).

Fruits collection activities. The results revealed that most of respondents collected *B. aegyptiaca* fruits from distances ranging between 2 to 3 Km (Table 2) depending on availability of trees, implying that most of the actors did not travel far distances for collection of the fruits.

Based on the result of Table 2, the time spent in collection of *B. aegyptiaca* fruits per trip ranged between 1 to 8 hours; while they spent 3 to 4 hours gathering *B.*

TABLE 1. Proportion of community land covered by *Balanites aegyptiaca fruits in north* Kordofan, Sudan

Cover (%)	*B. aegyptiaca* (%)
>50%	-
33%	16.7
<33%	83.3
Total	100

TABLE 2. *Balanites aegyptiaca* fruit collection source, time and distance in north Kordofan, Sudan

Actor	Places of collection		Distance for collection (km) (%)				Time for collection (hours) (%)			
	Farm	Forest	1-2	2-3	3-4	4-5	1-3	3-4	4-5	5-8
Collectors	100	0	20	48	24	8	8	77	4	11

aegyptiaca fruits *as stated by* most (77%) of respondents.

Quantity of *Balanites aegyptiaca* fruits collected. The average quantity of *B. aegyptiaca* fruits collected per month was 24 kg; but this largely depended on household size (Fig. 1). Similar results were obtained by Adam and Pretzsch (2010) that large families gathered more products from the farms or forests than their smaller counterparts.

Market of *B. aegyptiaca* fruits. The result showed that market types existed mainly in three categories; namely home, rural weekly market (*Umduarwar*) and urban market (Table 3). Up to 95.3% of the respondents sold the *B. aegyptiaca* fruits in rural markets depending on the quantity of the products. This was probably because transportation to rural markets was easier than to distant markets. As indicated by traders and middlemen, commodities that needed transportation, storing and energy inputs such as drying, storage, processing, and packaging before distribution are usually sold locally, though at low prices, to obviate these costs (Taha *et al.*, 2015).

In spite of the above listed hindrances, 3.4% of respondents preferred to sell their products in urban market (Table 3), owing to the lucrative prices there.

Gross margin from sale of *B. aegyptiaca* fruits. The total gross margin of *B. aegyptiaca* fruits was 78.84%, with the remaining percentage attributed to variable costs and taxes/levies (Fig. 2). A high percentage was received by producers (30%) in case of 60 kg, compared with other actors in the chain. Nevertheless, collectors were not considered the most beneficial because they were unable to collect sizable quantities due to off-seasons and other limitation. However,

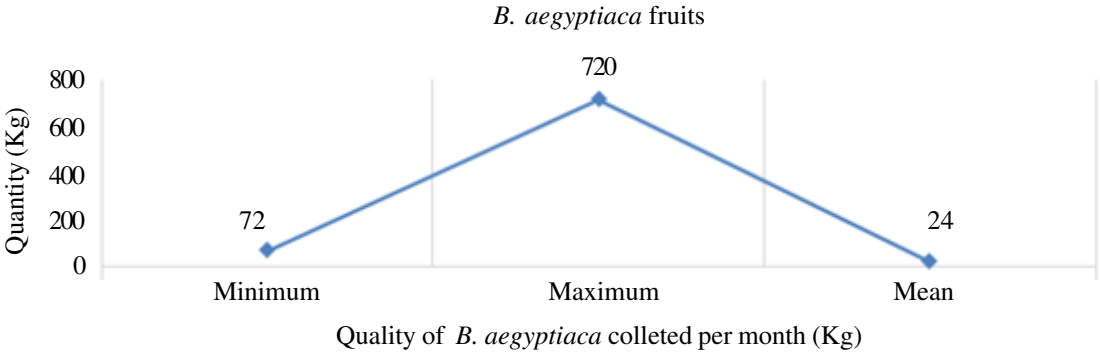

Figure 1. Quantity of *B. aegyptiaca* fruits collected per month by households in north Kordofan, Sudan.

TABLE 3. Market of *B. aegyptiaca* fruits in Kordofan, Sudan

Market place	Respondents (%)
Home	1.3
Rural market	95.3
Urban market	3.4

other actors had the advantage of using their capital to purchase and sell more quantities; and hence to receive high incomes and profit from the products.

Total variable cost for *Balanites aegyptiaca* fruits. The result demonstrated that the total variable cost of *B. aegyptiaca* fruits was 21.1% of the previous consumption at local level, the cost is paid by different actors throughout the chain; with producers incurring the highest costs compared with other actors in the chain (Fig. 3). Payment for commodity market preparation was in the order of 4.79%

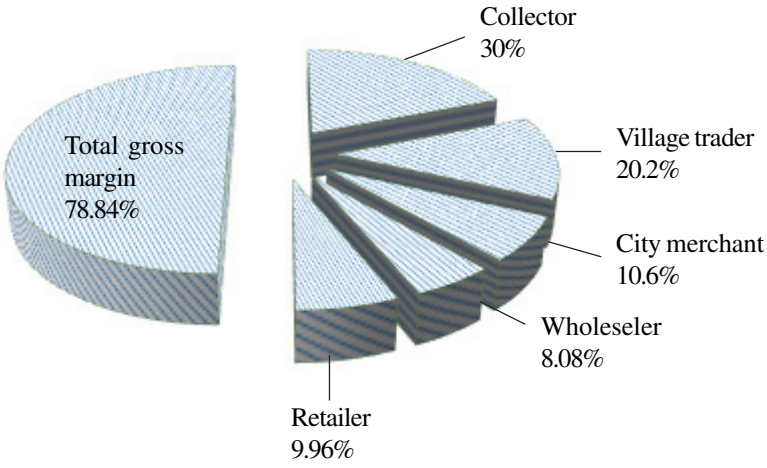

Figure 2. Gross margins from last consumption for *B. aegyptiaca* fruits in Kordofan, Sudan.

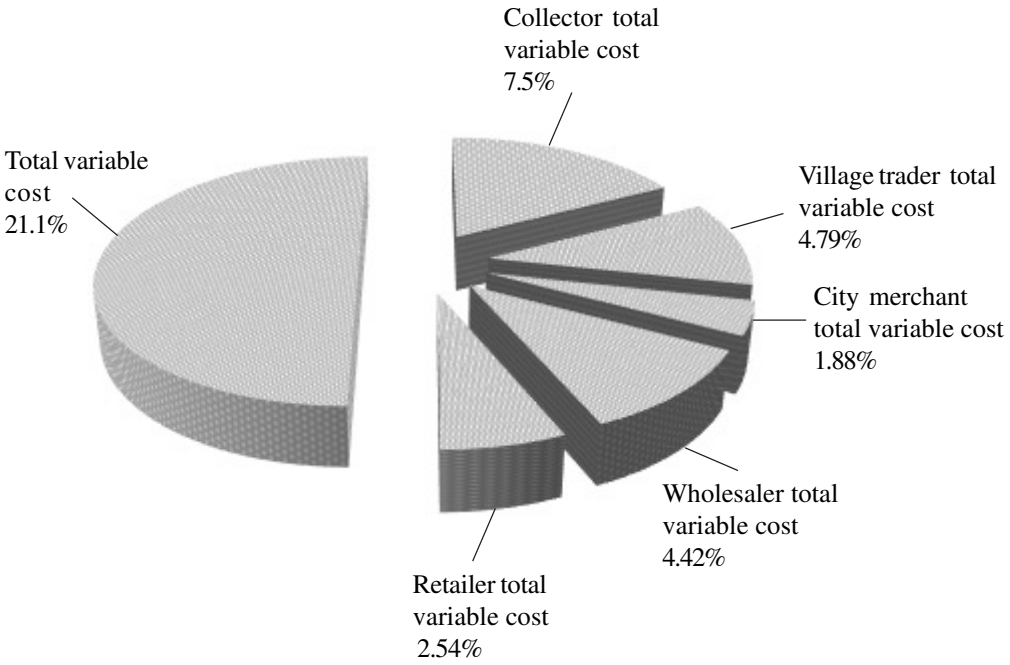

Figure 3. *Balanites aegyptiaca* fruits variable cost percentage of 60 kg from the end user in north Kordfan, Sudan.

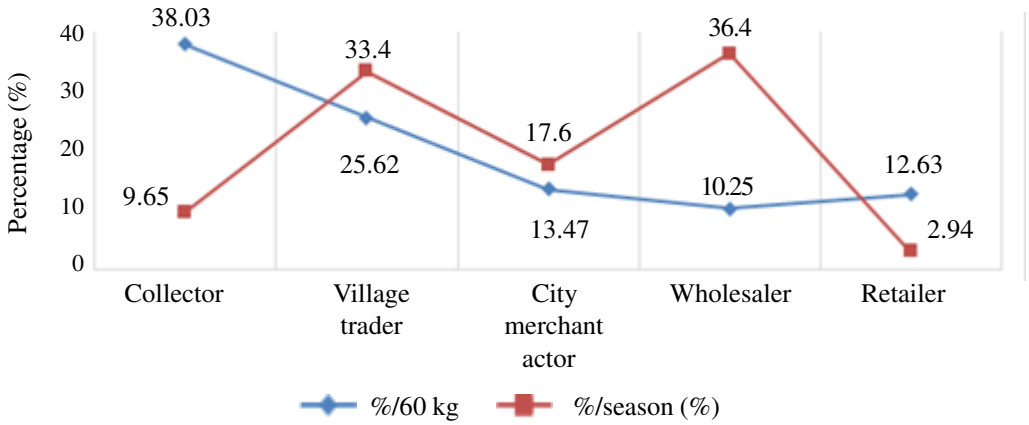

Figure 4. Gross margin of among actors per 60 kg of *B. aegyptiaca* fruits.

paid by village traders, 1.88% by the city merchants, 4.42% by the wholesalers and 2.54% by the retailers. Other costs across the value chain included transportation, storage and taxes.

Gross margin per season *versus* average fruit collection. Figure 4 illustrates that collectors received the highest (38.3%) gross margin per 60 kg of fruits; while wholesaler received the highest (36.4%) gross margin per season. This means that the collectors gathered limited quantities of product during the season leading to their low gross margin; while other actors had more opportunities depending on their capital. Large capital enabled purchase and sale of big quantities of fruits during the season.

CONCLUSION

The main actors involved in the *B. aegyptiaca* value chain in north Kordofan, Sudan are collectors, village traders, city merchants, wholesaler, retailer and consumers. The value chain is rather short, especially for the processors and exporter segments. From the Gross margin stand point, it is the wholesalers that benefited most (36.4%) in the value chain. Collectors sold their produce mainly to local markets at giveaway prices. We recommend provision of knowledge to collectors to enable them to improve harvesting techniques, processing, and marketing of *B. aegyptiaca* fruits.

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