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Research paper

Palm Dates Marketing and Economics in River Nile State of North Sudan

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Abstract

This research looks to study the palm date products marketing, constraints faced and how the dates business could be promoted in River Nile State of Sudan, in particular, and in other producing countries in the region as general. The study depends mainly on primary data that collected by using structured questionnaires for 50 randomly selected palm dates growers from the State. Secondary data is also employed; they have been collected from various relevant sources. Descriptive statistical analysis has been applied to achieve the objectives of the research. The research unveiled that agricultural marketing system in the area of study suffered from numerous chronic obstacles such as products prices instability, inadequate marketing infrastructure and high cost of marketing. The study concluded that stability and improvement of dates marketing system contribute significantly to farm sustainability and combat malnutrition in the State. However, the poor marketing system in the State restrict dates production as well as the sustainability of this strategic crop. The study finds that the conventional farming system of dates will need to be addressed by gradually shifting to modern one and accordingly provide incentives to make dates more profitable. So, the cooperation between international organizations and governmental institutions should tackle the constraints of dates marketing system in the region.

Keywords: Palm date, development, marketing, north Sudan

تسويق واقتصاديات تمور النخيل في ولاية نهر النيل بشمال السودان

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المستخلص

يهدف هذا البحث إلى دراسة تسويق منتجات تمور النخيل والمعوقات التي تواجهها وكيفية الترويج لتجارة التمور في ولاية نهر النيل بالسودان على وجه الخصوص وفي الدول الأخرى المنتجة للتمور في المنطقة بشكل عام. اعتمدت الدراسة بشكل أساسي على البيانات الأولية التي تم جمعها باستخدام استبيانات منظمة لعدد 50 مزارع نخيل تم اختيارهم عشوائياً من الولاية. تم استخدام البيانات الثانوية أيضًا والتي تم جمعها من مصادرها المتعددة وذات الصلة. تم تطبيق التحليل الإحصائي الوصفي لتحقيق أهداف البحث، وقد كشف البحث عن أن نظام التسويق الزراعي في منطقة الدراسة يعاني من العديد من العقبات المزمنة مثل تقلب أسعار المنتجات وعدم كفاية البنية التحتية للتسويق وارتفاع تكلفة التسويق. وخلصت الدراسة إلى أن استقرار وتحسين نظام تسويق التمور يساهم بشكل كبير في استدامة مزارع التمور علاوة على مكافحة سوء التغذية بالولاية إلا أن ضعف نظام التسويق في الدولة يقيد إنتاج التمور واستدامة هذا المحصول الاستراتيجي. توصلت الدراسة إلى أن نظام الزراعة التقليدية للتمور يحتاج إلى المعالجة من خلال التحول التدريجي إلى النظام الحديث، الامر الذي يتطلب تقديم حوافز لجعل التمور أكثر ربحية. لذلك فإن التعاون بين المنظمات الدولية والمؤسسات الحكومية يمكن ان يساهم في معالجة معوقات نظام تسويق التمور في المنطقة .

كلمات مفتاحية: تمور النخيل، تنمية، تسويق، شمال السودان

Introduction

Market is considered as the embodiment of all services and goods activities of a producer to obtain a profit from production. Thus, marketing of products does not start from post-harvest, but from the cultivation time of the crop. Accordingly, the producers and traders should consider the specific characteristics of the marketable surplus of agricultural product, like perishables, the annual demand and supply and crop prices. At present (in 2016), the Arab Region is the world leader of date cultivation with almost 75% of global area under date palm, around 77% of world production and approximately 69% of world total export of dates (Dhehibi *et al.*, 2016). The main consumers of dates in Europe are found in the large and growing Muslim community that mainly consists of people who emigrated from North Africa, South Asia and the Middle East. Date palm market grows at 5.2% CAGR to reach 13,482.48 kilo tons by 2025. Export and product pricing statistics, and trends (Adroit Market Research, 2019). According to the United Nation's Food and Agriculture the Middle East date palm consumption accounted for over two-third of the global market in 2018. Over the past few years, European dates import is continuing. Traditionally, date fruits are consumed during Ramadan. The Muslim calendar is based on the moon cycle and therefore the dates of Ramadan vary from year to year. Some studies mentioned that marketing is recognizing consumer behavior, measuring it, converting this information to planning production to meet the needs. In other words, marketing is a conscious effort to create an efficient allocation of resources and creating a kind of expertise in the market. Organizations must find their target market to better identify their needs to develop and provide products and services tailored to them. The base of marketing effort is to avoid wasting resources and different

facilities. Marketing means segmenting or market regulation and determining products for the most appropriate markets. Also, Scheer and Zallinger (2007) reported that, today, in most countries of the world, small and medium enterprises play a key role in job creation and economic development of communities. Necessary studies on the potential of sustainable economic growth have not been fully articulated so far, often due to a specific set of problems and obstacles for small and medium enterprises (SMEs) related to their size and relations. These production units are not capable of receiving and capturing market opportunities that require large quantities, homogenous standards and regular supply individually. In this regard, their experience difficulties in achieving economies scale in the purchase and supply of inputs such as equipment, raw materials, financing, consulting services and so on acts as a deterrent.

The failure of agricultural marketing system in northern Sudan is considered as one of the most factors that contribute to constraints to attain the objectives of agricultural development and farm sustainability and income of farmers. In other words, failure of agricultural development has a direct effect on political, cultural, social and economic aspects. Elfeil (1993) stated that in the Northern State, the marketing is thought to be the most important factor constraining the agricultural production.

Thus, attention to the agricultural marketing and marketing policies could increase agricultural production and lead to sustainable farms in the region, decrease unemployment, raise exports, create access to other regional and overseas markets. The marketable surplus of crops in northern region could be described as free of State involvement. Food and cash crops such as legumes, cereal and fruits are often sold immediately post-harvest at very low farm gate prices. The farmers usually enforced to sell their crops immediately post-harvest due to the need for cash and the high cost of transportation to urban centers. The production and marketable surplus of palm dates in Sudan is faced by numerous constraints, namely, low yield and high cost of inputs coupled with conventional varieties, poor technology, lack of financial incentives, lack of awareness of farmers and difficulties to access the international markets, lack of public investment in infrastructure and marketing systems, lack of research and training and extension, knowledge and relationship with the academic institutions. Palm dates in Sudan are produced under a conventional farming system without paying attention to irrigation water requirements, fertilization or other agricultural practices.

This research was conducted in Northern region of Sudan. The available agricultural land of the region is located along the River Nile banks. These areas are characterized by a high population density with the majority work in agriculture (Ahmed, 2009). Generally, this study aims to suggest options to promote dates marketing by finding permanent and stable national and overseas markets. Sudan has the opportunity to promote its palm date production to be compatible with international standards in terms of packaging and quality to reach global markets.

Methodology

This research was carried in 2017 at El-Ketiab scheme of River Nile State (RNS) where perennials are commonly produced under surface irrigation system by using pumps at the River Nile and to some extent from underground water. Elketiab scheme was established in 1917. The study selected this scheme mainly due to the high portion of perennials (71%). The scheme is well organized, the total area of the scheme is 6200 feddans, of which 4690 feddans are owned by the government, while the remaining area of 1510 feddans are owned by farmers. The total area of the scheme is distributed among 389 farms (*hwasha*) along Elketiab villages. The total number of tenants in the scheme is about 1687 tenant. Delivery of irrigation water for the scheme also depends on pump irrigation from the River Nile (RN). The main crops are perennial crops such as date palms, citrus fruits, mangos, guava and alfalfa. Irrigation water is supplied all over the year to irrigate the perennial crops. The main pump stations for the scheme are located at Elketiab and Elmuslmab. Irrigation water is conveyed to the cultivated area of the scheme that covers about 5000 feddans for both perennial and seasonal crops when they exist simultaneously. The agricultural system of the RNS is characterized mainly as semi-mechanized system. The perennials are considered the main cash crops in the tenancies system beside some food crops namely cereal and legume crops. Recently, the animal production activities are enlarged as well as oil crops. This research is considered as quantitative. In this study, to determine the dates farming system, random sampling method was used and the number of samples were selected in probability proportional method to the scheme tenants.

Area of the study

The research was conducted on date palm production and marketing in El-Ketiab public irrigated scheme in the River Nile State. The scheme is considered as one of the main suppliers of fruit products in the district where dates and citruses are commonly produced under surface irrigation from pumps on the River Nile.

Sources of data

Both primary and secondary data were applied in the study. The primary data were collected through a field survey by using questionnaires to interview date-palms growers. Secondary data were collected from relevant sources such as records of the State Ministry of Agriculture, previous studies and the internet.

Sampling

Probability proportional method was used and 50 tenants, selected randomly, forming about 3% of the total tenants in the scheme. The dates producing zone in Sudan were stratified into the two geo-administrative zones of Northern Sudan comprising the Northern and River Nile States, and central Sudan represented by Khartoum State.

Data collection

Field questionnaires were administered for 50 date-palms growers in El-Ketiab public irrigated scheme. In addition to the use of questionnaires, field observations, farmer consultations and farm visits were also made. Data collected was mainly on production, production costs, product marketing and returns, as well as on constraints facing palm dates growers and traders.

Data analysis

A set of analytical techniques were employed including descriptive statistics and farm partial budget technique is used to derive gross margins for different crops of at El-Ketiab scheme. The definition of gross margin is the enterprises gross returns less the variable costs attributed to it. The gross returns are the value of production of the enterprise, whereas variable costs refer mainly to production inputs which differ according to the size of those enterprises. In this technique some of the basic data was used to calculate gross returns. 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.
Equation (1) is the general mathematical form for the gross margin calculation per crop:

$$GM = GR - TVC \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

Where:

GM = Crop gross margin per fed in Sudanese Pound SDG,

GR = Crop gross revenue per fed in SDG and

GM = TVC: Crop total variable costs per fed in SDG.

Results and discussions

The palm date sub-sector in Sudan is improving less than expected. It still characterized with unsatisfied prices and hence, low returns causing dates improvement negatively. As far as dates industries are concerned it is known that most cultivars are of the dry type; hardly suited for exportation and international competition. They are predominantly consumed as fresh or dry fruits in various parts of the country but some is used to make a native drink like alcoholic drink or vinegar.

Socioeconomic characteristics

The socioeconomic characteristics of the palm dates growers are expected to have a great effect on the production process in the study area, in addition to increasing palm dates yield and household incomes. The main collected socioeconomic information was on tenants' education level, marital status, age, family size, family contribution on field work, years of experience, occupations in and/or out farm, distance between the tenants' home and field, farm size of

tenants, and land tenure beside some data regarded their farm activities. Table 1 represents the major socioeconomic characteristics of El-Ketiab scheme tenants.

Table (1): Major socioeconomic characteristics of the surveyed tenants

No.	Indicator	Mean	STD
1	Age	50	12.5
2	Family size	9.5	5.4
3	Years of experience	31.5	14.9
4	Farm size	8.5	5.5
5	Distance from tenants' resident to the farm	1.7	4
6	Number of family labor	2	1.8

Source: field survey by authors

The analysis of the main economic and demographic data of the surveyed date palms growers unveiled that their average age was about 50 years, while the family size averaged 10. Those date growers reflected high cumulative date planting experience averaging 32 years. The farm size in area of the study is considered as small holding, it varied from 1 to 27 feddans per farm household, with the majority of tenancies (64%) being run on rent basis. In El-Ketiab scheme farming system date palms occupied for 13%, while citruses accounted 53% of the total farm land. The level of education of farmers, at a particular point, can affect the adoption of modern technologies and improvement of the date palms farm system. The research found that all the surveyed tenants were educated and all of them were males. As high as 76% of them were fully occupied with their farms and about 82% had the engagement of an average of two members of their families in farm production.

International marketing of palm dates

Date production is a world agricultural industry producing about 5.4 million metric tons of fruit. The date fruit, which is produced largely in the hot arid regions of South West Asia and North Africa, is marketed all over the world as a high-value confectionery and fruit crop and remains an extremely important subsistence crop in most of the desert regions. The world production of dates has increased from about 1.8 million tons in 1961 to 2.8 million in 1985 and 5.4 million in 2001. The increase of 2.6 million tons since 1985 represents an annual expansion of about 5% (FAO, 2017). The international markets of dates such as Europe, Asian and Africa markets are considered as important markets in terms of value, even though they import relatively varied quantities of dates. EU markets compared to Asian ones are still imports relatively small quantities of dates, it accounts for 10% of world imports in volume with some 50,000 tones, and they account for some 30% in value. This reflects the fact that EU import prices for dates are comparatively much higher than the world average. The main palm date producers and supplier in the world markets are situated in the North Africa and Middle East.

The palm dates are imported from numerous countries namely, Saudi Arabia, Iran, Tunisia, Palestine and South Africa. Saudi Arabia, Palestine and Tunisia are mainly composing the date palm markets of the products in respect of the quality standard. While the palm dates

from Iran is less quality when compared to the above mentioned countries that why it is characterizing with less prices in the international markets. Table 2 and Table 4 illustrate the distribution of date palms by country for the major date producing countries and till 2001, Iran, Saudi Arabia and Iraq had almost 50% of the harvested area of the world.

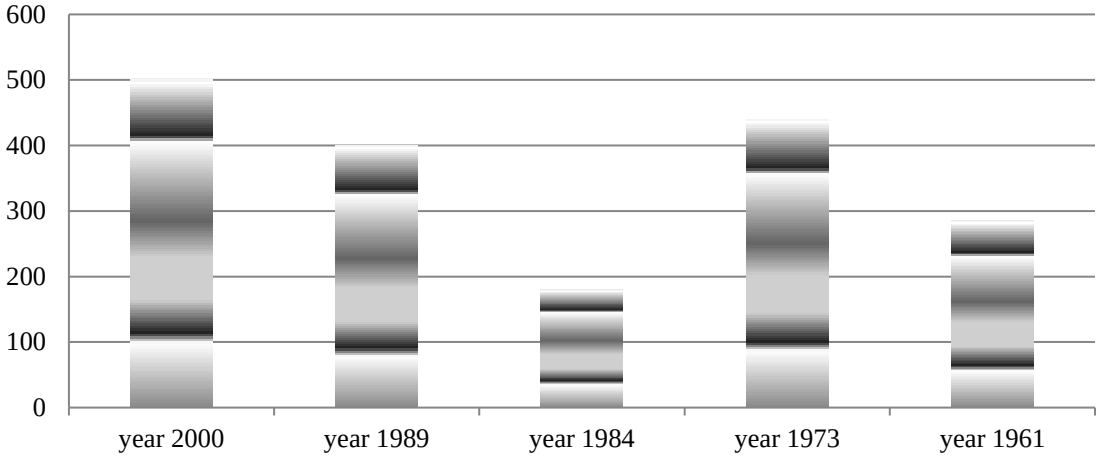
Table (2): Main date producing countries (000 tones)

Supplier	2001	% of world	% change 1991-2001
Egypt	1,102	20.6	67
Iran	900	16.8	42
Saudi Arabia	712	13.3	35
Pakistan	550	10.3	88
Iraq	400	7.5	-29
Algeria	370	6.9	75
UAE	318	5.9	84
Oman	260	4.9	93
Sudan	177	3.3	26
Morocco	32	0.6	-31
World	5 353	-	43

Source: Adapted from FAO (2001) data.

Table (2) shows that in 2001 the top five palm date producing countries were Egypt, Iran, Saudi Arabia Pakistan and Iraq, accounting for about 69% of total world production. If the next five most important countries are included, i.e. Algeria, United Arab Emirates, Sudan, Oman and Morocco, then this percentage rises to 90%. This clearly indicates that most of the world's date production is concentrated in a few countries in the same region. Table (2) also reflects illustrates the major date producing countries have steadily stretched production over the 1990th decade, representing a 43% increase over that decade. Over same period (1990th), date exports increased. Increase has been rapid in Oman, the United Arab Emirates, Egypt and Pakistan. Conversely, output decreased in Iraq (due to the trade embargo- from 248 tones in1989 to 20 tons in 2001) and Morocco (due to phytosanitary problems). The international production and trade in palm dates can be fluctuated; changes are often associated with many factors such as political and economic instability in the major producing countries. Unfavorable climatic factors can also affect production and storages. Asia dominates the export market by far in terms of volume (i.e. UAE and Iran), but further analyses show that North Africa has 26% of the market in terms of value (Tunisia and Algeria achieve high export prices), while it represents only 8% in terms of quantity. This is a clear reflection of North Africa's strategy to target the high value markets of Europe. Asia on the other hand is exporting lower quality dates at much lower prices, mainly to India. Europe, predominantly France - a non-producing region - has 5 percent of the market share through its re-exports of dates originating from North Africa. FAO (2017) reported that an average of almost 500,000 tons of dates was exported annually with a total value of about US$258 million. When this figure is compared with total production, it is clear that the bulk of the dates produced are consumed within the producing countries. Of the 500 000 tons exported, 225 000 tones were imported by India, 150 000 tones by the United Arab Emirates (UAE) and

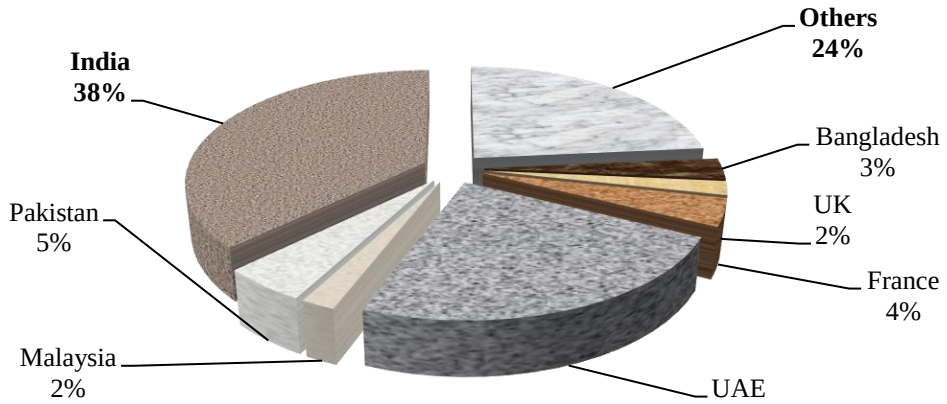
about 60 000 tones by the EC. The palm date trade figures indicate that about 93% of the date harvest is consumed locally and that by far the majority of these palms are not of the well-known export varieties. The world date imports varied greatly over the period 1961 to 2000 (Figure 1).



Source: Adapted from FAOSTAT 2017

Figure 1. World date imports varied greatly over the period 1961 to 2000 (in 000 tons)

The main importers are India, the United Arab Emirates (UAE) and Europe. The top five countries to import dates during 1996-2000 were India, Pakistan, Malaysia, the UAE and the EU (Figure 2).



Source: Adapted from FAOSTAT 2017

Figure 2. Import market share for selected countries (1998 - 2000) in terms of quantity

For the five-year period 1996 to 2000 India imported on average 213 000 tones while the UAE imported 139 000 tones, accounting for 28 percent of the import market. European countries like

France, Germany, the UK and Italy import much more expensive and, hence, higher quality dates. In contrast, countries such as India, the UAE, Malaysia and SADC Region (i.e. South Africa and Kenya) import much cheaper and lower quality dates.

World prices of palm dates

World prices of palm dates varied greatly for different reasons namely the variety, quality, season, type of packaging and market destination. According to the TradStat Trend Report, the average export price per ton in 1996 was in the order of US$3 100 in the case of France (re-export) while Algeria and Tunisia achieved US$3 500 and US$2 600 per ton, respectively (Table 3).

Table (3): Average farm-gate prices for export quality palm dates in 1996 (US$/kg)

Variety	Export price at farm gate (US$/kg)
Medjool	3.5
Barhee	1.5
Deglet Nour	2.5
Hayany	0.6
Iraqi Varieties	0.7

Source: Adapted from TradStat Trend Report; 2017.

Table (3) reflects that one hectare of palm dates of the Medjool variety harvested in season 1996 has attained an average income of $37,800 per annum, based on farm gate-price of $3,500 per ton and an expandable quantity of 10.8 tones/ha.

The marketing of palm dates in European Union (EU)

The European Union (EU) is an important market in terms of value, it considers as the largest date importer in value (over US$100 million in 2000) and the third largest in volume, even though it imports relatively small quantities of dates. France and the UK were the major markets, importing 21 000 tonnes and 10 600 tonnes, respectively (Figures 3 and 4). Compared with over half a million metric tons imported every year in the world, the EU accounts for 10% of the total with some 50,000 tones. However, it accounts for approximately 30% of global date imports in value with a net average of US$85 million per year in 2000 (FAO, 2017).

Imports of dates into the EU are highly seasonal. They tend to take place at the end of the year, for Christmas and New Year's Eve. In 2001, for example, over 80% of EU's imports were made between October and December. This period also corresponds to the date harvest in many supplying countries (Table 4), in particular in North Africa (FAO, 2017). However, imports also vary according to the dates of the Muslim holy month of Ramadan.

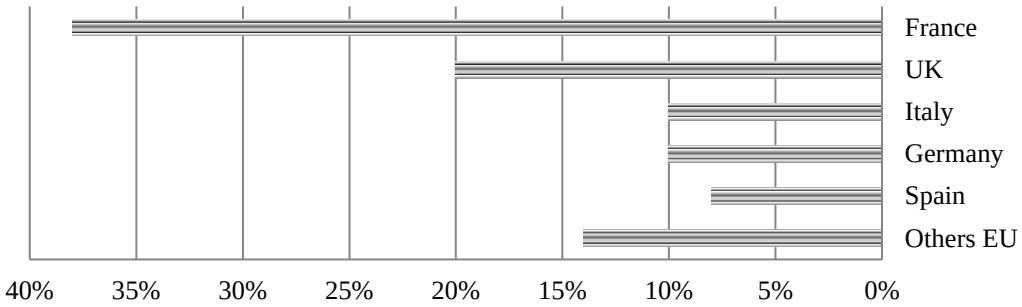


Figure 3. EU gross imports of dates (% volume)

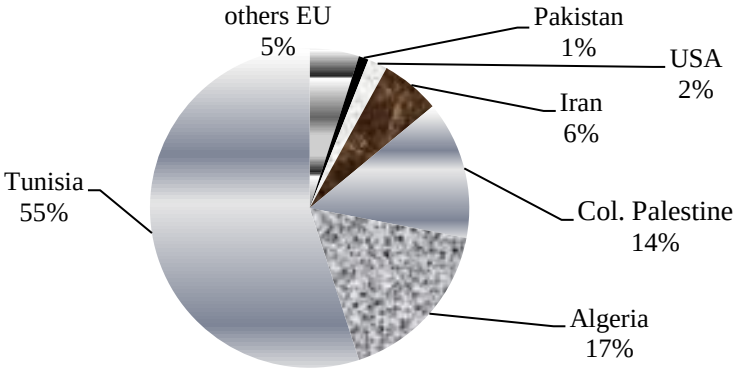


Figure 4. EU imports by origin in 2001 (% volume)

The main consumers of dates in Europe are found in the large and growing Muslim community that mainly consists of people who emigrated from North Africa, South Asia and the Middle East. Karadeniz (2010) reported that the palm dates in Turkey are composing about 40 types and dates are mainly consumed in big cities such as Istanbul, Ankara, Konya, Kayseri and Bursa. The high season of consuming the date palm in Turkey is the pilgrimage period during Ramadan.

The date palm input from Saudi Arabia during the period is legally nearly 800 tons. Additionally, the pilgrims are also thought to bring 6000 tons' palm from Saudi Arabia while coming back to Turkey. Traditionally, date fruits are consumed during Ramadan. The Muslim calendar is based on the moon cycle and therefore the dates of Ramadan vary from year to year.

Table (4): Main supplier of palm dates to EUC (tones)

Supplier country	Production (tones)	Exported amount	EUC imports in value
Tunisia	107,000	27,000	55%
Algeria	370,000	7 000	17%
Col. Palestine	9,500	4,300	14%
Iran	900,000	10,000	6%
USA	16,000	1,000	1.5%
Pakistan	550,000	800	1%

Source: Adapted from FAO' 2001data.

Palm dates export considerations

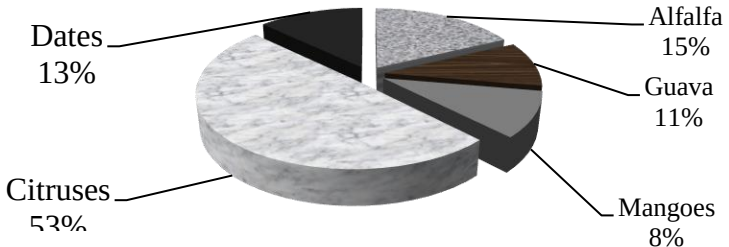
Knowledge of prices, of pricing patterns and the capacity to analyze the economic forces that cause and change those prices will be a necessary condition to help make effective marketing decisions. There is a wide variation in the average export prices achieved by different countries. Higher export prices are achieved by some country such as the colonized Palestine, Tunisia, United States and Algeria, which have developed a specific export strategy (Table 5); to grow top quality varieties and target the higher priced European markets.

Marketing of palm dates in Sudan

Marketing of palm date products in Sudan is still limited by the limitations in domestic markets, whereby the country can raise its date's products for export to international markets to improve market returns and farm incomes, food security and rural development. Trade in dates' products is nevertheless increasing rapidly and it can attain high revenue of hard currency in a short time. Most of Sudanese commodities are well treated before and after harvest and could be sold as high quality products provided the necessary public investment. The world palm dates market is growing at high momentum from one year to another. Palm dates grown for food in Sudan will have a wide-open door in the international market reaching much higher prices and consequently contributing more to the Gross Domestic Product (GDP).

The research depicts the particulars of perennials' production including palm dates in the scheme under study. It illustrates the perennial crops land allocation (Figure 5), yield and production are investigated in Table (6), which also compares farmers' productivities with those of research ones. The dominants perennial crops mix in the scheme mainly comprised citruses, date palms, mangoes, guava and alfalfa fodder.

Figure (5) also illustrates that farmland under perennials was up to 53% occupied by citruses and 15% by alfalfa, while the shares of date palms and guava were 13% and 11%, respectively. Only 8% was accounted to mangoes and considered as the lowest percentage among the perennials combination in the scheme. Research records investigate that dates' yield achieved by El-Ketiab farmers was generally low when compared with research yields attained from research conducted by Sudan's Agricultural Research Corporation (ARC), with a large yield gap reaching 53% as revealed in Table 6. A similar situation applies to other perennial.



Source: field survey by authors

Figure 5. Percent Area Share for Perennials in Area of the Study

Table (5): Main palm dates export considerations

1	Period of production	Production period of dates: e.g. this extends from 30th of August to 30th of Nov for the country. This will allows the markets to be supplied from Sep to May, bearing in mind the possibilities of keeping the product under refrigeration.
2	Logistics	Containers: imports may take place in a number of refrigerated containers with particular number of palletized cartons, as well as collectively by refrigerated truck. Transit time: Determine the period of transit time (2-4 weeks) based on the transportation mean, time of supply and prices (road, sea, air).
3	Sizes	Sizes: mostly three sizes can be offered: jumbo, large and medium (fancy). In the case of the USA, the jumbo size represents approximately 40% of the quantities harvested, the other two sizes representing approximately 30% each
4	Qualities	Qualities: It is difficult to say there is a specific quality standard for all palm dates cultivars (i.e. consumer preference). Mejool as example, it normally has its best degree of maturity and full flavor when it turns dark brown (black), and soft to the touch. There is, moreover, a market for a very mature and very fresh quality of date. In France, some pallets of processed Mejool have been sold and been much appreciated. Generally, Mejool has a light dusty appearance on the surface of the skin.
5	Storage conditions	Storage conditions: some dates cultivars (i.e. Mejool) could be stored under positive refrigeration retains all its qualities for many months (4-6 months). It may also be frozen, which extends its keeping and above all allows the gap between seasons to be bridged.
6	Customs duties	Customs duties: dates from some countries are subject to taxation when they enter the EUC. There is exemption from this tax if the product is imported in order to be repackaged. This is what the British traders do to avoid the charge. They import Mejool dates in 15 lb. cartons of loose dates and repackage them using their customers' trademark.
7	Loose packaging	Loose packaging**:** packaging intended for re-packers is generally 5 kg or 15 lb. That intended for loose sale is 5 kg. It is generally packaging which is very carefully produced using quality kraft material and sufficient thickness to avoid any sagging. The carton is generally telescopic with a printed lid which may, serve as a display. The bottom is of the same quality as the lid. It is covered with a film which protects the dates and has a cardboard divider which prevents the fruit from being compressed in the course of handling.
8	Individual packaging	Individual packaging**:** only UK, through large-scale retailers, has so far succeeded in getting a small package onto the market. In Germany, trials with a 150-g pack were under way in 2000. In France, a 250-g window box is selling sluggishly.
9	Prices	Dates prices**:** prices vary depending on the origin, the manufacturer, the size and the means of transport.
10	Limits on the development	High price: the low productivity of some dates types. The direct consequence of this small volume of supply is the high price of the product. Large-scale retailers: The willingness of large-scale retailers to invest in certain types of dates. These dates should be accessible to consumers as a whole, it is essential that it should be available in the departments of large hypermarkets and supermarkets. While this appears to be the case in UK, not in other countries.

Source: Adapted from FAO' 2001data.

Table (6): Distribution of surveyed tenancies and production of perennials

Crop	Average Area (fed)	Percent Area Share	Yield (kg/fed)	Production (kg)	ARC yield (kg/fed)	Yield Gap %
Dates	1.23	12.3	3000	3690	6500	53

Source: field survey by authors

Table (6) indicates high potential to improve dates' fruit productivity in area of the study as reflected by the notably higher research yields as compared to farmers' ones. Gaps and differences in crop productivity not only indicate differences in crop production technology, but also differences in crop varieties.

The paper has revealed that numerous hindrances are affecting the marketable surplus of palm date in Sudan. Productivity of dates is still under potential of the research and standard ones, agricultural resources implying irrigation water and farmland availability are in shortage. Varietal improvement in the country is constrained by shortage in tissue cultured date palms while appropriate preservation technology is lacking. Palm dates in Sudan fetch poor and volatile prices and their sale market prospects are rather narrow, being further influenced by high transportation cost, shortage and high cost of labour. Needed inputs such as improved seedlings and agro-chemicals are scarce and expensive. Further, the palm date fruit are attacked from time to time by various insects and diseases, e.g., palms green scale insect, the termite, the white scale, Targ, and a number of store pests. Furthermore, date production also suffers from the high irrigation water cost rate and lack of financial capital.

The main markets of the scheme tenants

In Sudan, the marketing of palm dates is one of the important factors constraining dates production. Palm date yield improvement, date quality and cultivar, processing and marketing facing numerous challenges to meet consumer expectations as well as international trade standards. Elfeil (1993) mentioned that the marketing of crops in the northern region is characterized by being deprived of government involvement; hence dates marketing are the responsibility of growers who undertake it individually. The product is usually sold immediately after harvest at unfavorably low farm gate prices. The causes that enforce farmers to sell immediately after harvest are the need for cash along with the small farm products that are too small to be transported to urban markets. The main characteristics of the markets in north Sudan are that the prices are usually less than in big city markets. However, local markets are periodical, which provide opportunities for the exchange of different goods among actors who came from different neighboring districts.

The research observed that there are no fixed primary markets for palm dates fruit in the north region of the country except for some weekly markets held at different rural places scattered among the region, each on a particular day. Accordingly, the main markets for the marketable surplus of palm dates in the states are RNS weekly market. The main actors of these markets are public scheme tenants, villages' traders and wholesalers. The general characteristics

of north Sudan markets are that the prices are always less than the capital and other regional centers market prices. In addition, they are periodical markets which provide opportunity for the exchange of a variety of commodities among market actors who come from different neighboring villages. Generally, the research analysis revealed that more than 50% of El-Ketiab palm dates growers prefer to sell their crop in the near markets at a distance of about 30-50 km, while the majority (46%) of them procured their crops for the capital of the country in Khartoum cities markets by crossing about 250 km as depicted in Table 7, it also shows the main perennial crops markets in the study area (Table 7).

Table (7): The main markets of palm dates in area of the study

Market	Number	%
Elketiab	15	30
Farm gate	05	10
Elzeidab	06	12
Shendi	01	02
Khartoum	23	46
Total	50	100

Source: field survey by authors

Table (7) further illustrates the distribution of El-Ketiab surveyed farmers transacting in these weekly markets. The study results revealed that 54% of the tenants procured their harvested palm dates to the small scattered village markets of River Nile State, allocated at El-Ketiab market 30% followed by Elzeidab at 10%, while farm gate and Shendi markets received about 12% and 2%, respectively, and Khartoum were found to be only 46% for each.

The analysis found that more than 50% of the scheme tenants prefer to sell their crops in nearest markets, while 46% of them take their crops to big city markets such as Khartoum market about 250-500 km away. The study also showed that most of tradable palm date crop (56%) was traded in mixed markets around the area of the study, followed by 20% transacted in town markets 12% offered at the farm gate and 8% was brought to village markets. The share of village traders who usually play the role of money lenders to the tenants was found to be 4%.

Distribution of palm date crop quantities

Perennial crops – especially citruses, palm dates, mangoes, guava and alfalfa fodder – are generally considered as the main sources of cash and food crops. In addition, they play an essential role in sustaining and developing the production of the farming systems.

Tenants' decisions on marketable surplus quantities and the timing of their sale depend on the type of crop, supply, demand and their prices. In spite of the fact that dates producers in Sudan exert great efforts during the growing season, hoping for profitable harvests, they face low-price shocks. Accordingly, and due to lack of public investment and the inadequate marketing infrastructures, they are usually compelled to sell major quantities of their crops immediately after harvest at unfavorable prices, and allocate the remaining portion to future sales as shown in Table 8.

Table (8): Distribution of the palm dates disposal quantities in the study area

Crop Production	Production (kg/fed)	Post-harvest sale (kg)	Gifts & H.H. consumption	Future sale (kg)
Date	3690	2030	554	1107
%	100	55	15	30

Source: The field survey by authors

The field survey results denoted that the allocation of marketable surplus to sales at different times, after allocating a portion to household consumption, gifts and others, depends on crop prices. As illustrated in Table (8), palm dates growers store the crop in their house yard or in traditional stores for many months waiting for prices to increase. The dates farmers reported that 45% (554+1661) of their date's production go for storage for future sales and household consumption. About 86% of the palm dates fruit was sold (48% immediately after harvest and 39% for future sales), with the remaining 13% going to storage. As a dominant phenomenon in the northern states markets, palm dates and pulses are partly sold after harvest and partly stored, while vegetables, tomatoes and potatoes are sold immediately post-harvest due to lack of appropriate storage infrastructure and inadequate markets as illustrated in Figure (6).

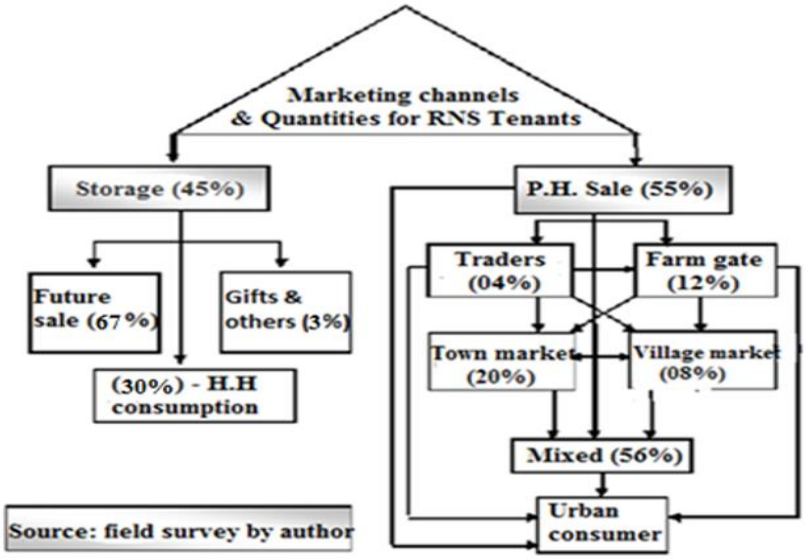


Figure 6. Palm dates marketing channels and quantities allocation in north Sudan

Marketing information

The study observed that development in communication means has become an essential approach for marketable surpluses where they can reduce marketing cost as well as raising farmers' awareness about urban markets. The date palm growers in the area of the study reported that they depend on mixed sources of market information such as local markets, traders, and agricultural officers of the scheme. In the last decade, north Sudan witnessed improvements in agricultural products marketing due to some progress in its public investment. The adequate infrastructure in the region has contributed to some extend facilitating fruit and cereal crops transportation and

marketing. Although, there are numerous linkages and options for marketing of dates, but still the crop growers face some difficulties to undertake the right decision of where and when to sell their product. The hesitancy of northern States farmers might be attributed to the high cost and difficulties of transportation and its high cost, in addition to different fees and charges levied along the roads from rural areas to the entrances of big cities markets. Furthermore, the still poor marketing infrastructure is considered as a chronic hindrance facing date growers in northern region of Sudan to diversify their markets.

Palm dates producers in north Sudan lack adequate market records, validity of information and are randomly market their dates individually not as one body to control the supply and demand of their crop marketable surplus. The study observed that public investment in north region of Sudan improved the means of communications where highways and other infrastructures contributed to reducing the marketing expenses, alleviating lack of knowledge risk of the right information on prices in urban and village markets, awareness regarding supply and demand, and saving the time of farmers. But the middlemen and brokers still play their historical role between the date farmers, retailers and consumers, a situation leading to decrease in the returns to dates growers.

Table (9): Source of marketing information in North Sudan

Source	Frequency	Percentage
Markets	20	40
Communications	03	06
Wholesale merchant	04	08
Mixed	23	46
Total	50	100

Source: field survey by authors

Table (9) shows that 46% of the surveyed tenants depend on mixed or diversified sources as the main sources for markets information, followed by markets sources at 40%, while 8% of the surveyed tenants depend on wholesalers and only 4% depends on communications.

Analysis of palm dates returns

Since palm dates farming are contributing significantly to the agricultural sector, the aim should imply its development and dissemination in the Sudan. The partial budget is an efficient tool for large and small firms; it helps farm managers to estimate the financial effect of incremental changes and only implies changeable resources. In other words, only the change under consideration is evaluated for its ability to increase or decrease income in the farm business. Elsir (1997) mentioned that partial budgeting can be useful in the decision process farm owners and managers use to decide on alternative uses of resources they have in their businesses. Partial budgeting is a systematic approach that can assist the manager in making informed decisions. But this budgeting process can only estimate possible financial impacts, not assure them. Management decisions and chance can change the projections. These may result in better or poorer than expected performance. Repeating the analysis using different assumptions about key

variables will give some idea about the degree of risk involved in making the proposed change. Many studies mentioned that partial budgeting methods continue to be the backbone of much of analysis on agricultural policy. In their simplest form, budgets provide the evidence that policy makers use to make decisions about private profitability and hence the incentives that farmers have to grow particular commodities. The basic data used to calculate gross returns per feddan are output value (crop prices times' quantity of output, i.e. yield per feddan) from which average total variable cost are deduced to get gross margin per feddan.

Gross margins

Gross margin is a useful indicator of how profitable a farm is at the most fundamental level. Gross margins unveil how much a firm earns to pay fronts fixed costs. Firms with higher returns or gross margins will have more money left over to spend on other activities such as updating technologies, land investment, improvement of farming system. The general mathematical form for the gross margin (GM) calculation per crop is as follow:

$$GM = GR - TVC$$

Where:

GM: Crop gross margin per fed in SDG;

GR: Crop gross revenue per fed in SDG and

TVC: Crop total variable costs per fed in SDG.

Fortunately, the global demand for dates is annually increasing due to consumers' awareness of their value and benefits. Babiker (2003) reported that, Sudan exported 20 plant and livestock food products as conventionally cultivated foods valued at US$305.7 million. In Sudan, in view of the current oversupply of conventional dates on the local markets, of the low level of prices and of the tendency of consumers to shift towards higher quality products or other promising varieties, there seems to be little scope for a large increase in producing of conventional dates to these markets. The profitability of conventional date products for a newcomer would be very low, even with low production costs. Of all conventional date palm cultivars, the Barakawi was the most preferred. The cultivars diversification in north Sudan might be due to more than one factor such as geographic location, climatic zone, date usage, farmer knowledge, education level, extension services, date palm returns, family size and research innovation. In order to improve date prices, dates growers of "non-traditional varieties" (Sukary, Majdool, Khadry, Barhy…ect.) would have to invest in promotion and advertising campaigns to convince consumers to switch from conventional dates to the mentioned new varieties. In this case, the markets that should be targeted are Sudanese big cities, and regional and international markets, as consumption of conventional dates is still relatively high there compared to new varieties. Using basic research data, the gross margins for dates under study were assessed individually per feddan and the results were expressed in Sudanese Pound (SDG) as discerned in Table (10).

Table 10: Gross margin analysis for palm dates fruit (SDG/fed)

Budget Component		Value
Cost of production	**(SDG/fed)**	**1,900.8**
Average yield	(kg/fed)	3000
Average price	(SDG/kg)	6.67
Gross returns	**(SDG)**	**20,010**
Gross margins	**(SDG)**	**1,002.0**

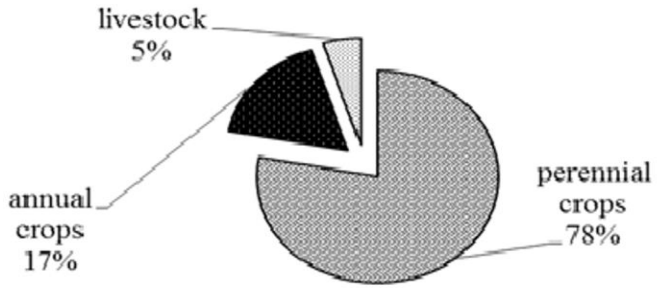
Source: calculated by the researchers

Table (10) illustrates that the GM of dates were positive, and the crop described as a low gross margins. The low returns of dates indicate for their low yields, with yield improvement and adoption of high quality cultivars of dates, higher gross margins can be obtained. In general, expenses are lower than gross returns. Dates price vary between during the year and among varieties over time. On the other hand, palm dates production is changing rapidly, leading to price instability. For example, high prices for non-conventional varieties can lead many tenants to grow these verities, which might depress prices. Thus, tenants' awareness is important about marketing process within the promise offered by non-conventional cultivars. Generally, the awareness of date growers and consumers' preferences and demand for different date cultivars are important for planning and designing a sustainable genetic resources conservation strategy, but do not often receive much attention in Sudan.

Main income sources of palm dates growers

No doubt farm income diversification is considered as useful tool to combat agricultural risk as well as for farm sustainability. Beetz (2002) reported that, integrating trees and shrubs with the other enterprises on a farm can create additional sources of income, spread farm labor throughout the year, and increase the productivity of the other enterprises, while protecting soil, water, and wildlife. As well, enterprise diversification makes it easier for farms to be more self-sufficient in terms of nutrients, livestock feed, soil organic matter and energy. The palm date crop is playing an important role in the culture in north Sudan as well as contributes to livelihoods of rural people. Babiker (2003) found that the expected higher income for palm dates growers will also be positively reflected on their standard of living. More national revenue means more money available for solving related problems that hinder rural development. Marketing large amounts of palm dates will make the country a prominent figure in the international market of dates' products. It will also attract global investors to invest in agricultural production of the crop. The most common source of tenants' farm income is the sale of harvested field crops and livestock. Also, off-farm income is still one of the fundamental sources for the scheme tenants to meet the farm operation cost and household expenditures. The research revealed that the main off-farm sources in the area are remittances and contributions of family members, formal employment, trade, and other off-farm private activities. About 37% of the tenants earned off-farm income beside their farm income, while 63% relied only on farm returns. Most of the farm income accrues from palm dates and other perennials (78%). The majority of tenants (63%) diversified

by growing several crops at one time, often having both livestock and annual crops, and sometimes value-adding enterprises (Figure 7).



Source: field survey by auth**ors**

Figure 7. Farm income sources in area of the study

Figure (7) shows that farm income is obtained mainly from three sources: perennials which providing the highest farm returns followed by annual crops, and 5% gained from livestock as the lowest source. This information ensures the importance of perennial crops in shaping the tenants' returns in the State.

Conclusion and policy implication

The research established that Sudan boasts of high potential to promote the palm date productivity due to many comparative advantages particularly in El-Ketiab scheme, namely availability of stable and high quality agricultural resources, suitable environmental conditions, huge experiences of date palms growers, and the strategic location of the target area for palm date's investment. Although the current situation under the prevailing yields and prices is not in favor of palm date's investment but the potential looks promising. Thus government interventions and application of suitable policies are critical to provide incentives to the palm dates producers in the country by giving momentum to address the prerequisites of dates exportation, technology transfer, international collaboration, highlight priorities to address major hindrances for facilitating date palm marketing and date palm growing network, these solutions will ease to achieve dates farming sustainability and formulating relevant policies that provide reasonable and stable prices to dates producers.

Further, it is essential also to consider that proper management of palm dates farms production, handling, improvement of marketing strategies and processing implying cool storages and modern transportation as fundamental for sustainable palm date farms in Sudan. This should also be supported by encouraging private funding and professional investors in date products marketing to ease the State's responsibility and promote date farms in the country. Nevertheless, public investment is needed to improve palm date production and marketing. Vitally and important is the need for reviving the marketing system in area of the study and make strong links with national and international markets. Equally important is the maximization of use of the available agricultural resources for producing high quality cultivars of dates, exchange of

germplasm and conservation, setting up of in vitro culture labs for improving date crop combined with the other perennials combination.

Lastly, the conventional farming system of dates and the low quality of many of the grown date varieties will need to be addressed by gradually shifting to high-quality dates and accordingly provide incentives to make this crop more profitable due to its importance for malnutrition and farmers' livelihood.

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