





# Abstract

**Purpose** The paper aims to study the economics of marketing of food legume crops in the River Nile State of Sudan.

**Methodology** The study depend mainly on primary data which was collected by using structured questionnaires for (70) randomly selected respondents through probability proportional method from Elzeidab public irrigated scheme of River Nile State as a case study. Descriptive statistical technique has been employed to achieve the objectives of the study.

**Findings** The paper revealed that agricultural marketing system in the area of study suffered from numerous chronic constraints.

**Value** The study concluded that stability and improvement of food legume crops marketing system contribute significantly to farm sustainability and alleviates malnutrition in the River Nile State. However, the actual marketing constraints restrict the sustainability of these important crops. So, the

cooperation between international organizations and governmental institutions should tackle the hindrances of food legume crops marketing system in the River Nile State.

**Keywords** Marketing system improvement, farm productivity.

# Introduction

For over half a century, the world has relied on increasing crop yields to supply an ever increasing demand for food. One of the major problems that limit economically successful agricultural production worldwide is poor soil fertility. Nutrient depletion of soil is a particular problem for small land holders in developing countries, where much grain-legume production occurs (Baset and Shamsuddin, 2010). A key characteristic of legume crops is their ability to 'fix' atmospheric nitrogen, in conjunction with rhizobium bacteria, helping to maintain soil fertility. The observed increase in world production of cool season food legumes during the 1980s was up to 90% caused by a tripling of pea production in the developed countries, while in the developing countries the increase in chickpea and lentil contributed only 10% and faba bean remained stagnant. In Sudan, the tenants have compiled numerous crops in order to intensify production in an attempt to improve household food security and income. Faki et al. (1992) mentioned that, the institutional constraints such as inefficient marketing and credit systems may be partly responsible for weak performance in Sudan. On the other hand, the tendency toward removal of trade restrictions in the country and the observable trend of an increasing international trade in pulses will increasingly generate new patterns of production and trade flows which will sustain further growth of global cool season food legume production. The area of the study is the River Nile State (RNS) located in North of the country. It is considered as one of the main suppliers of legume crops to the country. The paper undertook Elzeidab irrigated scheme of

RNS as study area. Field legume crops are regarded as essential crops within the crop combination in River Nile State (RNS) namely, faba beans, kidney beans and chick peas. They are a major part of the daily diet for the Sudanese. Abdelaziz (1999) reported that, the primary marketing of produce in River Nile State takes place mostly at the farm-gate through the traditional private trading system. There are no specified primary market places, in the state, although some farmers take some produce to the weekly markets held at various places. Numerous researches indicated that the RNS has been assumed to have a comparative advantage with seasonal cash and food crops production namely, wheat, faba bean, chick pea, dry bean, onion, vegetables, spices, sorghum, maize, potato and fodder beside some perennial crops. The paper focused on faba beans, kidney beans and chick peas as the most important three legume crops in the RNS because they have a significant role in the diets of the Sudanese people and contribute substantially to the economy of the country. Legumes are the major source of proteins for both man and livestock, especially in poor countries, where animal protein is expensive (Hubbell and Gerald, 2003). Salih (1981) also mentioned that it is the main food for millions of people and the source of protein for the middle and low income groups. Salih and Farouk (1995) reported that the food legume crops are gaining further in importance as a source of protein for the majority of the population which cannot afford animal products because of escalating prices. All the mentioned field crops are grown in both private and public irrigated schemes of the state,

but the public ones are regarded the main suppliers for these crops according to its areas and the high number of tenants. The production in the public schemes is based on payment of fixed water charges. The paper undertook Elzeidab public irrigated scheme as a case study to implement the study. The marketing of legumes in the region has faced constraints due to inadequate market infrastructure and lack of marketing system, fluctuation of prices, high cost of marketing, inadequate marketing credit, and remoteness of the production areas, which resulted in inadequate interaction with the rest of the country. This situation forced the small farmers to sell their products locally and in village markets at lower prices. This case study has been taken to examine how inadequate marketing system contributes to legumes production inefficiency. Marketing channels, marketing information, transportation and marketing costs are discussed. The paper concludes that marketing system in the River Nile State is inefficient and it needs tremendous improvements to ease movement and interaction in these markets.

### **Methodology**

This study was carried in Elzeidab public irrigated scheme of RNS. The crops are commonly produced under pump irrigation from the River Nile to some extent as well as from underground water. The farming system of the RNS is characterized mainly as not full-mechanized system. The winter season is considered the main season for producing cereal and legume crops. Recently, the RNS enlarged animal production activities and oil crops. Stratified random sampling was employed in selecting seventy respondents through probability proportional method for the study, forming about 2.3% of the scheme's tenants. The cost route approach was adopted in collecting data for the 2005/2006 season. Data

collection involved personal interviews and the use of structured questionnaire. A descriptive statistical analysis through SPSS software program has been employed to achieve the objectives of the study. The data collected comprehensively to cover the entire marketing system of food legume crops in the RNS.

Gross Margin Analysis (GMA) was employed to determine the economics of legume crops. The gross, which is calculated as gross revenue less variable costs forms a good indicator of how profitable a firm is at the most fundamental level. The general mathematical form for the gross margin analysis used to calculate the gross margin as follow:  $GM = GR - TVC$ .

### **Results and discussion**

Globally, legume production grew at 4% per annum between 2000 and 2010. Legume production in Africa is small (6%) relative to the world production and has been growing slightly slower than the global average, and in 2010 Africa overall produced about 21.5M metric tons of legumes (vs. about 87.1M metric tons of cereal production). However, within focus countries and excluding Nigeria, growth has been significant during the 21st (Monitor Group, 2012). River Nile State (RNS) of Sudan is considered as one of the promised States for agricultural investment in the country due to its relatively cooler weather and fertile alluvial soils. It also has a comparative advantage over other parts of the country in producing relatively high-value crops (wheat, faba beans, citrus, mangoes, dates, certain spices and medical plants). Legumes are regarded as one of the major winter food crops in the State. The State accommodates three types of pump-irrigated schemes: private, cooperative and public schemes with different production-relation systems. The optimum time for legumes

planting is November because temperatures during this period remain cooler than average. In almost all legumes growing areas, the bulk of plantings occur on time. In RNS, the marketing of seasonal crops is thought as the most important factor constraining agricultural production. Elfeil (1993) mentioned that, the marketing of crops in Northern Sudan is characterized by being free of government involvement; hence, marketing of seasonal crops is the responsibility of farmers who undertake it individually. Seasonal crops are usually sold immediately after harvest at very low farm gate prices. The reasons that obliged farmers to sell immediately after harvest are the need for cash and moreover, the individual farmer's produce it too small to be transported to urban centers.

Socio-demographic characteristics of Respondents: The average age of surveyed tenants in Elzeidab scheme was 40 years, while the average family size of surveyed tenants ranged from 1 to 15 persons. The study detected that all surveyed tenants were educated, and all of them were males. Farming experience estimated at 20 years on the

average. The average farm size in the scheme varied from 1 to 28 feddan per farm household. The average distance from tenant's residence to their farms was 2.7 km. The farming system of Elzeidab scheme is dominated by wheat production which accounts for 25% of the farm land.

### **The main markets of the scheme tenants**

The study observed that there are no fixed primary markets for food legume crops except for some weekly markets held at different rural places scattered all over the RNS, each on a certain day. On basis of this background the main market for Elzeidab food legume crops is Elzeidab weekly market. The main actors of this market are farmers, village traders and wholesalers. The general characteristics of Elzeidab market are that the prices are always less than the regional centers market prices. In addition, they are periodical markets which provide opportunity for the exchange of a variety of goods among sellers and buyers who come from different neighboring villages (see Table 1).

**Table 1.** Distribution of Elzeidab tenants according to the main markets

<b>Market</b>	<b>Number</b>	<b>Percentage</b>
<b>Elzeidab</b>	<b>24</b>	<b>34.3</b>
<b>Elaliab</b>	<b>01</b>	<b>01.4</b>
<b>Elketiab</b>	<b>01</b>	<b>01.4</b>
<b>Eldamer</b>	<b>01</b>	<b>01.4</b>
<b>Village market</b>	<b>40</b>	<b>57.1</b>
<b>Atbara</b>	<b>02</b>	<b>02.9</b>

Table (1) illustrates the main seasonal food legume crops markets in the study area. It further shows the distribution of Elzeidab surveyed tenants transacting in these weekly markets. The results revealed that 57% of the tenants procured their harvested food legume crops to the small scattered village markets of Elzeidab, followed by Elzeidab market 34% and 2% in Atbara markets, while Elaliab, Elketiab, El-damer, and Khartoum were found to be only 1.4% for each.

### Marketing information

Tenants of the scheme lack adequate market information and are not well organized to market their crops as one body to control the demand and supply of their marketable surplus. During the last decade the RNS witnessed

improvement to some extent in the means of communications where highways and some other infrastructures contributed to reducing the marketing cost, reducing risk of lack of knowledge of the right information on prices in urban and village markets, and saving the time of tenants. But the middlemen still play their previous role between the tenants and consumers, a situation leading to reduction in the returns to tenants.

The research found that 77% of the surveyed tenants depend on markets as the main source for market information, followed by wholesalers at 11%, while 4% of the surveyed tenants depend on communications and only 1% depends on mixed sources (Table 2).

**Table 2.** Frequency distribution of Elzeidab surveyed tenants according to the source of market information

Source	Frequency	Percentage
Markets	54	77.1
Communications	04	05.7
Wholesale merchant	11	15.7
Mixed	01	01.4
Total	70	100

### Market distance

In the RNS, it is clear that the ability to move the products is one of the major determinants of geographical size of the seasonal food legume crops markets. As such, transport from the farm to storage or between village and towns are one of the chronic constraints.

The survey results (Table 3) show that, the majority of the farmers 57.1% market their food legume products within a distance of less than 10 km, while the other distance categories range from 5 to 17 km.

### Distribution of field crop quantities

The research observed that Elzeidab tenant was considered as an expert in Northern Sudan due to its capability to organize a future plan for distributing its food legume products (see Table 4). The field data (Table 4) revealed that the actual quantities of food legume crops to be sold were 85% of the total production. About 68% of the total food legume crop production was sold immediately after harvest, while the remaining quantities of 15% went to storage. The surveyed farmers reported that they devote 17% of the stored amounts as seeds for the next season and 31% for household consumption, while the future sale quantities was found to be 52%.

**Table 3.** Frequency distribution of Elzeidab surveyed tenants according to the market distance

Market distance	Frequency	Percentage
Less than 10 km	40	57.1
10-20 km	17	24.3
30-21 km	05	07.1
Greater than 31 km	08	11.4
Total	70	100

**Table 4.** Distribution of seasonal food legume crops quantities for the surveyed tenants of the scheme

<b>Crop</b>	<b>Production (kg/fed)</b>	<b>A. Harvest sale (kg)</b>	<b>H.H consumption (kg)</b>	<b>Seeds of next season (kg)</b>	<b>Future sale (kg)</b>
<b>Faba bean</b>	<b>1739.7</b>	<b>1161.36</b>	<b>100.8</b>	<b>187.2</b>	<b>290.34</b>
<b>Chickpea</b>	<b>387</b>	<b>291.6</b>	<b>8.82</b>	<b>16.38</b>	<b>72.9</b>
<b>Dry bean</b>	<b>1080</b>	<b>720</b>	<b>63</b>	<b>117</b>	<b>180</b>
<b>Total</b>	<b>3206.7</b>	<b>2172.96</b>	<b>172.62</b>	<b>320.58</b>	<b>543.</b>

The Table also shows that food legume crops were distributed for direct sale after harvest and storage. The tenant's tendency is to sell immediately after harvest due to lack of storage and inadequate markets as illustrated in Figure 1.

Marketing in the RNS has a hierarchical structure where institutions of different types are involved. Ijami (1994) summarized that marketing begins from the center nearest to the producer, i.e. the village or small town markets. Distribution of field food legume crops among markets.

Food legume crops play a minor role on the international agricultural markets but are of tremendous importance for the country economies and food security. The primary markets in the area of study are linked to the regional market centers or sub-terminal markets (e.g. Shendi). The terminal markets are at the apex level, which are either in the main consumption centers, or at the outlet of the export/import trade (e.g. Khartoum). The field survey revealed that, most of the tradable seasonal

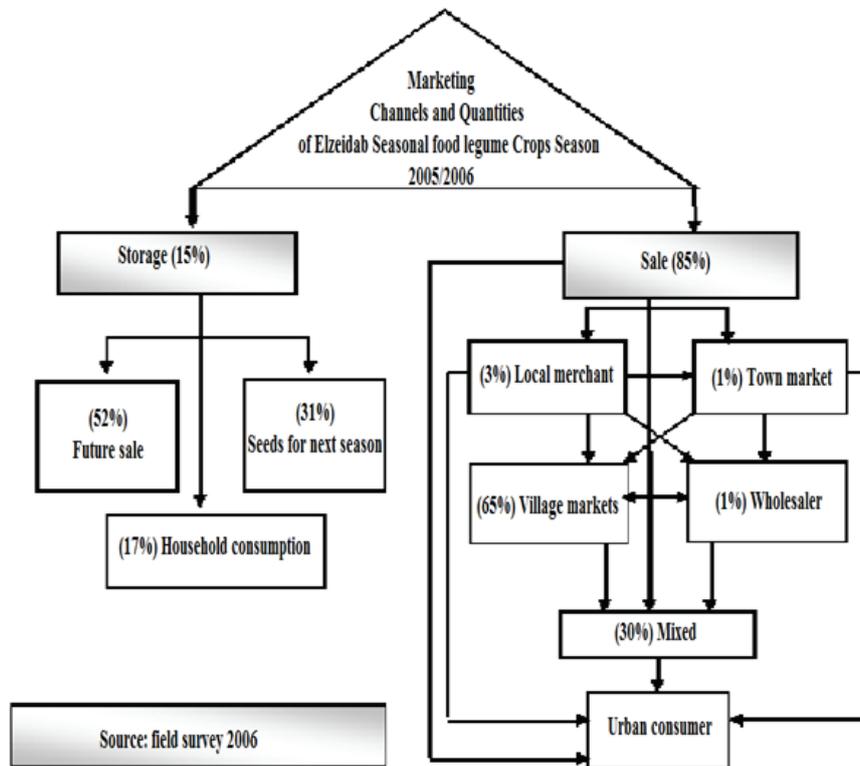
crops (65%) were procured to village markets, followed by 21% transacted in mixed market.

The share of village merchants who usually play the role of money lender to the tenants was found to be 3%, and only 1% goes to both wholesalers and town markets as shown in Table (5) and Figure (1).

**Table 5.** Distribution of the dominant marketing channels for Elzeidab tenants

Market channels	Frequency	Percentage
Village merchants	02	02.9
Wholesalers	01	01.4
Village markets	45	64.3
Town markets	01	01.4
Mixed	21	30
<b>Total</b>	<b>70</b>	<b>100</b>

**Figure 1.** Marketing channels and quantities distribution of Elzeidab seasonal food legume crops in season 2005/2006



### Marketing cost

The marketing of crops in the RNS is constrained by very high cost of unreliable transportation, monopoly in the marketing and transportation system by a limited number of traders, unavailability of proper storage and processing facilities, indebtedness of the farmers and shortage of formal credit (Abdelaziz, 1999).

Detailed marketing costs of Elzeidab seasonal food legume crops calculated from the field survey data are illustrated in Figure (2). The study focused on the main cost items contributing to the seasonal crops marketing cost namely, storage, pest-control and transportation.

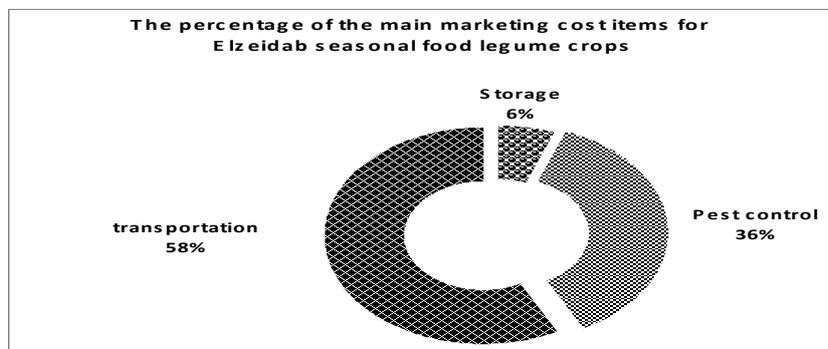
The research revealed that the most expensive item in trading cost of seasonal crops was the transportation item at 58% of the total marketing cost. Transportation of crops between the storage and market consist the of high-way fees in case of markets outside the The research revealed that the most expensive item in trading cost of seasonal crops was the transportation item

at 58% of the total marketing cost. Transportation of crops between the storage and market consist the of high-way fees in case of markets outside the State, followed by pest-control item at 36% of total marketing cost, while the storage cost was found to be the lowest item at 6% as illustrated in Figure (2).

### Transportation means

Availability and reliability of transportation systems are the backbone of an efficient crops marketing system. As transport either from farm or storage to the different markets is one of the main marketing constraints. The study revealed that 64% of the respondents reported small trucks were the major means for their seasonal food legume crops transportation, followed by big trucks (lorries) at 15%, while 12% of the tenants reported transport with animal-drawn carts and 5% of the tenants reported using various combinations of the previous categories, as depicted in Table 6.

**Figure 2.** Main marketing cost items shares for Elzeidab surveyed tenants in season 2005/2006



**Table 6.** Frequency distribution of Elzeidab surveyed tenants according to the transportation means

<b>Trucks</b>	<b>11</b>	<b>15.7</b>
<b>Box cars</b>	<b>45</b>	<b>64.3</b>
<b>Animals</b>	<b>09</b>	<b>12.9</b>
<b>Mixed</b>	<b>05</b>	<b>07.1</b>
<b>Total</b>	<b>70</b>	<b>100</b>

### Gross margin of food legume crops

Despite the lack of attention devoted to legumes in the past, there is a strong case for stimulating legume production and value addition in Africa. Legumes provide numerous opportunities to improve the lives of smallholder farmers and benefit local communities. The value of legumes for SHFs can be divided into three categories: income-generating opportunities, improved nutrition and health benefits, and soil and eco-system health (Monitor Group, 2012). Gross margins reveals how much a firm (farm, company etc.) earns taking into consideration the costs that it incurs for producing its products and/or services and it could be expressed as a percentage. Gross margin is a good indicator of how profitable a firm is at the most fundamental level. Farms with higher gross margins will have more money left over to spend on other activities such as investment, improvement of production and marketing.

The general mathematical form for the gross margin calculation per crop is as follow:

$$GM = GR - TVC$$

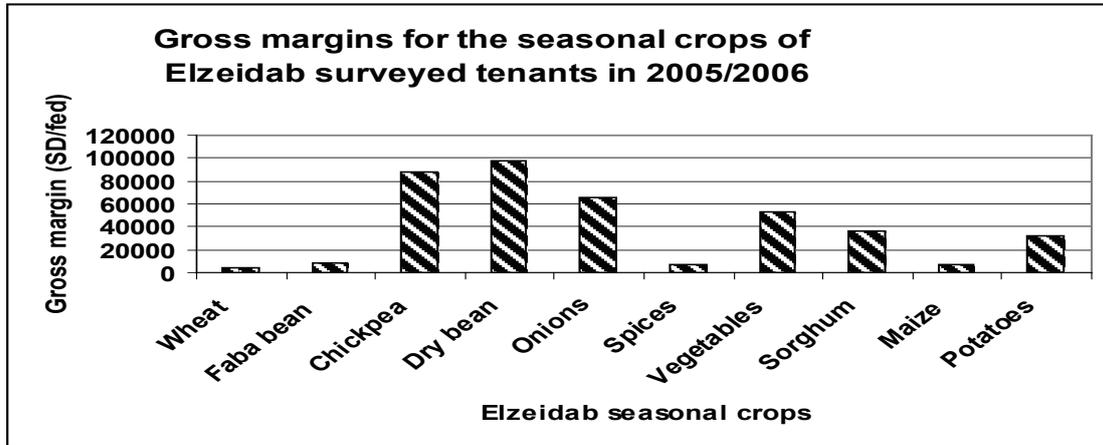
Where:

GM: Crop gross margin per fed in SD,  
GR: Crop gross revenue per fed in SD  
and

TVC: Crop total variable costs per fed in SD.

Gross margins for Elzeidab seasonal food legume crops under the study were assessed individually per fed for season 2005/06 compared with the other seasonal crops in the study area as illustrated in Figure 3. The Figure also investigates that the gross margins of the mentioned seasonal food legume crops were found to be positive. The gross margin of dry bean and chickpea were SD 97950 and 87749.24 respectively formed the highest ones among the crop combination in the scheme regarded as the most valuable and profitable crops when compared to the other seasonal crops, while the gross margin of faba bean was the lowest within the food legume crops ones.

**Figure 3.** Gross margin analysis for the seasonal crops of Elzeidab surveyed tenants, season 2005/2006



# Conclusion and policy implications

Based on obtained results, the study concluded that:

- Food legume crops contributed significantly to farm sustainability and alleviating malnutrition in the RNS. However, removal of marketing restrictions in the area of study is an important factor in improving seasonal food legume crops marketing and production which will sustain further growth.
- The marketing system in the State is inadequate and there is need for improvements to ease access to local and international markets. Hence, cooperation between the international organizations and the RNS government institutions should take place to eradicate the hindrances of food legume crops marketing and establish the adequate marketing system in the RNS.
- Incentives should be provided to make these crops more profitable due to their importance for food security. Relevant policies may include reducing marketing costs or interventions to purchase them at reasonable prices.
- Increase the cultivated area of the seasonal food legume crops chickpea and dry bean and the perennial fodder legume alfalfa to increase farm returns.
- Integrate crop markets need to be established to provide a guarantee to farmers that their production would be sold through a fair system. Moreover, farmers' cooperative union should play the role of the intermediate middlemen between the farmers and the market system eliminating the brokers' intervention.

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# About the authors

**Dr. Elgilany Ahmed** is a Visiting Senior Lecturer and Assistant Professor at Universiti Utara Malaysia, School of Economics, Finance and Banking, College of Business. He worked as a Socio-economic Researcher at Agricultural Economics and Policy Research Center of Agricultural Research Corporation (ARC). Conducted numerous socioeconomic research programs including different aspects pertaining to socioeconomic activities such as assessment and mapping of poverty, food security situation, agricultural policies, agricultural finance, environmental economics, resources use optimization, evaluation of on-farm irrigation water use efficiency and others by applying relevant analysis techniques and models including suitable software program such as GAMS, CROPWAT4, Stochastic Frontier and some of the other normal software programs of computer.

**Professor Hamid H. M. Faki** is currently a Freelance Professor and National Expert for the Ministry of Agriculture and Forestry, Sudan. He earned his Ph.D. degree from Universitate of Hohanhien in Germany. Professor Faki worked at many international organization such as ICARDA and WFP. He carried out numerous research projects pertaining to agricultural economics, food security, poverty reduction, development and planning and socioeconomic studies. Besides, he is a supervisor for large number of students.