Funded by the European Union

Dates Value Chain Analysis

in Tarim District - Hadhramaut - Yemen

Implemented by the Small and Micro Enterprise Promotion Service (SMEPS)

With the United Nations Development Programme (UNDP) in Yemen

Funded by the European Union (EU)

2022

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وكالة تنمية المنشآت الصغيرة و الأصغر
Small&MicroEnterprise PromotionService

SIERY
Strengthening Institutional and Economic Resilience in Yemen
مشروع تعزيز المرونة المؤسسية والإقتصادية في اليمن

Date Value Chain Analysis

In Tarim District - Hadhramaut - Yemen

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Note:

During field visits to collect data, ODK technology - electronic data collection by smartphones - was used, without the use of the Internet. The servers of the SurveyCTO site were used to store data.

A photo showing the data collection process through the SurveyCTO application by the team with one of the players in the chain

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Saleem Ali
R&D Supervisor
SMEPS

Abbreviations

Symbol	Expression
EU	European Union
FGDs	Focus Group Discussions
kg	kilogram
km	kilometer
m	meter
PESTLE	Political, Economic, Social, Technological, Legal, and Environmental
SIERY	Strengthening Institutional and Economic Resilience in Yemen

Symbol	Expression
SMEPS	Small and Micro Enterprise Promotion Service
SWOT	Strengths, Weaknesses, Opportunities, and Threats
Ton	ton (1000 kg)
UNDP	United Nations Development Programme
USD	United States Dollar
[1]YR	Yemeni Riyal

Definitions of Key Terms

Term	Symbol	Definition
Value chain	**VC**	The value chain (VC) is a set of activities and procedures related to each other and necessary to convert the primary resources used (inputs) into products or services (outputs), which in turn go through different stages of production to give the product added value until the latter reaches the final consumer in the chain (Porter, 1985).
Value chain players	**VCA**	Value chain players, value chain actors, or value chain workers are all terms with the same meaning.
Supply Dealers	**---**	Supply dealers are suppliers of supplies and needs of chain producers.
Producers	**---**	The producers in this study are farmers.
Aggregate Retailers	**---**	Aggregate retailers are traders who buy products (dates) and sell them in retail quantities without any processing to convert them to other products.
Aggregate Wholesalers	**---**	Aggregate wholesalers are traders who buy products (dates) and sell them in undivided quantities and without any processing to convert them into consumable products.
Processing Retailers	**---**	Processing retailers are traders who buy products (dates) and sell them in retail quantities and process them to convert them into other products.
Wholesale & Retail Processors	**---**	Wholesaler and retailer processors are traders who buy products (dates) and sell them in both small and large quantities, processing them to transform them into consumable products..
Enablers	**---**	Enablers are the authorized entities with the power to make decisions and formulate laws and regulations for the sector.
Supporters	**---**	Supporters are entities that seek to support the sector.
Full-Time Employment	**FTE**	The number of jobs during the year where these jobs are 8 hours per day, 26 days per month, and 12 months per year, that is, a total of 312 working days during the year.
SWOT Analysis	**SWOT**	SWOT analysis is a cognitive process that examines the interrelationships between the internal and external environments of the sector or project, where SWOT analysis is based on a mixed (subjective-objective) evaluation of strengths, weaknesses, opportunities and threats (Ghazinoory, Abdi, & Azadegan-Mehr, 2011; Amato, Andreoli, & Rovai, 2021).
PESTLE Analysis	**PESTLE**	PESTLE analysis is a common research tool used to analyze and classify Political (P), Economic (E), Social (S), Technological (T), Legal (L), and Environmental (E) issues (Rastogi & Trivedi, 2016; Song, Sun, & Jin, 2017).

1 The dollar rate according to the study area (Tarim District) was 1,100 Yemeni riyals in March 2022.

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Executive Summary

This report reflects the results of a value chain study and analysis of the date value chain in Tarim District, Hadhramaut Governorate, Yemen, in 2022. The study was implemented by the Small and Micro Enterprise Promotion Service (SMEPS) with the United Nations Development Programme (UNDP) in Yemen in March 2022 and funded by the European Union (EU).

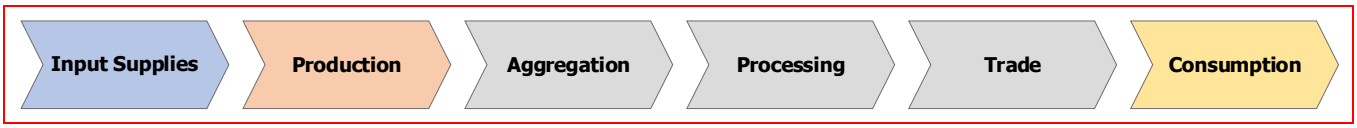
The study was conducted through collection of primary data from the target area through key informant interviews and focus group discussions; where several interviews and workshops were conducted with multiple stakeholders and value chain actors including input suppliers, producers, traders, consumers, companies, local authorities and other relevant authorities.

The study is divided into four main parts: -

- Background and Overview Section
- Study Methodology
- Findings
- Development Strategy

Key Findings:

The study outcomes show 6 stages of the date value chain in Tarim District, and the following figure shows these stages starting from the supply inputs through to consumption.



Through SWOT and PESTLE analyses of the date palm sector in the Tarim District, the results showed that the players in the supply chain have the ability to be patient and perseverant, and possess qualified and experienced labor as the main strengths. In addition, there are favorable opportunities for the growth and development of this sector, represented in its good economic return for the players, and the suitable environment in the Tarim District for cultivating, producing, and using the date palm crop, and encouraging investment in this sector. The analysis also showed the existence of weaknesses, such as a lack of capital, heavy burdens and responsibilities on the players, and low quality. The threats included the spread of diseases, pests and insects, the scarcity of agricultural land due to urban expansion and the flooding of land, in addition to the volatility of prices and the high costs of transportation and labor.

The study also showed that date palm fruit move in two different forms, fresh and dried dates, from the producers to the market, and the selling prices are affected by the type of product and date palm variety. Some varieties, such as Sukkari, Barhi and Madini, are sold at relatively high prices compared to other varieties, with the highest average selling price reaching YR 1,243 / kg. Dates can be harvested at two stages, when preferred for direct consumption as fresh dates, while other varieties such as Al-Jazaz, Al-Majraf and Arafad are harvested when fully ripe to become dried dates, and they fetch an average price of YR 495 / kg.

The date palm value chain moves through five types of traders to reach the final market and through seven main flow channels from the producers. The direct channel from the producers to the local markets has an average price of YR 1,925 / kg and a flow rate of 26.3% of the production quantities, making it the highest in terms of price. The highest flow channel, however, is where the producers sell to retailers, representing 30.9% of the production quantities and is sold at an average of YR 1,243 / kg.

The date palm value chain in Tarim District provides job opportunities for ten workers per player in the chain, where the average percentage of women among these workers is 39%. Also, more than half (54%) of the workers per player in the chain are from within the family. In general, each player in the chain provides 1,499 workdays per year and spends approximately YR 5,658,400 on labor costs.

The dates, both fresh and dried, pass through a diverse exchange network of 15 marketing channels with close marketing margins for producers in most channels, ranging from 49% to 58%, except for channel 15 which achieved a marketing margin of 100% for producers when marketing their products directly to the local market. However, in this channel producers bear additional costs for transportation and marketing. In channels 13 and 14, producers receive 28% and 19% of the marketing margin, respectively, which is attributed to selling lower quality products that require higher costs of reprocessing and production, borne by the manufacturing plants, which explains why they receive the remaining percentage of the marketing margin.

The date palm value chain faces several problems and obstacles, the most significant being the fluctuating exchange rate, which is experienced by all players in the chain. This results in low incomes, high fertilizer costs, and higher prices of date products. Other problems include high transportation costs, weak security measures among supply traders, the spread of diseases and pests, low product quality among farmers, lack of capital, entry of external competing varieties, low product quality and unstable supply for consumers and the market. Finally, there is a lack of training and awareness of the importance of date palms, a shortage of skilled labor, and insufficient budget among enablers and supporting organizations. It is worth noting that the most significant problems according to PESTLE analysis were economic, followed by technological, then social problems, which contributed negatively to the economic situation in Yemen and increased the suffering of the players in the chain. The players in the chain agreed that the government is primarily responsible for improving and developing the date palm sector.

The study recommends that the date palm sector in Tarim requires a set of interventions that extend along the entire value chain, starting from input suppliers to the market. The study participants proposed that there are interventions that can contribute to the development and growth of the sector, providing high quality, productivity, disease resistance, and the the use of modern agricultural technologies, irrigation and fertilization systems to improve the quality and quantity of production. It will also be important to conduct training and qualification courses for workers in the date palm sector, including input traders, producers, factory owners, and agricultural engineers in production areas to develop their skills in proper agricultural practices to empower the community in combating pests, reducing costs, and increasing productivity and profits.

The study results also show the importance of organizing producers into entities and associations that connect them together and continuously provide them with services and technical support to face production challenges and ensure appropriate marketing of their products at fair prices, which will have a significant impact on improving production, as indicated by the study participants.

In addition, interventions in the lending and financing sector are considered a top priority to develop the date palm industry and enable traders to own modern equipment and machinery for packaging and processing to reduce costs and increase productivity.

1 Background and Overview

This section includes a preface to the project and value chain analysis, and then an introduction and objective of the study

1.1 Forward and Preface

In order to develop a number of vital economic sectors in Yemen, the United Nations Development Programme (UNDP), with funding from the European Union, worked on implementing the Strengthening Institutional and Economic Resilience (SIERY) project with a group of local partners. The project aims to strengthen institutional and economic resilience through a value chain approach. The project began implementation at the beginning of 2022 in the governorates of Hadhramaut, Aden, Sana'a, and Hodeida, in a number of different and important sectors in each governorate.

The United Nations Development Programme (UNDP) organized workshops in collaboration with a number of organizations and local implementing partners to involve local authorities, the private sector, associations, unions, and other stakeholders in all targeted directorates of the project in selecting priority economic sectors. The workshops discussed the nominated sectors from the communities and identified the priorities that the project will work on developing. From the outcomes of these workshops, the targeted sectors were selected.

The Small and Micro Enterprise Promotion Service (SMEPS)[2] role in the project is working to enhance the selected economic sectors in each target areas, according to the selection of the sectors by several actors in the target locations. The agency's main role is to first, conduct a detailed value chain study of the selected economic sector in the target area, and provide the needed technical and financial support to the chain actors based on the value addition and gaps. In particular, the agency's role include:

- Support smallholder producers in the selected value chains to overcome the constraints they face in increasing production, productivity, and income, thus improving their livelihoods. In addition, smallholder producers will be supported using the "poverty markets" approach, which will enable them to access markets and financial services by facilitating linkages and encouraging their roles in the market.
- Fill gaps within the selected value chains by strengthening linkages between producers, smallholder farmers, supply chain enablers, and markets, including SMEs and large business associations.

After selecting the targeted economic sectors for the project, the Research and Development team at SMEPS began implementing value chain studies for the identified sectors in each district to determine intervention priorities in these sectors and assist local authorities in developing plans that contribute to the development of the studied areas. The studies were carried out by teams consisting of SMEPS employees, sector experts and technicians. The teams used survey forms specific to the study for each stakeholder along the value chain. The survey process was conducted through individual meetings & focus group discussions with selected samples from all stages of the value chain.

2 The Small and Micro Enterprise Promotion Service, a Social Fund for Development subsidiary, was established in 2006. Its mission is to provide business development services through innovative and creative projects that help the growth of various economic sectors, following a business development approach, value chain analysis, and entrepreneurship. Under the current situation, SMEPS has been implementing emergency projects that aim to assist vital economic sectors to continue providing services to the community (agriculture, coffee, fish, honey, livestock, and health) using the same development approach.

1.2 Concepts in the Study

The recent global focus on cost reduction has led to the introduction of suitable methods to achieve this goal under competitive pressure and in the pursuit of excellence. In this context, value chain analysis has emerged as one of the methods for cost reduction due to its advantages in distinguishing between value-adding activities and those that do not add value. With this distinction, it has become possible to identify areas of improvement and places of excellence to enhance them (Omar K. , 2010). Understanding the value chain of goods & services is important for planning and implementing program interventions, which allows individuals to contribute to the comprehensive economic development of sectors & country strategies. It is useful to understand the relationship between producers, suppliers, transporters and traders.

1.2.1 Concepts in Value Chain

1.2.1.1 Value Chain Definition

In 1985[3] Porter introduced the concept of value chain (VC) as a set of interrelated activities and procedures necessary for transforming the primary resources used (inputs) into products or services (outputs), which pass through various production stages to add value until they reach the final consumer in the chain (Porter, 1985). The United Nations Industrial Development Organization (UNIDO) describes the value chain as a complete set of activities necessary to prepare a product that passes through various stages of production, from the initial inputs to the final destination in the market (The UNIDO Approach, 2009). Stabell & Fjeldstad (1998), go further to propose that value chain analysis should evolve into value components analysis. They defined the value chain as an approach to analyzing the competitive advantage at the enterprise level based on three value-creating technologies and logic, in addition to the value chain. They also added two other value formations: value shop and value network. All three of the above formations are based on the logic of value creation. The value chain relies on transforming inputs into products; the value shop revolves around customer problems and solutions; and the value network is based on connecting customers.

Therefore, the actors in the value chain who are responsible for transporting materials and/or information and/or services share an interest in the final product, because changes in the final market affect all players in the chain. Value chain can also be defined as the relationship established between different players in the chain with the aim of adding value and sharing the risks associated with each stage of the product flow, from the production stage to its final consumption. In general, the value chain includes input suppliers, producers, traders, distributors, processors, and final consumers. Partners within the value chain work together to identify their best goals, with a willingness to share risks and profits and efficiently utilize time, energy and resources (UNDP, 2016).

Al-Falouji (2016) summarizes that the value chain is a set of multiple activities that work to prepare a product or service from its early stages in the chain (the product) and through its other stages in the production chain until it reaches

3 Professor Michael Eugene Porter at Harvard Business School, University of Bishop William Louise.

the final consumer. The value chain is an analytical tool that links all steps and activities together, including inputs, production, processing, and distribution. Each step is analyzed with the previous and subsequent steps, and the value chain also works to enhance strengths, address potential weaknesses, avoid threats, and exploit possible opportunities, using the SWOT analysis tool. This contributes to ensuring the continuity and sustainability of businesses or projects while being able to adapt to current economic conditions.

Therefore, the value chain is considered a working methodology for analyzing strengths, weaknesses, and competitiveness at the organizational and production levels. The value chain should be classified into its strategic components to better understand the impact of each component on cost and value.

1.2.1.2 Value Chain Goals

There are several objectives for studying the value chain as stated by Gereffi (1999), Omar (2010) and Zaghloul (2003), which can be summarized as follows:

- Increase value and enhance competitiveness in the labor market for players and value chain establishments.
- Increase benefits for value chain players through the division and organization of integrated activities between value chain players in a sequential and functionally and logically interconnected manner, and providing products or services with a competitive advantage for the end consumer in the value chain.
- Develop a joint mechanism for work between value chain players, which in turn will help in decision-making, policy and strategy development, organizing production processes, and using information technology to provide products and services that meet consumer needs.
- Distinguish between value-adding activities (and enhance them) and non-value-adding activities to address them in the value chain.
- Use resources efficiently.

1.2.1.3 Importance of Value Chain Analysis

The importance of analyzing the value chain lies in identifying the best interventions to enable small producers and other players in the chain to overcome production and food shortages, as well as poverty. This helps improve their income level and continue to develop their businesses. The importance of analyzing the value chain can be summarized as follows, as stated by Ronald (1981) and Omar (2010):

- Generate opportunities and ideas for developing the player in the chain by diversifying products, improving their quality and reducing costs.
- Determine and identify the costs in the supply chain.
- Help reduce operational costs.
- Help in arranging performance.
- Identify opportunities for business development.
- Help identify performance indicators for management information systems within the organization.
- Help improve decision taking.

It is worth noting that poverty can be reduced through production by developing value chains. This works to increase the prices of producers and players in the chain, establish strong and inclusive organizations for producers (cooperatives), effectively reach the most vulnerable groups such as women, and lower prices for consumers by improving the efficiency of the chain.

1.2.1.4 Definition of Value Chain Mapping

Planning the value chain is a central element in the analysis of the value chain. It is used to show the flow of transactions from raw material and input sources to production, processing, marketing and final sale. The maps can also illustrate costs and value added at each stage, critical constraints, and the relative influence of players along the value chain (UNDP, 2016).

Value chain maps provide an easy way to understand the processes and paths leading to production and sales by simplifying the complexities of the industry sector and its value chain. They are particularly useful for analyzing value chains and researching them to determine how they are performing, how they can be improved, or how they can be refined. The maps align sectors and participants and produce a common picture not only of what the industry or sector is doing but also of how it could look. They can also be developed collaboratively to enhance a shared perspective among all participants or some of them. This can be of utmost importance for the ability of concerned companies to innovate, or for them or the sector to develop or improve the value chain (Economic Development Board, 2015).

1.3 Background Information

1.3.1 Overview of the SIERY Project

The Strengthening Institutional and Economic Resilience in Yemen (SIERY) project aims to improve productivity and resilience in promising value chains, create job opportunities, improve livelihoods, and enhance food security and household nutrition. The SIERY project - Strengthening Economic and Institutional Resilience in Yemen - aims to improve productivity and resilience in promising value chains, create job opportunities, and improve livelihoods and food security, and family nutrition. This follows the project's theory of change, which assumes that if value chains are improved, livelihoods will be improved through job creation, increased income, as well as production and productivity.

This follows the project's theory of change which assumes that if value chains are improved, livelihoods will improve through job creation, increased income, as well as production and productivity.

Therefore, targeted companies and associations will become more resilient and able to effectively deal with the fragile economic context and continue to provide vital commodities related to food security. In addition, communities will be more resilient and able to effectively deal with low levels of food security, decreased health services, low levels of nutrition, and increased poverty, and thus be strong drivers towards recovery and peace building efforts.

The project aims to implement the economic resilience project to strengthen vital value chains in the Yemeni economy, with the main objective of enhancing food security, improving access to health, and creating job opportunities.

The grant will help implement a value chain development approach to support the resilience of micro, small and medium-sized enterprises in selected value chains in the targeted areas, to assist communities, households, SMEs, and the vulnerable to access the basic building blocks for early recovery, sustainable livelihoods, and improved access to food and health. Therefore, the targeted companies and associations will be more flexible and will be able to deal effectively with the context of fragility and continue to provide vital commodities related to food security. In addition, societies will be more resilient and will be able to deal effectively with current food insecurity, health and nutrition, and poverty, and will be powerful drivers of recovery and peacebuilding efforts.

The project aims to implement the Economic Resilience Project to strengthen the vital value chains of the Yemeni economy, with the main objective of enhancing food security, access to health, and job creation.

The grant will help implement a value chain development approach to support the resilience of Micro, Small, and medium enterprises in selected value chains, and in the same target areas, to help provide communities, families, and vulnerable SMEs with the building blocks to move toward early recovery and sustainable livelihoods and enhance their access to food and health.

1.3.2 The Objective of the Study

Based on the project document, the objective of the study will help in conducting initial value chain studies for the target sector to identify economic gaps, opportunities, and the main players in the chains to be supported.

This study will also assist in the selection of business intermediaries (supply chain enablers), SMEs, entrepreneurship companies, MFIs, markets, and market players such as input supply traders, microfinance institutions, business consultants, and small producers to be targeted in the project.

The study will be conducted by the Research and Development Unit at SMEPS. The studies will cover the targeted areas of intervention with the involvement of stakeholders involved in the chains, particularly chambers of commerce and local authorities.

1.3.3 Importance of Date Commodity

The date palm (*Phoenix dactylifera* L.) is a valuable plant that provides an important source of income for both local farmers and governments in arid and semi-arid regions around the world. The majority of date palm cultivation continues to occur in the hot deserts of North Africa and the Middle East, including Syria and the Arabian Gulf, and northern Yemen (Shabani, 2012).

According to the Food and Agriculture Organization (FAO), the Middle East and North Africa are currently the largest producers of dates in the world, and Arabian dates are known for their taste. Dates are also an important commodity, as they are rich in nutrients and have a delicious taste. From a health perspective, fresh dates are a good source of vitamin C, although it disappears once they are dried. Dates are also a good source of sugar, carbohydrates, fiber, calcium, iron, and potassium and do not contain a large amount of harmful fats or cholesterol (Muhammad, 2014).

According to a Nation Master study, since 2014, Yemeni date production has increased by 4.3% year on year. In 2019, Yemen ranked 14th compared to other countries in date production at 64,375 tons annually. Morocco overtook Yemen and ranked 13th with 101,537 metric tons. Yemen was followed by the United States with 55,700 tons. Egypt ranked highest with 1,603,762 tons in 2019 (Master, 2019).

Therefore, the date palm occupies an important place and is still a major agricultural food source. Dates top some meals for their nutritional value being a good source of carbohydrates, mineral elements and vitamins. Thus, dates are considered a food crop that contributes to achieving food security. With all these benefits, including the use of palm waste in national industries, it is necessary to focus on date production and palm care by identifying production and marketing obstacles in the date sector (Hadrami House for Agricultural Information, 2012).

Photos showing various date types and products

1.4 Introduction

Yemen is known for its palm cultivation and date production since ancient times, and dates are one of the most important fruit crops. The area planted with date palms accounts for 25% of the total area of fruit trees, and palm cultivation in Yemen is spread in two main locations (Alwan, 2017):

- **Dry hot areas:** Wadi Hadhramaut, Al-Jaouf, Shabowah, and Marib.
- **Hot coastal Areas** The coast of Hadhramaut, Tihama Plain, Hodeidah, Abyan and Lahj. Palm cultivation in Yemen is concentrated in Hadhramaut and Hodeida, where 67% of date palms in Yemen are found.

Dates are an important food crop in Yemen. There are approximately 4,680,000 palm trees, of which 3,276,000 are fruitful and 1,404,000 non-fruitful. They occupy a total cultivated area of approximately 15,946 hectares with a production capacity of about 20,969 tons annually. The cultivated area with date palms in Hadramout is approximately 5,037 hectares, or 32% of the total area cultivated with date palms in Yemen, with a production capacity of about 6,477 tons (Green Dream, 2020).

Despite the importance of date palms in Yemeni society, their cultivation faces several problems and obstacles that threaten their survival or at least the continuation of their traditional heritage in the memory of Yemenis. As a result of the urban sprawl of Yemeni citizens generated by the conflict, palm trees are uprooted and replaced by concrete columns. In addition, date palms are affected by diseases and insect pests that include false smut, black and crazy blight, root rot, shoot death, fruit rot, fruit wrinkling and fruit shrinkage.

The emergence of insect pests threatens the survival of palm trees in Yemen. These pests include *Ommatissus lybicus* (dubas bug), *Batrachedra amydraula* (lesser date moth), *Rhynchophorus ferrugineus* (red palm weevil) and *Oligonychus afrasiaticus* (mites), currently the most dangerous of them being the dubas bug that can cause the fruit from a single tree to decline from 30-50 kg to less than 10 kg. These bugs infiltrated Hadhramaut due to the lack of agricultural quarantine on exports and imports of plant samples, especially through land border crossings. A new pest, the red palm weevil, has appeared over the last two years. It is more dangerous than the dubas bag, and is expanding its territory, especially in Katen, Sayoun and Tarim. Official authorities are no longer capable of controlling this pest and limiting its spread to the remaining areas of palm cultivation in Hadhramaut.

A report issued by the National Information Center for the year 2011 (Ministry of Agriculture and Irrigation, 2020) showed that the rate of increase in production between 2008-2011 was about 0.41%, and that the average production of dates was 56,650 tons over an average agricultural area of 14,809 hectares. That is, in the pre-conflict period, the productivity of dates was stable and relatively dense, contributing to the economy and income of the country. Reports have shown, according to Halim Akhdar (2020), that date production in 2020 reached about 20,969 tons over a total area of about 15,946 hectares, a decrease due to the impact of conflict, climate change, natural disasters, and tensions between modern and traditional agricultural practices in Yemen. This led to a significant decline and deterioration in the date palm sector from previous years, where productivity has decreased by 62% compared to the period between 2011 and 2020. Some of the decrease is due to climate change, and natural disasters such as floods that have led to the disappearance of

palm trees from some locations. In addition, there has been the displacement of some farmers from their lands, where the conflict has had a direct impact on agricultural infrastructure and water availability, hindering the cultivation and harvesting of crops and negatively affecting food security in general.

Therefore, the palm tree occupies a significant place in the minds of Yemenis, especially the inhabitants of the valleys, as it was and still is a significant source of agricultural food. Dates top some meals due to their nutritional value containing carbohydrates, key mineral elements and being a good source of vitamins. Therefore, dates are considered one of the food crops contributing to achieving food security. For all of this and the benefits of palm tree waste in national industries, it has become necessary to care for date production and palm trees by identifying productivity and marketing obstacles in the dates sector (Maqeel, 2000).

1.4.1 Date Sector in Tarim District

Tarim District is one of the districts located on the eastern side of the Hadhramaut Governorate. It is about 34 km away from Sayoun, has an area of about 2,894 km^2, and its population in 2004 was estimated at around 105,552. Population estimates for 2019 predicted an increase to about 155,611 people (Food Security Integraed Phase Classification, 2020).

Tarim District is characterized by a vast flat plain flanked by mountain ranges on the northern and southern sides. Many valleys are located within the two plateaus, the most important being Wadi Adham, which descends from the southern plateau, and Wadi Thibi and Wadi Al-Khun, which descend from the northern plateau. All these valleys flow into the general plain district of Wadi Hadhramaut, where population clusters and agricultural lands are located (Knowledge, 2022). Palm cultivation is one of the most important agricultural activities in the Tarim district because of multiple uses for dates and palm trees in nutrition, decoration, and combating desertification. Palm trees provides job opportunities for rural families in the region (Maqeel, 2000).

The climatic conditions that characterize Tarim District, such as high temperatures, dryness and high soil salinity, have not prevented the spread of palm cultivation since ancient times. This may be due to the palm tree's ability to adapt to harsh climatic conditions. However, these climatic, natural and geographic conditions of the district are one reason for the decrease in palm productivity, in addition to production and marketing obstacles that hinder its development.

1.4.2 Impact of Climatic Change on Production

Yemen is particularly vulnerable to the impacts of climate change due to its heavy reliance on water resources. The per capita share of annual water resources is only 195 cubic meters, and Yemen is already facing severe water scarcity. However, the country relies heavily on water, with more than 90% of water used by the agricultural sector, and there is strong unmet demand from residential and industrial users. The country is also exposed to severe storms that produce flash floods interspersed with long periods of drought. In addition, groundwater reserves will be exhausted in the foreseeable future, and only climate change in the best-case scenario will delay this for a few years (World Bank, 2010).

Date palm (*Phoenix dactylifera* L.) is an important cash crop in many countries, especially in the Middle East. Understanding the potential distribution of this crop under current and future climate scenarios will enable decision-makers to develop appropriate strategies to manage changes. Climate change has serious effects on the agricultural sector due to direct exposure and reliance on weather conditions, both in agriculture and other natural resources (Farooq, 2021).

This means that climate change is expected to have a significant impact on agriculture and food production in the Middle East, particularly by reducing water availability and direct effects on crop yields. For example, during the 2010 season, many date farmers observed unusual early flowering as a direct result of climate change. It is also expected that climate change will significantly affect agriculture and food production in Saudi Arabia, particularly due to limited water availability and direct effects on crop yields (Allbed, 2017).

In Yemen, date farmers have faced multiple challenges over the past decade. Pest infestations, such as red palm weevil and locust epidemics, have worsened on farms. The increase in desertification resulting from climate crises and invasive plant species has affected the water sources necessary for date palm cultivation. There has been a sharp decline in production during the current war, with estimates suggesting the loss of nearly half of the four million palm trees since the beginning of the conflict. These are significant numbers considering that food insecurity has pushed millions of Yemenis to the brink of famine (Zwijnenburg, 2020).

Photos showing a date farm in Tarim District

2 Study Methodology

The study was structured in a methodological, scientific manner and organized in several steps to ensure efficient and quality data.

2.1 General Approach to the Study

The study adopted the descriptive and analytical approaches of value chain analysis as the study went through the following five stages:

- **First** Stage: Stakeholders were involved, and the target sectors selected.
- In the **second** stage: Communication was established with the consultants, the team of workers selected, and the study needs of various forms and templates identified.
- In the **third** stage: The data was collected, verified, and processed.
- In the **fourth** stage: The data was reviewed and analyzed.
- The final **fifth** stage**:** The report was written and distributed to stakeholders.

Details of the implementation stages of the study are shown below in Table no.1.

Table no.1 Shows the stages of the implementation of the value chain study

المراحل Stages	النشاط Actions	المخرجات Outputs
Selection of target sector	• Participation of stakeholders in the target area and setting their priorities. • Participation of target chain players in identifying chain players and the problems of the sector • Coordination with concerned entities to start studies and project	• Induction workshops by the donor team • Workshops by the SMEPS team. • Sector problem analysis forms at the level of each player in the chain
Preparing study needs	• Desk review and revision of accessible reports and statistics • Define and map the players and value chains of sectors, and the initial analysis of stakeholders • Selection and evaluation of the work team (specialists + team leaders + data collectors + reviewers and verification of data + coordinators + translators + editors) • Preparing an electronic portfolio for the work team that includes (a simplified value chain guide + electronic survey guide + work procedures guide + templates and forms for the project and study and other necessary papers and documents) • Development of primary data collection tools (paper and electronic data collection forms (ODK-CTO) and value chain study report template) • Training for the work team and distribution of samples and tasks	• Available reports and statistics. • Training workshops • Lists of target value chain players • Electronic portfolio • Paper and electronic data collection form • Data collection sheets
Data collection and verification	• Field visits and communication with targeted people to collect data for target sectors of the value chain • Data review and verification • Data processing	• Data collected in the SMEPS system • Lists of visits and communication with the targeted people • Reports of work team • Photos of communication with targeted people
Data review and analysis	• Review of the key technical and financial data of the study • Statistical data analysis • Mapping the value chain players of the targeted sectors • SWOT analysis and analysis of sector-related problems • Analyze the quantitative and financial flows of a product across chain players. • Suggest recommendations for the development of the target sectors.	• Analysis results • Map of value chain players • SWOT analysis and quantitative and financial flows • Recommendations
Report writing and publication	• Writing the initial version of the report • Re-drafting the report and designing graphs and figures • Writing the final version of the report and translating it into Arabic and English • Printing the report • Distribution and sharing of the report with stakeholders	• Draft report • The final report in Arabic and English • Wrap-up workshops

2.2 Study Scope

2.2.1 Implementation Date

The study data were collected in March 2022.

2.2.2 Study Area

The study targeted Tarim District in Hadhramaut Governorate - the largest governorate of Yemen. Tarim District is located in the eastern part of the governorate with the coordinates (16.05°N 49°E) as shown in Figure no. 1.

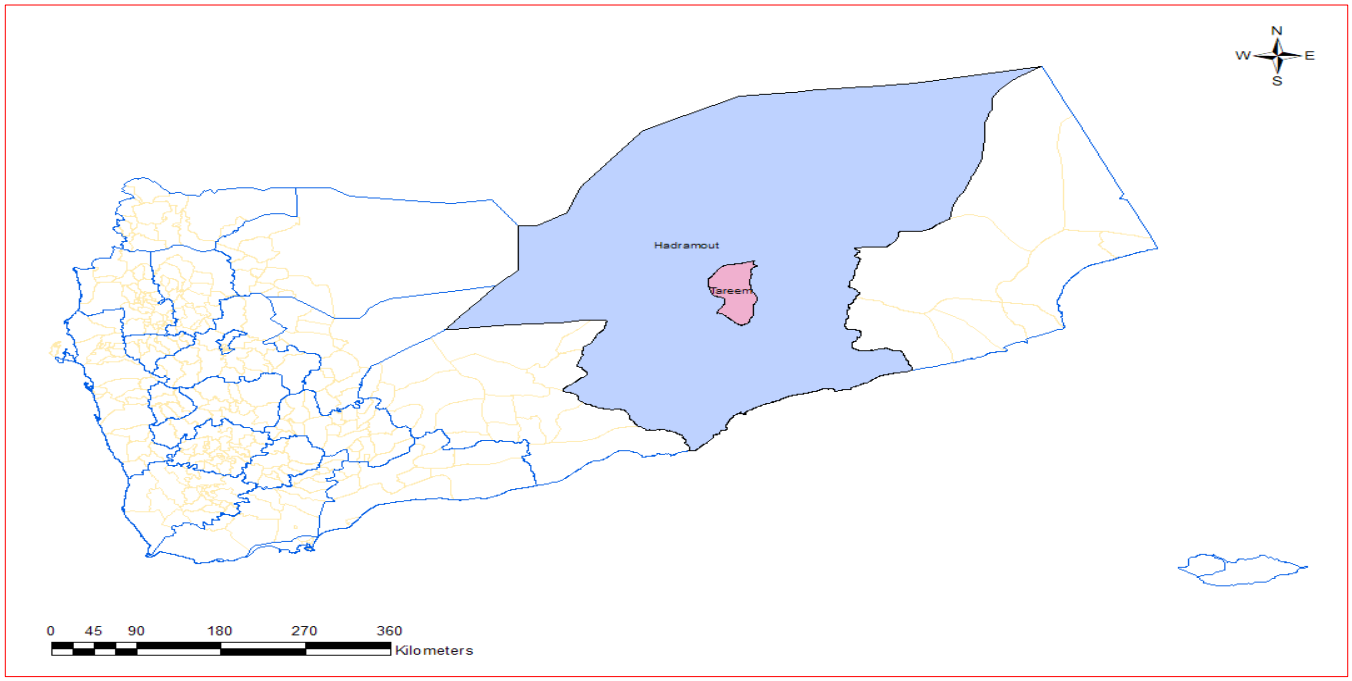


Figure no. 1: Map of study area

2.2.3 Teamwork

The work team consisted of 13 members, divided according to an organized work structure (refer to the work team page at the beginning of the study for more details). This structure ensured the order of work, the sequence of the data collection, and a study free from any errors and with accurate and logical content. The work team structure consists of the following:

- 1 officer in charge of implementing the study + data analyst
- 2 technical and administrative assistants
- 2 study consultants
- 1 data collection team leader
- 4 data collection team members
- 1 data reviewer + verification + data analysis
- 1 external report reviewer (UNDP)
- 1 English translator

In addition, another team of SMEPS staff worked on reviewing and reformulating the text, headings and data to develop a highly efficient and accurate study.

2.2.4 Sampling

Figure no. 2 shows the sites and distribution of the study samples on a map. Table No. 2 shows the details of the sampling at the level of stages in the value chain.

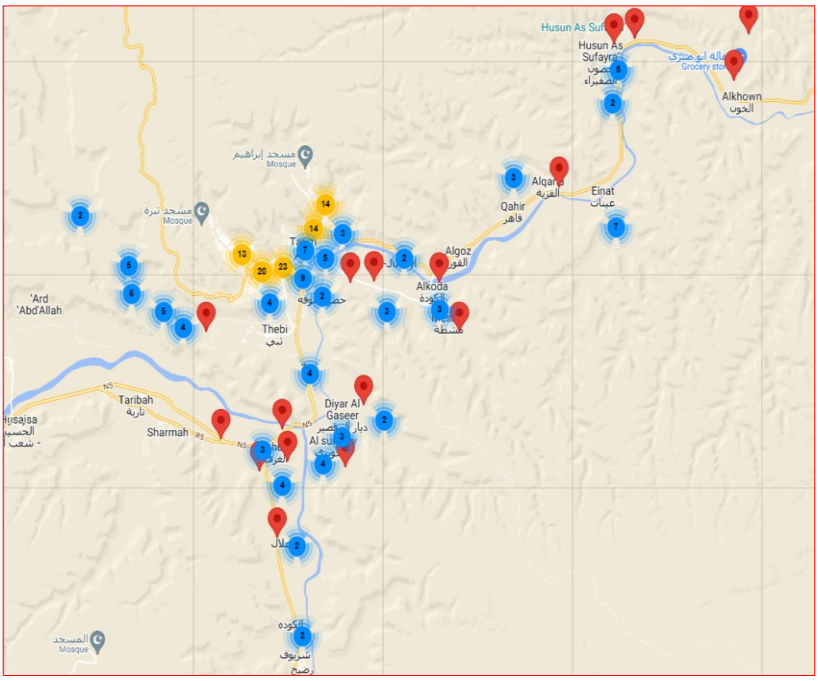


Figure no. 2: A map showing the sites of the study sampling

With the launch of the value chain study activities in the target sector, a discussion workshop was held, in which a sample of actors or players in the value chain participated. Several individuals from each link or job in the chain were divided into groups on separate tables.

At the beginning of the workshop, the participants were introduced to the study and its significance, and how it could have a role in reviving the sector. The problems of the sector were discussed, and innovative solutions were proposed by attendees to help develop the sector. These discussions enhanced the community's response to the data collection team. In addition, each group had the opportunity within the workshops to talk and express within the limits of their role and position in the chain their concerns and the most significant challenges they face. The workshops also provided an opportunity for the actors in each chain stage to hear each other and cooperate. During the workshops, participants filled out a pre-prepared questionnaire. The participants recorded the most significant problems facing them, the causes and effects of these problems on the sector, proposed solutions to these problems, and the parties responsible for implementing these solutions.

Table No. 2 Size of sampling classified at the level of date value chain stages in Tarim District (Primary Sources, 2022)

Type**	Description	Trader Suppliers	Producers	Traders / Processors / Exporters	Consumers / Market	Government and Supporters	Total
FGDs	FGD with groups of value chain players (Number of persons per group)	1 (3)	1 (6)	1 (8)	0* (0)	1 (5)	4 (22)
KIIs & Q	Chain players	13	134	40	46	5	238
Total Study Samples		**16**	**140**	**48**	**46**	**10**	**260**

** = **Type of data collection tool**: **FGD**= focal group. **KII**= Key interviews. **Q**=Questionnaire.

*** Note:** Because consumers were preoccupied and unable to attend the opening workshops, other players were the focus in the workshops at the beginning of the study. However, consumer data was taken later through interviews and questionnaires.

2.3 Data Collection and Verification

2.3.1 Data Collection

Before starting the study and collecting data from the field, secondary sources and references were gathered, and primary data collection forms were prepared for all players in the value chain. The study team was then prepared to collect primary data electronically using the SurveyCTO Collect program. The survey covered several levels of the targeted sector's value chain, where primary actors in the chain, such as producers, input suppliers, traders, distributors, and end consumers, were interviewed. The interviews also included supportive entities in the chain, such as associations, cooperatives, enablers or legislators in the chain, represented by local authorities. To carry out the study, teams were prepared with expertise related to the targeted sector, and specialists and consultants were contacted and tested to select the working team.

Before collecting any data from the field, an opening workshop was held for players in the value chain of the targeted sector, and they were divided into groups, with each group representing a specific function in the targeted value chain. The attendees were then introduced to the project and its objectives, and the most important problems in the sector at the level of each group (function) in the value chain were discussed. Primary data was collected for the problems of each function, along with proposed solutions to these problems. Data collection forms were then prepared in a way that was appropriate and compatible with the targeted sector and its players.

Photos showing the focus group discussions for each date value chain player in Tarim District

During the preparation and implementation of the workshops, a report template and data collection forms were prepared on paper and converted into electronic forms to facilitate data collection. The forms included all possible answers and options to facilitate the data collection process and increase the level of accuracy. Field visit models, achievement levels for field teams, and a model for reporting field tasks were also prepared. Additionally, three guides were prepared for the team, including a guide to the concepts of the value chain, a guide to ethical fieldwork, and a guide to the data collection process to facilitate the team's work.

After that, the work team (team leaders and field surveyors) were trained for five days. During the training period, the team was introduced to the project and its objectives, the importance of the information that will be collected, its accuracy and credibility, and how to download and activate the electronic form. The training also included aspects related to ethical and regulatory fieldwork, how to deal with the target groups, how to fill out forms, models, and daily and final

reports to complete the task. At the end of each training day, the work plan and fieldwork documents and attachments were distributed, and the target sample was distributed among the team.

Photos showing the training period of the field survey team

After preparing and equipping for all the study's needs, the field survey team set out to meet the players (stakeholders) in the targeted sector value chain. The field survey process continued for 10 working days, during which the players at all levels and stages of the chain were interviewed, and the data was sent directly to the agency's database, which was pre-equipped to receive data via SurveyCTO Collect servers. The data was immediately reviewed, verified, and any errors from the field were corrected.

According to the study plan, a clear methodology was developed for the data collection process from the field team. The sample distribution list was distributed to the team so that all stakeholders in the targeted value chain were targeted. The study included several aspects, including technical, financial, production location, work environment, and problems and obstacles faced by the players in the chain. Upon completing the data collection, the team leader checks the completeness of the forms with his team to ensure that all the form data has been completed before sending it to the data collection server.

The team leader also reviews the daily survey team reports, ensures the level of achievement, and follows up with the team through a social communication group (WhatsApp) to monitor all updates facing the team and solve their problems immediately, disseminating any observations among team members. Additionally, he receives any emergency instructions from the research and development team to disseminate to the team.

Photos showing the work team during data collection from the field

2.3.2 Data Verification

To verify the validity and accuracy of the data, a specialist was appointed to review the data as it was received. The specialist was trained on how to receive, review and follow up the data first-hand to avoid repetition of data and errors from field enumerators, and to enhance the quality of data to the highest possible degree.

Photos showing the meetings and training of the data processing and verification team

During the data collection process, an interactive dashboard was created that was linked to the study's database. The dashboard was used to monitor the progress of the field survey team and guide the team to focus on all levels of the value chain. It was also used to track the team's progress speed, the areas that were visited, and the number of forms submitted to the database for each player in the value chain, as shown in Figure no. 3.

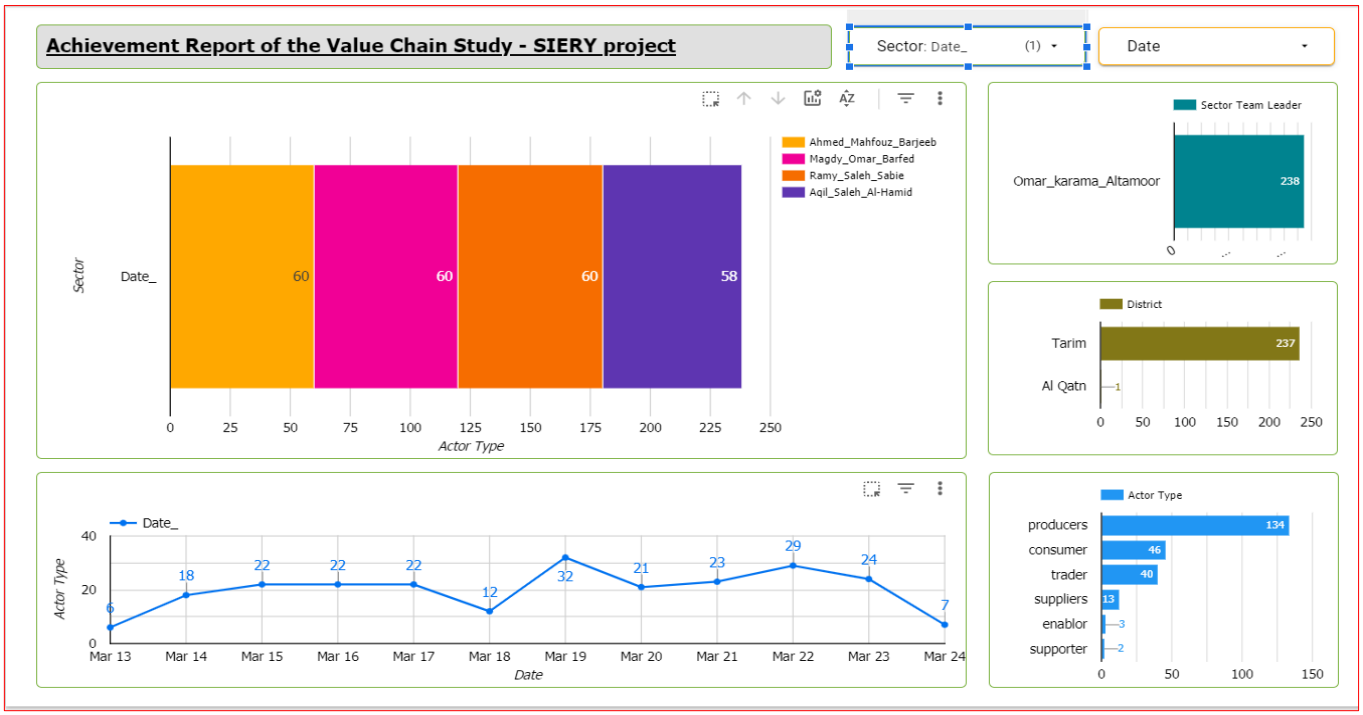


Figure no. 3: An interactive dashboard to track the daily achievements of the data collection

After completing the data collection process, the data was verified by the specialist who contacted a sample of the target group by phone to verify the accuracy and credibility of the data, ensuring that it matched what was collected from the field. Any missing data or illogical data were completed and corrected in coordination with the field team leaders and field surveyors.

2.4 Data Processing and Analysis

2.4.1 Data Processing and Cleaning

To process the data, a specialist was trained for each study to review and process the data and verify it. The data processing specialist was trained on the workflow and the concept of the value chain, how to receive and verify data, and review it in real-time to avoid duplicating data, and negotiate obstacles or erroneous data from the field data collection team. The reviewer was connected to the interactive dashboard to monitor the flow of data received from the field and to determine the level of progress of the field survey team and guide the team to focus on all links in the value chain.

Photos showing the training of the specialist in data review, processing and verification

During the data collection process, the accuracy of the data was verified by a specialist in review and verification. Random samples of the surveys that had been received in the database were contacted by phone to verify important questions and to match the answers given in the survey. Data was processed upon arrival and any missing data was completed in coordination with the field team leaders and field surveyors.

After processing and verifying the data, a meeting was held with the study specialist to discuss the mechanism for data analysis, and how to coordinate the work between the monitoring and evaluation team, the review specialist, and the study specialist in order to write the text in a report format, and to ensure coherence between the information and to maintain consistency in the report. Data analysis was conducted using Google Sheets for technical and statistical analysis, and some mathematical and statistical methods were used for variables such as averages, ranges, highest and lowest values, percentages, and other statistical measures.

The study included several aspects in its analysis, including production costs, sales prices, profit margins, and product flow channels through the studied value chain. The cash flow between the players in the chain was analyzed, and a map of the players was drawn. The SWOT analysis model was used to review the most important problems and challenges, and how they can be addressed. The strengths and opportunities were highlighted, and recommendations were proposed to develop the sector and improve the performance of the value chain in the future.

Photos showing the meetings with the study specialist and agreement on the analysis mechanism and report writing

2.4.2 Data analysis

The quantitative and qualitative data were analyzed using systematic scientific methods to reach the financial and economic indicators related to the studied value chain. One of the most important indicators studied in this report is the value added by the players in the chain, how their shares are distributed in the value chain, what is the profit margin and marketing margin for the players in the value chain, and other necessary financial and economic indicators for this study. The data were classified into two parts: qualitative or descriptive indicators, and quantitative or numerical indicators:

2.4.2.1 Qualitative Data

Descriptive data analysis is one of the most intensive tasks in the analysis process, due to the standardization and encoding of the data, dividing it into several levels and classifying it into groups and then re-analyzing it. One of the most important descriptive analyses of the study is of the players, functions, and channels of the value chain, as well as SWOT and PESTLE analysis of obstacles and problems, and the analysis of developmental strategies for the targeted sector.

2.4.2.2 Quantitative Data

There are many indicators that have been relied on to measure the performance and analysis of the value chain, including financial and economic indicators that are necessary to evaluate the financial performance of the chain as mentioned in (McFadden & others, 2011). The data for these indicators were obtained from the data collection forms for this study. The most important of these indicators are outlined below.

2.4.2.2.1 Variable Costs (VC)

Variable costs or operating costs are the costs that change with the change in the number of production units. When the number of production units increases, the variable costs increase, and when the production costs decrease, the variable costs decrease. Variable costs include fertilizers, feed, fuel, pesticides, treatments, vaccinations, transportation, water, and production labor (i.e., temporary labor), etc. The **average variable costs** can be obtained according to the following equation:

$$\text{Average Variable Costs (AVC)} = \frac{Total\ Variable\ Costs\ (TVC)}{Yield\ (Y)}$$

• Where: **AVC** is the average variable costs **TVC** is the total variable cost **Y** is the number of units produced

2.4.2.2.2 Fixed Costs (FC)

Fixed costs are costs that do not vary with changes in the production volume, and they are the opposite of variable costs. These are costs that must be paid whether or not the production process is carried out. Fixed costs include fees, subscriptions, maintenance costs, rent, permanent labor costs, and others. The **average fixed costs** can be obtained according to the following equation:

$$\text{Average Fixed Costs (AFC)} = \frac{Total\ Fixed\ Costs\ (TFC)}{Y}$$

• Where: **AFC** is the average fixed costs **TFC** is the total fixed costs **Y** is the number of units produced

2.4.2.2.3 Total Costs (TC)

Total costs is the sum of fixed costs and variable costs, and **average total costs** can be obtained according to the following equation:

$$\text{Average Total Costs (ATC)} = AFC - AVC$$

- Where: **ATC** is the average total costs AFC is the average fixed costs AVC is the average variable costs

2.4.2.2.4 Depreciation (Dp)

Depreciation is a gradual and continuous decrease in the value of fixed assets. The depreciation rate is estimated annually, and the depreciation expense is calculated by subtracting the estimated salvage value from the cost of the asset and dividing it by the asset's useful life in years. The **annual depreciation value** can be obtained according to the following equation (Abdul Latif):

$$\text{Depreciation (Dp)} = \frac{AFC - dd}{Time\ (T)}$$

- Where: **Dp** is the depreciation share **AFC** is the average fixed costs **dd** is the value of an asset after the depreciation period
- **T** is the depreciation period of an asset by years

2.4.2.2.5 Total Revenue (TR)

Total Revenue which includes the sale value and other project revenues, is the total number of units produced multiplied by the selling price or market price. **Total revenue** can be obtained according to the following equation:

$$\text{Total Revenue (TR)} = Price\ (P) * Yield\ (Y)$$

- Where: **TR** is the total revenue **P** is the sale/market price **Y** is the number of units produced

Average total revenue can be obtained according to the following equation:

$$\text{Average Total Revenue (ATR)} = \frac{TR}{Y}$$

- Where: **ATR** is the average total revenue **TR** is the total revenue (sales) **Y** is the number of units produced

2.4.2.2.6 Profit (Pf)

The profit indicator is one of the key financial indicators for measuring the efficiency of the performance of the economic units and projects (Al- Falouji, 2016). **Profit** can be obtained according to the following equation:

$$\text{Profit (Pf)} = \text{TR} - \text{TC}$$

- Where: **Pf** is the average net profit **TR** is the total revenue (sales) And **TC** is the total costs

Gross profit can be calculated according to the following equation:

$$\text{Gross } Profit = Net\ Sales - Cost\ of\ Sales$$

2.4.2.2.7 Gross Margin (GM)

Gross margin is a short-term indicator and measure of the performance of the enterprise or project. One of the determinants of this indicator is that it is not related to the time value of money (Lampkin & Measures, 1994, 2001). Gross margin is the difference between the total revenue and total variable cost of the enterprise. It can be obtained by the following equation (Barnard & Nix, 1979):

$$\text{Gross Margin (GM)} = (Q * p) - TVC$$

• Where: **GM** is the Gross Margin **Q** is the quantity of sold product **P** is the unit price for every unit sold **TVC** is the total variable or operating costs

2.4.2.2.8 Net Profit (NPf)

Average net profit is the average value of sales minus the average fixed and variable costs together. The **average net profit** can be obtained according to the following equation:

$$\text{Average Net Profit (ANPf)} = Average\ sale\ value\ (ASV) - (AFC + ACV)$$

• Where: **ANPf** is the average net profit **ASV** is the average annual sales value **AFC** is the average fixed costs **AVC** is the average variable costs

2.4.2.2.9 Value Added (VA)

The value added is the value generated at each stage of production and marketing along the value chain and ends when the product reaches the final consumer. This indicator is used to measure the importance and competitiveness of the production project and its contribution to enhancing the country's GDP. That means the more the added value of the project, the more the project contributes to increasing the national domestic product (Al-Falouji, 2016). This indicator is one of the necessary planning indicators in distributing resources to the various projects to achieve social benefit (Al-Ezzi, 1989).

The value added can be measured for the product in the value chain as the difference between sales revenue and the cost of external purchases and services (direct production costs). The following equation illustrates the method for calculating value added (Karpik & Belkaoui, 1990):

$$\text{Value Added (VA)} = Revenue\ (R) - Variable\ Costs\ (VC)$$

• Where: **VA** is the value added at the level of each player **R** is the returns or revenues (outputs) **VC** is the operating cost (inputs)

The added value is estimated for the players, links, or levels of the chain between the producer and the consumer by calculating the price difference between the selling price and the purchase price (Al-Falouji, 2016):

$$\text{Value Added (VA)} = Sale\ Price\ (SP) - Purchase\ Price\ (PP)$$

• Where: **VA** is the value added at the level of each player **SP** is the selling price And **PP** is the purchase price

The same equation above is used to estimate the marketing margin (MM) for each of the chain players.

2.4.2.2.10 Share of Value Added (SoVA)

This indicator is used to know the share or proportion of each player in the studied value chain, which as stated by (Kulmiye, 2010), is the ratio of value at each stage of product manufacturing and/or product distribution or at the level of wholesalers, retailers, and other players in the chain. This value can be obtained by dividing the value added at any player's level in the chain by the total value of all players in the chain. For example, the value added at the product level is the sale price minus the production cost, while the value added for other players in the chain is the difference between the sale price and the purchase price divided by the total value added for all players in the chain. The share of value added can be obtained through the following equation (Al-Falouji, 2016):

$$\text{Share of Value added (SoVA)} = \frac{Value\ Added\ at\ Market\ Level\ (VAi)}{Total\ Value\ Added\ (TVA)} * 100$$

- Where: **SoVA** is the share/ proportion of the value added **VAi** is the added value for each player in the value chain
TCA is the sum of value added for all value chain players

There is another term called "Share of Value" similar to "Share of Value Added", and the SoV approach is used to compare the Gross Margins of players or entities in the value chain.

$$\text{Share of Value (SoV)} = \frac{GMi}{TGMvc} * 100$$

- Where: **SoV** is the share/ proportion of the value added **GMi** is the total profit margin per one player in the value chain
- **TGMvc** is the sum of the profit margin for all chain players

2.4.2.2.11 Marketing Margin (MM)

The marketing margin is an indicator of the value or cost paid for the processing and marketing services for the product at each stage of production (Al-Falouji, 2016), which is the difference between the selling price and the purchase price of the product. The value of the marketing margin can be found through the following equation (Hag, 2011):

$$\text{MM} = Sale\ Price\ (SP) - Purchase\ Price\ (PP)$$

- Where: **MM** is the marketing margin **SP** is the selling price **PP** is the purchase price

2.5 Report Writing, Translation and Publication

2.5.1 Report Writing

The study team built a detailed plan for what the report would include at the beginning of the study planning phase. Based on that, a report structure was developed, including chapter titles and section headings, as well as tables, charts, and appendices. This helped the team prepare the first draft of the report to present the main outputs and initial results to the team and receive feedback to develop the report. The team reviewed the first draft of the report, reformulated and rewrote it, and designed graphics, figures, and tables. They produced the final version of the report to be translated and shared with relevant parties, supporters, and the funding entity for the study (EU-UNDP).

2.5.2 Report Translation

The team prepared the report in its initial version in Arabic, and a specialized consultant was hired to review the final version of the report and hand it over to the consultant for translation into English. This took approximately two weeks to finish the translation, language review and professionally rephrasing for publication and sharing with stakeholders.

2.5.3 Report Publication

After completing the final report and printing it in both English and Arabic, it became possible to share the report with relevant stakeholders, whether they are players in the value chain or related donors and entities in the same sector, as well as official bodies.

Reviewing the results, presenting the outputs and recommendations will contribute to the development of an independent value chain sector. The report includes a detailed presentation of the gaps that can be addressed and the efficiencies that can be enhanced among stakeholders in the value chain. The report also includes proposals that may contribute to improving and raising the efficiency of the sector value chain and increasing local production and exports, while reducing operating costs. It will also significantly contribute to raising the country's economy and providing many job opportunities.

The report will also help relevant stakeholders and supporters to facilitate decision-making and design appropriate projects based on the needs of stakeholders in the chain, to support and enhance the development of the sector value chain in Yemen. The report can be downloaded in both Arabic and English through the agency's and UNDP's websites, and promoted through social media platforms to provide an opportunity for all interested parties and individuals to access it.

Photo of the Copy of the Arabic version	Photo of the Copy of the English Version	Barcode to access the study via the web

3 Findings

The date sector is a promising investment sector in Tarim District – Hadhramout governorate

3.1 Dynamic Date Value Chain System

There are four main components or headings through which the dynamics of the complex date value chain system in the Tarim District will be identified and understood. These headings are as follows:

First: Defining the stages, players, and functions of the date value chain.

Second: Describing the mechanism of the chain stages with SWOT analysis and PESTLE analysis, and defining the trading channels (buying and selling) between the players in the chain.

Third: Describing the process of quantitative cash flows between the players in the chain and analyzing the profitability (profit margin) of the date value chain players.

Fourth: Analyzing the marketing channels and profit margin of each player at the level of each marketing channel.

3.1.1 Identify the Date Value Chain

3.1.1.1 Stages of Date Value Chain

The study team was able to divide, sort, and group all players in the date value chain in Tarim District into six stages. The stages start from inputs, then production, and end with the final consumption of date products. In between, there are stages of trade, processing, and export. Figure no. 4 illustrates the stages of the date value chain in Tarim District. Each stage will be detailed separately under the headings below.

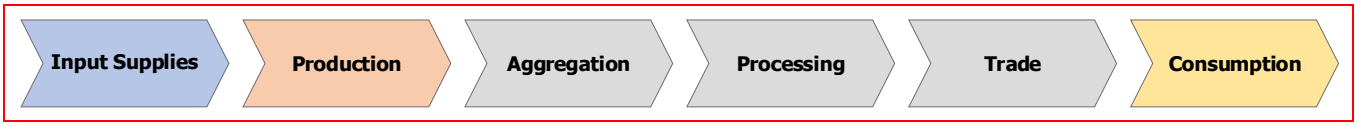


Figure no. 4: Date value chain stages in Tarim District, Hadhramaut, Yemen (Primary Sources, 2022)

3.1.1.2 Players and Functions of Date Value Chain

In order to understand the mechanism and dynamics of the date value chain in Tarim District, the players and their functions were defined as shown in Figure 14, and players and functions can be distributed according to the stages of the date value chain as follows:

- **Inputs supply stage:** There are three types of players at this stage, suppliers of production inputs, suppliers of packaging and labeling tools, and suppliers of seedlings. Each stage will be addressed with its players and their jobs in detail below.
- **Production stage:** This includes the producers (date farmers), as only about 8% of farmers are members of associations in the district. The percentage of shared land for several producers in date palm farming is about 15% of the total land in Tarim Distrit, where the number of partners is not less than two individuals.
- **Aggregation, processing and trading stage:** This stage includes six types of players; major producers (aggregators), brokers (aggregators), wholesale processors and retail processors. There are also retailers and wholesale traders who do not perform any processing on the product.

- **Consumption:** This stage includes two types of consumers, the local market and private consumption by households, neighbors and the public.

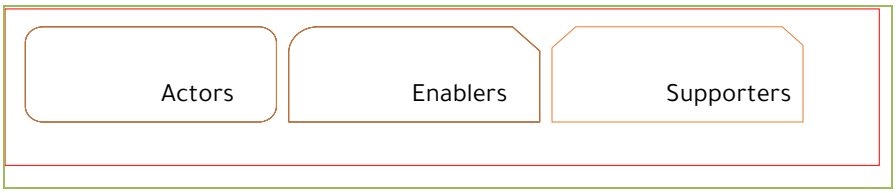


Figure **no.** 5**:** The forms of value chain players, enablers and supporters.

The direct chain stages do not exhaust all the relevant players, however. There are other players that we can call secondary players in the chain - enablers and supporters. Figure no. **5**: shows the forms of both the primary and secondary players in the chain. The following headings will provide details of the stages, players, and activities of the date value chain in Tarim District.

3.1.2 The Mechanism for the Work of Value Chain Stages and SWOT and PESTLE Analysis

Material traders or input suppliers in Tarim District are the main source of supplying date palm farmers with the basic inputs for date palm cultivation and production. Input suppliers in the date value chain play an important role in supplying producers with their needs, enabling them to continue the process of date palm cultivation and production, whether these needs are internal or imported from abroad.

The roles of primary input suppliers in the chain vary according to the nature of their work. According to the study, some provide irrigation networks, chemical fertilizers, and pesticides, while others provide personal safety equipment, machines used in spraying pesticides and fertilizers, as well as machines used in digging for planting palm shoots, pruning shears used in harvesting fruit, and other necessary supplies for date palm farmers.

However, most of the inputs used in date cultivation and production provided by input traders in the district of Tarim are imported. About 62% of input traders believe that the impact of imports on the date sector is positive, and their responses were evenly distributed that imports first reduce the price of inputs, thus enabling farmers to purchase and use those inputs, which benefits them as a result of selling more quantities of those inputs. Secondly, imports of inputs fill the gap in demand for inputs in the market.

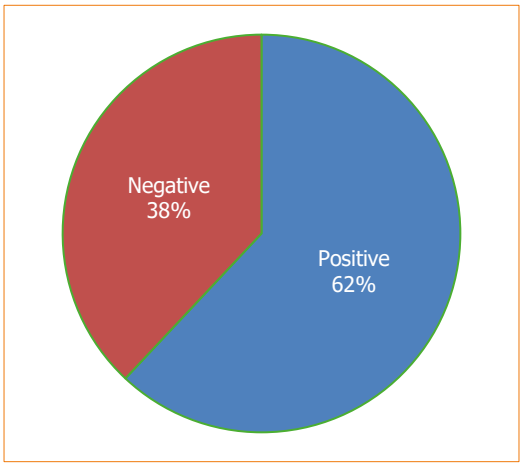


Figure no. 6: The views of inputs suppliers on the impact of importing products from abroad

Meanwhile, about 38% of input suppliers believe that one of the negative effects of imports is the recent increase in the prices of inputs due to the restrictions imposed on imports, which have increased the costs of those inputs. Meanwhile, about 14% of input suppliers believe that importing from abroad has a positive impact, as it leads to an increase in demand for the product and fills the gap in demand for the product in the market. Figure 6 shows the opinions of input suppliers on the impact of imports.

The data in Figure 7 shows that the majority of input traders in the date sector in the Tarim District face some difficulties in the procedures and transactions of buying inputs from abroad. 15% indicated that this is due to the restrictions recently imposed on imports, especially fertilizers and agricultural pesticides, while 85% of input traders stated that the procedures and transactions of buying from abroad are neither easy nor difficult (medium), explaining their answers due to the availability of sea and land ports close to Tarim District (the ports of Shaher, Mukalla, Nishtun Mahra, Aden and Shihin) which facilitate the arrival of these inputs from abroad.

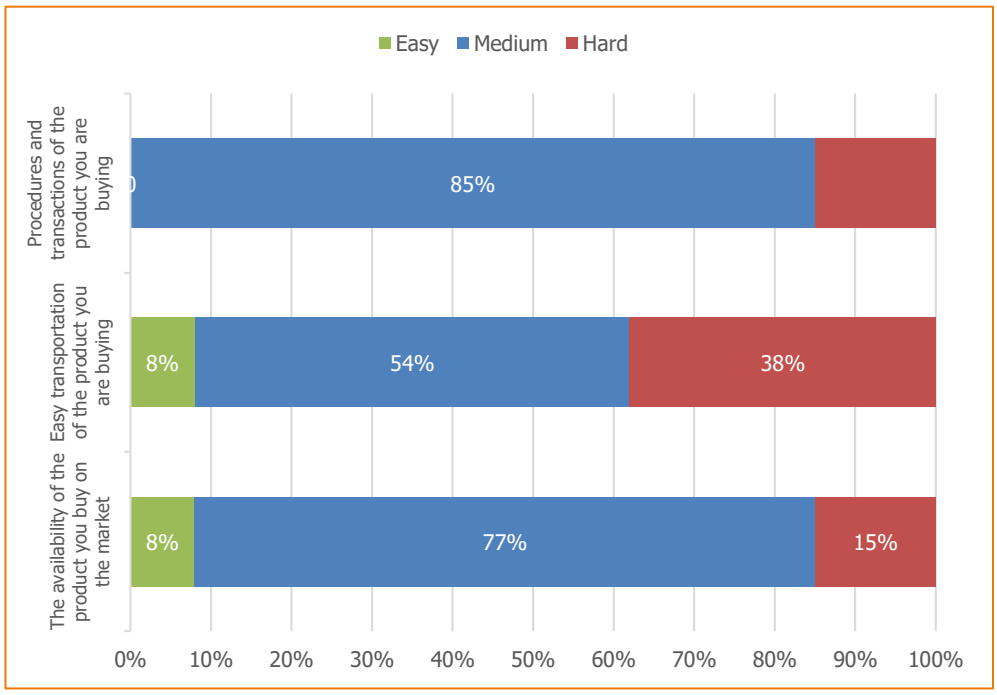


Figure no. 7: Illustrates the opinion of input traders regarding the procedures, ease and availability of products.

However, as is clear from Figure no. 7, input suppliers in the date palm sector in Tarim District face some difficulties in transporting the products they buy or import due to the lack of road maintenance and the abundance of security checkpoints, with 38% indicating this. Meanwhile, 54% of them stated that the process of transporting the product is not easy or difficult (medium), and 8% indicated the ease of transporting the product they buy to their warehouses.

As for the availability of the product purchased by input suppliers in the date palm sector, 8% indicated the ease of availability. However, the majority of input traders, 77%, agree that the availability of the product in the market is neither an easy or difficult process (medium). Meanwhile, 15% of them believe that there is a difficulty in obtaining the product, which lies in their inability to obtain it due to fluctuations in the exchange rate of the local currency (Yemeni rial) against the US dollar, as purchasing from abroad or from agents within the country is done in US dollars, while selling to producers is in Yemeni rials.

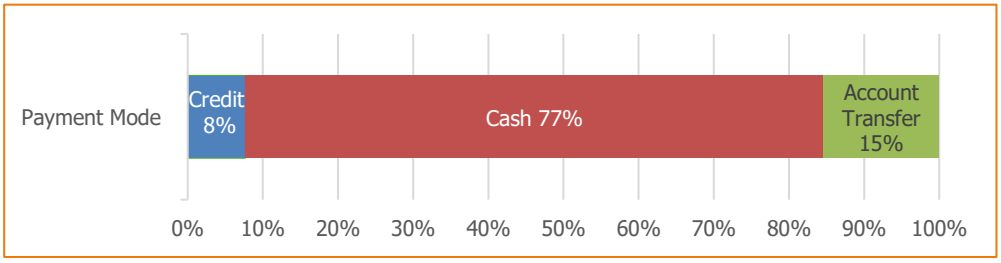


Figure no. 8: Method of sales transactions between inputs dealers and their customers

Figure no. 8 shows the payment method between input producers, farmers, marketers, and their customers. Only 8% of input traders have payment terms,

and payment guarantees are based on mutual trust between the parties. Meanwhile, 77% of payments between traders and their customers is in cash, and 15% of them deal between input traders and their customers through bank transfers .

Figure no. 9 shows that the best month for work for input traders in the date palm sector in Tarim District is January, after which the level of work gradually decreases until February. Work then stabilizes from February to November with a slight increase or decrease during this period, before declining to the lowest work level in December. The commercial activity among input traders then begins to increase until it returns to January to start a new work cycle. On the other hand, selling prices are highest in August and gradually decrease until December, which has the lowest selling price. After that, selling prices begin to rise again until April, then prices start to decrease and increase slightly during the period from May to July, and then the selling price starts to rise again during August to start a new cycle.

In summary, Figure no. 9 indicates that January is the best month for work and sales for input suppliers, followed by August, while December is the worst month for work and sales for input suppliers.

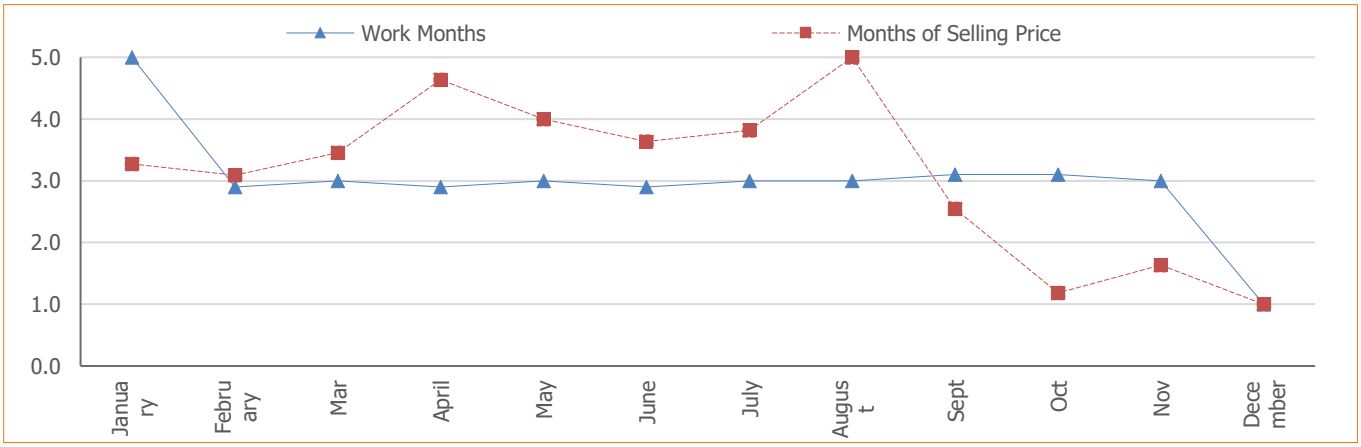


Figure no. 9: Working and selling months for supply inputs in date sector in Tarim District

5 = more/much better **4 =** more/better **3 =** average **2 =** less/worse **1 =** less/much worse

Looking at the level of satisfaction of players in the date value chain in Tarim with the local infrastructure in general, 25% of players are dissatisfied with the infrastructure in general, while 54% are somewhat satisfied, and the remaining 21% are completely satisfied.

When looking at the details of the infrastructure, seven services are shown in Figure no. 10 and Figure 15. Energy and electricity services were among the highest ranking in dissatisfaction for input traders with a repetition rate of 36%. The reasons supplied for this were the constant daily electricity outages, as well as the weakness of electrical current and high prices.

The second ranking service in terms of dissatisfaction for the players in the value chain were road services and ease of transportation, with a rate of 30%. The reasons given were the lack of attention to roads and their maintenance by the relevant authorities, which causes problems for transportation and their constant disruption, as well as delays caused by floods, in addition to the lack of warning signs on the roads.

Meanwhile, communication and internet services were the third service that input traders were not satisfied with, at a rate of 29%. The reasons provided included frequent disruptions and constant instability, sometimes even complete disconnection from the service. Many areas also suffered weak coverage, as well as high prices.

Health and medical care services came in fourth place in terms of input traders' dissatisfaction, with a rate of 26%. The reasons provided were the scarcity of available health facilities in the district, the weakness of the health services provided by existing facilities, which lack specialized medical staff, and the high price of medicines.

Education services and the availability of schools ranked fifth in terms of input traders' dissatisfaction, with a rate of 25%, due to the lack of educational facilities or their distance from some areas, in addition to the scarcity of experienced and qualified educational staff.

Sanitation services ranked sixth in the dissatisfaction of input traders at 18% due to sewage flows onto roads, which causes distress and discomfort to citizens and input traders because of the foul sewage odor.

Finally, water facilities and availability of water were ranked last in terms of input traders' dissatisfaction, with a rate of 7%, due to weakness in the service and high prices. On the other hand, input traders in the date sector see the best service as water facilities and the availability of water in the area is seen to be satisfactory, with a rate of 93% of traders being somewhat satisfied with this service.

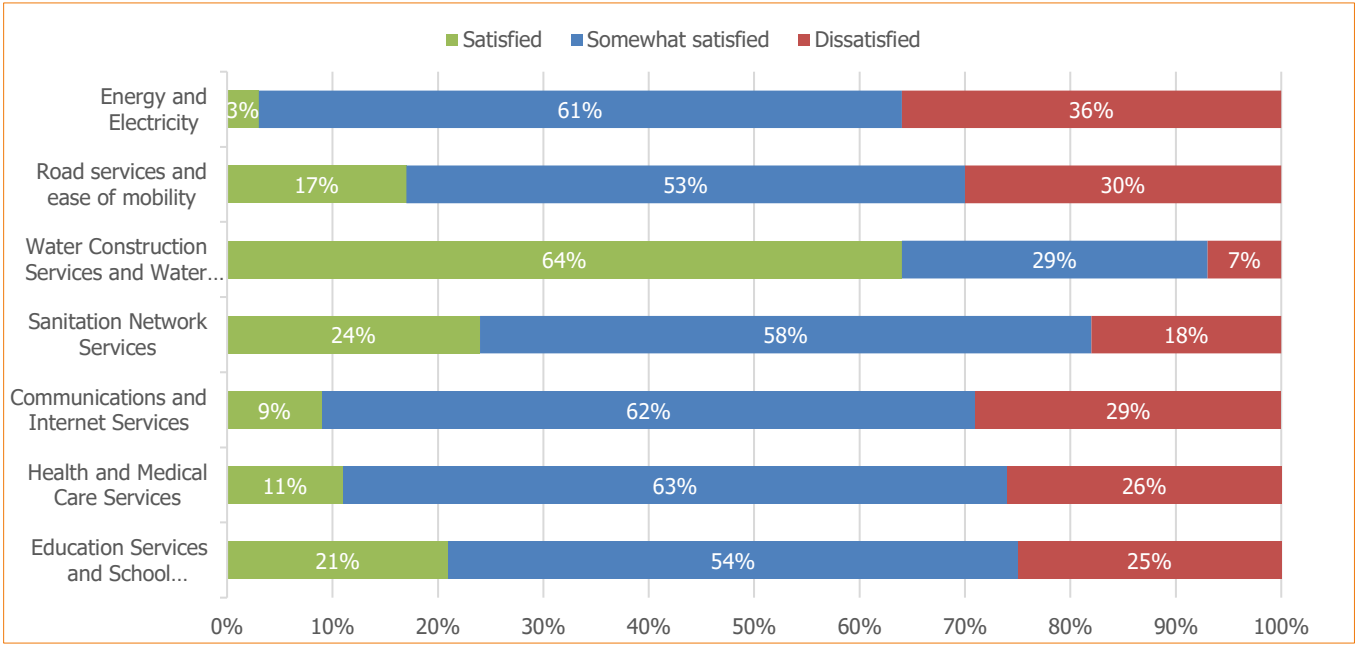


Figure no. 10: Inputs dealers' level of satisfaction about the infrastructure in Tarim District

3.1.2.1.1 SWOT and PESTLE Analysis - Input supplies

In general, the SWOT and PESTLE analysis relied on ranking the points according to their frequency of mention among the players of the value chain, not according to their importance, as in the analysis of problems / challenges (see Appendix 2: SWOT and PESTLE Analysis Details). The findings and details at each stage level of the SWOT and PESTLE analysis are addressed under the following headings for the date value chain in Tarim District.

Strengths

The study showed that the strengths of the input sector are economic represented by the ability to provide inputs with a frequency rate of 23%, where input traders provide fertilizers, pesticides, agricultural techniques, irrigation networks, as well as providing tools for harvesting and processing such as bags and bins. Additionally, their knowledge of markets is another economic strength at a rate of 18%, which reinforces the growth of the input market for the date palm sector. They also have qualified labor at a rate of 14%, especially in the production of improved seedlings or offshoots. Input suppliers also have accumulated experience at a rate of 14%. Furthermore, they demonstrate patience and perseverance at a rate of 9%, as it is customary for them to sell production supplies to farmers and producers with payment either in cash, or with part of the payment made before harvest and the rest paid afterwards.

Opportunities

Opportunities for this stage include institutional opportunities, represented by the availability of awareness through training courses with a frequency rate of 27%. Additionally, Tarim's environment is suitable for dates at a rate of 13%, which makes their presence in the Tarim District strong, as there are 48 input traders according to the study statistics to meet the requirements of farmers and producers. Also, the availability of water, at a rate of 13%, and then increasing demand as an economic opportunity for their continuity, at a rate of 13%.

Weaknesses

Most of the weaknesses in this stage were technological, represented by the unavailability of palm service equipment with a frequency rate of 40%. This is due to the weak purchasing power of farmers to buy this equipment, in addition to their adherence to traditional methods in caring for palms. Introducing modern inputs in palm cultivation and training on them will reduce effort and time in caring for palms, and therefore increase demand for these inputs and revive the input market. There was a social weakness indicated by the presence of large burdens and responsibilities, at a rate of 20%. Economically, the location of the stores is not suitable, at a rate of 20%, and there is an unavailability of warehouses, at a rate of 20%.

Threats

The input stage in Tarim for the date sector faces multiple threats, including economic threats with fluctuating prices, with a frequency rate of 50%, especially since most sales are made on credit. Additionally, supply markets for inputs are far away, at a rate of 8%. The cost of labor is also high, at a rate of 8%. There is also a lack of interest in palm cultivation, at a rate of 8%, which limits the demand for inputs from farmers and producers.

3.1.2.2 Production

Annually, palm trees produce their fruit after a series of strenuous operations carried out by farmers in the district of Tarim. Despite the fact that palm trees are resistant to drought, salinity, and high temperatures, in order to obtain high production and quality fruits, a series of service operations for palm trees must be carried out. These operations usually begin with the start of moderate temperatures in October and November of each year and continue until the harvest in June and July of each year.

The dubas bug (*Ommatissus lybicus*) invaded Hadhramaut governorate at the beginning of the millennium and continued to spread significantly. By 2012, it had wiped out many palms in the Hadhramaut Valley. For this reason, and others such as the old age of some palm trees and the flooding of palm groves, farmers are replanting palm trees to fill the gaps and increase production. Farmers rely on a number of sources to provide palm tree saplings, either from mother palm trees that produce saplings in the fields, or by purchasing saplings from other farmers, which are usually called Kilaah. The saplings are removed from the mother palm tree stem after 3 years in a way that ensures the removal of all roots and a clean cut from the stem so that the transplant operation can be successful. The third source is by purchasing ready-made saplings, which are imported from abroad and sold in specialized nurseries in villages and districts in Wadi Hadhramaut.

Usually, the planting process takes place in the months of moderate temperature, December and January, to avoid exposing the saplings to high temperatures and reduce the percentage of sapling death. For this purpose, sapling palm fronds are tied in a way that protects the heart (the developing top) until it reaches the production stage, which is usually 3 to 5 years after planting, depending on the care taken, the fertility of the soil, and the variety of palm.

To care for palm trees, there are a set of practices that palm farmers in the district of Tarim carry out, which are summarized below:

- **Palm Irrigation:** Palm farmers rely on well water for palm irrigation, which requires them to incur costs for pumping water from deep underground and irrigating palms. The traditional irrigation method and the use of soil channels to transport water to field locations increase costs and cause water waste, as well as dense growth of weeds around palms, which compete with palms for water and nutrients.
- **Weed removal:** As a natural result of adding water to the soil, weeds grow around the palms in abundance, and farmers remove them, but usually at a later stage because the farmers use the weeds as feed for livestock. This negatively affects the palms as these weeds absorb large amounts of nutrients from the soil.
- **Subsoiling:** An important seasonal process is usually carried out between December and March every year to turn and break up the soil to facilitate water absorption and the growth and spread of roots.
- **Fertilization:** The majority of farmers use animal and plant waste to fertilize palms. The data showed that 63% of farmers use animal waste and wazif (tiny fish), while 47% use some chemical fertilizer additives with irrigation water to fertilize palms for higher production and healthy palm trees. However,

upon analyzing the process it seemed farmers are not following the correct method of treating animal waste and fermenting it properly, resulting in lower than expected yields.

- **Thinning, pruning and trimming:** These are important processes, especially for reducing the impact of dubas bug infestation. The insect lays its eggs in the base of the fronds, so dry and dead fronds are always removed to facilitate harvesting and reduce damage from the insect. Also, excess or damaged fruit clusters are thinned, pruned, and trimmed for easier harvesting and set to hang downward.
- **Pollination:** Palms are monoecious plants where the palm only carries one type of stamen, either male or female. Palms are manually pollinated by attaching the male stamen to the female stamen.
- **Pest control:** Farmers resort to pest control to reduce the effects of insect infestations that attack the palms. The greatest pests are the dubas bug (*Ommatissus lybicus*), the palm weevil (*Rhynchophorus ferrugineus),* and the rhinoceros beetle (*Oryctes rhinoceros*). Together, these pests greatly reduce quantity and quality of production, and cause producers large challenges.
- **Covering and wrapping fruit bunches:** This process begins early before the dates reach maturity in March and April to protect the fruit bunches from rain, prevent fruit dropping upon maturity, and protect against dry winds and insect infestations. This process helps to obtain clean fruit with better marketability.
- **Harvesting:** With high skill, farmers climb palm trees to collect the harvest, which is ready for marketing from the moist stage, while some wait until full maturity to harvest and sell the crop. All of this is related to demand and the variety's marketability as fresh or dried dates.

Photos of producers (farmers) of the date value chain in Tarim District

3.1.2.2.1 Analysis of Production Costs

To implement a project for date palm producers (farmers) with an area of 24,000 m^2, the project will cost approximately YR 43,622,216, of which about 17.8% are fixed costs, amounting to YR 7,774,790, while the remaining costs are operational costs as shown in Table no. 3. This is assuming that the land is leased and the irrigation water is purchased.

The fixed costs are for purchasing tools, equipment, and irrigation networks that are consumed over years, and a specific depreciation rate has been set for each type of cost. The total annual depreciation costs (Dp) will be YR 2,302,954.

The other costs are operational, which account for approximately 82.2% of the total costs. As shown in Table no. 3, the operational costs revolve around renting the land, purchasing water, seedlings, labor, fertilizers, pesticides, and other requirements for date palm cultivation during the first four years of establishing the farm, during which the equipment is in the pre-production phase.

From the above, it can be concluded that in order to establish a project for date palm producers (farmers) in the Tarim District with an area of 24,000 m^2, the total cost (fixed and operational) is approximately YR 43,622,216, and the average annual production cost after calculating the depreciation value and operational costs is approximately YR 9,537,595, to produce about 16,416 kg annually. So the production of one kilo of dates requires YR 580 before factoring in waste. After accounting for waste, the cost of production per kilogram is approximately YR 652.8. In the next section, the profitability and economic feasibility of implementing such projects will be studied.

Table no. 3 Average quantity and cost of date producer's inputs for an area of 2.4 ha / per year in Yemeni Riyals (YR) (Primary Sources, 2022)

Description	Unit	Quantity	amount	Total	Notes Depreciation Ratio |...
Constructional costs / fixed					
Palm shoots	Number of	199	22,000	4,378,000	33%
Digging and pruning tools	PCs	1	28,490	28,490	33
Irrigation networks	m (meters)	182	9,900	1,801,800	20
Harvesting (collection) utensils	Number of	10	3,850	38,500	5.25
Baskets	Number of	245	4,400	1,078,000	33
Mesh sacks to cover fruit	Number of	1500	300	450,000	25
Variable / operating costs					
Land rent	m^2	2,400	14	336,000	Land rent
Pollinating flowers (tafheti)	Number of	40	1000	40,000	Pollinating flowers (tafheti)
Plowing and preparing the land	h (hours)	15	9,137	137,055	Plowing and preparing the land
Irrigation (water)	liter	3,024,000	374	1,130,976	Irrigation (water)
Organic fertilizers	kg	3,980	22	87,560	Organic fertilizers
Inorganic fertilizers (chemical)	kg	179	2,750	492,250	Inorganic fertilizers (chemical)
Pesticides	liter	48	23,100	1,108,800	Pesticides
Laborers	Number of	20	55,000	1,100,000	Laborers
Sacks (burlap)	Number of	200	300	30,000	Sacks (burlap)
Specialized agricultural engineer	Number of	1	2,772,000	2,772,000	Specialized agricultural engineer
Land rent	m^2	24,000	14	336,000	Land rent
Total construction/fixed costs (FC)	7,774,790 (1.33% of total costs)				
Total variable / operation costs (VC)	7,234,641 (98.67% of total costs)				
Total annual depreciation costs (Dp)		2,302,954			
Total production costs (variable + depreciation)		9,537,595			
Total costs (TC)	**YR 43,622,216** (USD 41,130)				

3.1.2.2.2 Profitability and Feasibility of Production

From Table no. 4 Indicators for the production efficiency of producers of the date value chain in Tarim District, estimated at 2.4 ha / year, it is evident that the total investment cost for an area of 2,4000 m^2 is approximately YR 43,622,216 per annum, with an average net cash flow of YR 17,565,120 starting from the fifth year of planting. Using the previous figures, we can obtain the payback period, which equals the average investment cost divided by the average net cash flow. The payback period was found to be 2.4 years after the first year of production. This indicates that such projects are economically viable for date producers, though it should be noted that the investment and operational costs are relatively high.

According to Trading Economics (2022), the average investment rate in Yemen in 2022 is around 27%. From the analysis, it is evident that there is profitability and feasibility for productive projects for date producers, and according to the return on investment (ROI) index[4], the value for such projects is about 125.9%, which is above the average investment rate in Yemen. Therefore, it can be concluded that this project is profitable and feasible for date farmers with an average area of around 2,4000 m^2, and the return on investment is 17.4% in the fifth year of planting and the first year of production. The harvest could produce for more than 30 years.

Table no. 4 Indicators for the production efficiency of producers of the date value chain in Tarim District, estimated at 2.4 ha / year (Primary Sources, 2022)

	Production and economic efficiency indicators (calculation mechanism)	Symbol	Unit	Producers (Date Farms)
1.	Production unit (Production Unit)	P/U	Text	Square Meter (m^2)*
2.	Production quantity/size per Year (Production / Year)	Q-In	(1)	2,400 (2.4 ha)
3.	The period of work from the establishment until the first production	Per(0)	year	4
4.	Period/life cycle of the product/service after the establishment	Per(n)	year	1
5.	Number of production/service cycles (after establishment) per year	---	No.	4
6.	Yield unit (Yield Unit)	Y(U)	Text	kg
7.	Production quantity - output per production unit - input per life cycle	Q-Out/In	kg/2.4 ha	16,416
8.	Productivity for all production units - inside (after establishment) / year (Yield)	Q-Out	kg/2.4 ha/year	16,416
9.	Loss of productivity per year (Loss)	Loss	%	4.4
10.	Total investment cost (establishment + fixed)	TFC	YR/2.4 ha	7,774,790
11.	The medium depreciation rate for each year (of assets) (% of item 10)	CFC	%	32
12.	Total variable/operation cost per year	TVC	YR/2.4 ha/year	28,612,785
13.	Total marketing cost per year	TMC	YR/2.4 ha/year	0
14.	Total capital (10 +12 +13)	TC	YR/2.4 ha	43,622,216
15.	Total production costs per year (*1-11*) * 10+12+13)	PCT	YR/2.4 ha/year	9,537,595
16.	Sale price per unit (Price /Unit-Sell)	SP	YR/Kg	1070
17.	The purchase price or production cost per unit (Price / Unit-Buy)	PP	YR/Kg	652.8
18.	Returns/revenues (after establishment) per year (16* (*1-9*)*8)	R	YR/2.4 ha/year	17,565,120
19.	Other returns/revenues (support/sale of assets/etc...) per year	OR	YR/2.4 ha/year	0.00
20.	Total returns/revenues per year	TR	YR/2.4 ha/year	17,565,120
21.	Profit or gross margin or cash flow for each year	Pf or GM	YR/2.4 ha/year	8,027,595
22.	Net profit after deduction -5% (taxes, Zakat, and others)	NPf	YR/2.4 ha/Year	7,626,148
23.	Return to cost ratio (profit) or gross margin	GM	%	17.4
24.	Payback period (10/21)	PBP	year	6.4

Italic number = a real number and counts as a number and not a number for the item. * = data provided for an average agricultural land area of 2.4 ha.

[4] Average return on investment = (average net annual cash flows- initial investment) Initial Investment * 100. Fahim (2015)

3.1.2.2.3 SWOT and PESTLE Analysis - Production

Strengths

The production phase has social strengths, represented by perseverance with a frequency rate of 23%. It is common knowledge among farmers that palm trees begin to produce after 3-5 years of planting, and farmers perform agricultural operations such as preparing the land, planting the seedlings, irrigation, fertilization, and tree care. The average working days for these farmers is 200 per year, for a single production cycle. They also have accumulated experience at a rate of 22%. Therefore, supporting this sector preserves the historical agricultural heritage of this region, as it is considered one of the sectors that are inherited across generations. Additionally, there is an economic strength in providing the product at the appropriate time at a rate of 10%, as well as pride in the profession at a rate of 8%, and possessing qualified workforce at a rate of 8%.

Opportunities

This sector has economic opportunities that will contribute to enhancing productivity, reducing production costs, and developing the sector. These points include the fact that Tarim's environment is suitable for dates, with a frequency rate of 23% in terms of production and consumption, in addition to the economic opportunity of easy sales at a rate of 20%, especially in the local community. There is also an environmental opportunity with the availability of water, at a rate of 13%, which encourages farmers to use water in palm tree cultivation. It represents good economic returns, at a rate of 11%. Furthermore, there is an opportunity for the inheritance of date palms across generations, at a rate of 17%.

Weaknesses

The date palm sector in Tarim region faces economic weaknesses, including a lack of capital at a frequency rate of 23%, low productivity at a rate of 12%, and poor crop quality at a rate of 9%. This is due to the poor quality of seedlings and the old age of some palm trees, in addition to the spread of diseases and pests. Socially, the sector faces heavy burdens and responsibilities at a rate of 8%.

Threats

The threats facing the production stage of the date palm sector in Tarim region include environmental threats such as diseases, pests, and epidemics with a frequency rate of 23%, especially the red palm weevil, which has caused many palm trees to die, weakened production, and decreased product quality, resulting in significant financial losses for farmers and discouraging some from engaging in this activity. Additionally, there is an economic threat at a rate of 18%, which is due to the fluctuation in prices, as well as urban expansion and the shrinkage of agricultural land at a rate of 9% as palm trees are uprooted over large areas of the region. In addition there are rising costs of transportation at a rate of 7% and the increasing wages of labor at a rate of 5%.

3.1.2.3 Aggregation, Processing and Trade

Figure 11 illustrates the details of the collection, processing, and trade that occur between the production and consumption stages in the date value chain in the Tarim District. This figure is part of the complete date value chain map shown in Figure 18. According to the study, the stages of collection, processing, and trade were divided into six players as follows:

- **Large producers** (aggregated)
- Aggregator **brokers**
- **Wholesalers**
- **Retailers**
- Processing **Retailers**
- Processing **Wholesalers**

The following headings will describe how each player works in these stages between the product and the consumer stage.

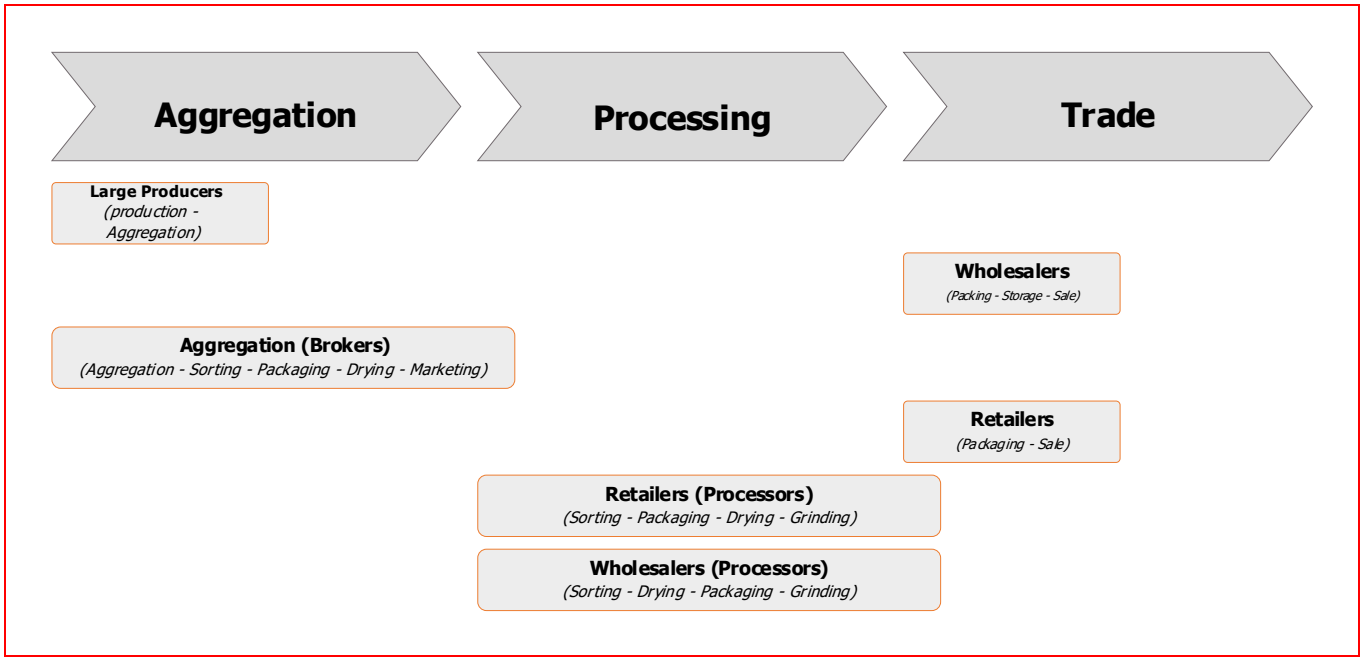


Figure no. 11: Stages of collection, processing and trade in detail, and the functions of these stages in the date value chain in Tarim District (Primary Sources, 2022)

Dates go through different stages during the ripening period on palm trees, and each stage has a different name. The palm trees can be harvested at certain stages, and each stage has a specific price and market. The following is a description of the two most important stages of date ripening:

- **Ruttab Stage**: This is the stage when the fruit tissue begins to moisten, and it softens gradually from the tip to the base. The fruit loses its external color and acquires a dark brown or gray color, depending on the variety. Its starts to shrink, and the flesh becomes denser. This stage is characterized by good flavor and high sweetness, and it is entirely suitable for consumption. If the fruits are not picked at this stage, they enter the final stage of ripening. The ruttab stage is considered the stage of full maturity.
- **Date Stage:** This is the last stage of the fruit ripening process, and it is characterized by the transformation of the bright color of the ruttab into a dark color. The fruit weight decreases, and its size

shrinks due to water loss. The sugar transfer stops, and the fruits become suitable for harvesting, transportation, storage, packaging, and pressing. These fruits have a high capacity for protection against microorganisms that cause fruit decay and fermentation due to the high sugar content inside the fruits.

Large Producers - Aggregated

These are owners of palm tree farms who have more than 700 palm trees and produce various varieties of dates in all stages of ripeness, according to the varieties of palm trees in their fields and the preferences of their customers. In addition to being date producers, they also work in the collection and purchase of date crops from other farmers and resell them to traders, in addition to producing dried and fresh dates.

In addition to marketing, sales, and crop collection operations, they also work in palm tree cultivation and perform all agricultural operations for palm trees, including pollination, spraying, irrigation, pest control, fertilization, harvesting, and some post-harvest treatments such as drying some types of dates, which are marketed to traders in the district center and nearby locations.

Their experience in date production ranges from 7 to 50 years, and not all of them have a system or mechanism for managing farm accounts and files. They also mentioned their aspirations to expand further in date production and to produce or import new varieties with high marketing specifications.

Brokers - Aggregated

The aggregators buy different varieties of dates directly from palm tree farmers, either in the fields after harvesting or in markets close to the production areas. They then transport them directly according to their type, either to their own preparation factories or to wholesale traders in central markets, or to retail traders in village or nearby districts markets. Varieties such as Barhi, Sukkari, Al-Namishi, Al-Madani and other items are marketed in the ruttab (wet) stage directly in the market of Tarim District through retailers or outside the district, and some of them outside Hadhramaut governorate through wholesalers that are mentioned below.

For the harvest that reaches the final ripening stage, it goes through a processing stage before it is marketed. The processing stage includes steps that start with sorting and cleaning the dates. After that, the dates are compressed in presses and packaged usually in 1 kg amounts, and then sold to traders. Alternatively, they are dried and sold in cartons or plastic packages of different weight.

Most aggregators have been working in collecting and selling dates for years, some up to 25 years. Many have only simple mechanisms for accounting and managing business operations. 75% of those interviewed expressed their desire to develop their business by introducing modern machinery and equipment for producing higher quality dates at lower costs. Meanwhile, 25% expressed their desire to cultivate palm trees.

Wholesalers

Wholesalers prefer to purchase different varieties of palm fruit in the wet stage, despite it being a perisable stage that may lead to product damage if not marketed on time. However, there is a high demand for wet product, and they have higher prices than dates of the same variety in the dry stage. Therefore, some people resort to refrigerating the product until it is marketed.

Wholesalers are present at central markets within districts, and their activity is limited to purchasing and selling dates without processing them, except at a simple level of packaging in baskets or bags, depending on the variety and condition of the product, whether wet or dried, or storing wet dates in central refrigerators until demand arises, such as the month of Ramadan, which wholesalers consider an opportunity to achieve good profits.

Most wholesalers and packaging factories do not have refrigerators, but rely on the owners of central refrigerators who receive the dates ready and packed in bags or boxes and store them for a period until they are marketed.

Wholesalers have been working in the date trade for varying periods of time, some with 15 years of experience. 60% of wholesalers have simple to good systems in place for management, accounting, inventory, and document archiving, while the rest stated that they do not rely on any specific system. During the data collection process, wholesalers were asked about their goals and future plans, and their answers varied between those who want to expand by opening new branches and others who want to increase the quantity of date purchases and improve the quality of local products.

Retailers

Retailers also prefer to sell dates in the fresh (wet) stage, and they prefer the best varieties according to customer demand, such as Al-Khalas, Al-Burhi, Al-Sukari, and Al-Madani. These are large fruit with a better taste, and most retailers target the nearby markets within Hadhramaut Governorate.

These retailers buy either fresh or dried dates, usually packaged in plastic baskets, and display them for sale directly from within the baskets in the markets. These retailers explain that most of their customers prefer to consume fresh dates, especially some of the distinctive varieties in taste and size, such as Madani, Burhi and Sukkary, especially in the month of Ramadan when the demand for these items increases and many consumers chose to break their fast with fresh dates. For this reason, some retailers resort to storing fresh dates in refrigerators if the harvest season, which usually falls in June and July of each year, does not coincide with the holy month of Ramadan.

Retailers have been working in the date trade for varying periods, some for a short period of 1 to 5 years, while others have been working in the date trade for more than 20 years. They generally do not rely on any management or accounting systems or systems for archiving records, and 57% do not follow any specific systems for accounting purposes. The data revealed that each retailer has different aspirations, with some aiming to develop their business and establish a production line for packaging dates, while others wanted to own a refrigerated truck for marketing their products in a safer and better way.

Retailers - Processors

These retailers trade in dates after processing them, either by drying and packaging, or grinding and packaging the products according to what is appropriate. Dried dates can be packed in bags that can withstand non-ideal storage conditions and long-distance shipping, while fresh dates are compressed in different packaging and weights according to the marketing method and customer demand. The waste of processing, date pits, or damaged fruit are ground and packaged as feed for livestock.

Retailer processors aspire to develop their workspace with modern machines to increase production, improve quality, and reduce costs. They do not have advanced work systems, but rather simple paper-based accounting mechanisms.

Wholesalers - Processors

Processing wholesalers process different types of dates, either by drying or pressing and packaging, then targeting markets in distant districts and other governorates, where their products are packed in different packages at relatively higher weights than retailers. Some of these traders have been in the sector for up to 25 years and work with simple systems to manage work, accounting, and documents. They aspire to increase their production by increasing the number of customers, using modern machines, and reaching new markets.

The aggregators work on the sorting process, which is the removing of damaged and defective fruits and date pits, then washing and grinding them or packaging them without grinding according to the consumer's desire and selling them as feed for livestock.

3.1.2.3.1 SWOT and PESTLE Analysis - Trade, Processing and Export

Strengths

Analyzing the strengths of the traders, processors and exporters, the highest strength they possess is their technological expertise, represented by their accumulated expertise with a repetition rate of 18%. This includes the processes of drying, sorting, packaging, storing, and transforming the date product, especially in the production of date syrup, date paste, date seed coffee, and competitive varieties, at a rate of 15%. Their patience and perseverance represent another strength at a rate of 12%, as well as their good relationships with the players in the market at a rate of 11%. They are considered as one of the most influential players in the date value chain, given their role processing and its extension to the final stages. They also control the marketing system as a link between producers and final markets. In addition, they possess qualified labor at a rate of 10%, which is required in the processing stage.

Opportunities

The available opportunities for this sector at this stage include economic opportunities that support the continuity of its cultivation and processing, represented by market knowledge and ease of selling, with a repetition rate of 32%. It represents good economic returns at a rate of 20%, which motivates the players to continue in this sector. The location is suitable at a rate of 15%, and skilled labor is available at a rate of 10%, as this work is popular in society. There is also an institutional opportunity represented by encouraging investment at a rate of 5%.

Weaknesses

The weaknesses in this stage were diverse due to the variety of activities, with economic weaknesses represented by a lack of capital (31% repetition rate), unsuitable store locations (12% repetition rate), decreased productivity (7% repetition rate), and low quality (7% repetition rate) as a result of the products they receive from producers, leading to increased costs compared to production volume. The social weakness was represented by heavy burdens and responsibilities (7% repetition rate).

Threats

Traders in this stage face economic threats represented by rising prices (32% repetition rate), environmental threats from diseases, pests, and epidemics (23% repetition rate), increased transportation costs (10% repetition rate), rising oil derivative prices (7% repetition rate), and increasing labor wages (7% repetition rate).

3.1.2.4 Consumption

The study showed that the consumption of date palm products was limited to certain areas such as Hadhramaut Governorate and its surroundings only, and this production does not cover the demand of the market or consumers in other governorates. The market in other governorates is covered through the import of products from abroad. These imports negatively impacted local products by 12.8%, as consumers preferred to buy imported products, resulting in a 42.9% decrease in local product prices and a loss of 4.8% of customers. However, imports had a positive impact on meeting market/consumer needs and played a significant role in bridging the gap between supply and demand by 87.2%.

It is worth noting that 50% of the market/consumers buy through local markets, and 87% of them process the product after purchase. 71% of consumers stated that obtaining these products is somewhat easy (medium), but 2.17% stated that transportation is difficult.

There are also several uses for date palm products, such as in animal feed and palm leaves are used in preparing handicrafts. As for date palm products, they have various uses in the food industry, as they are used in the production of sweets, pastries, baked goods, popular dishes and cakes. 93% of consumers stated that there are no quality standards applied in preparation within these food industries.

There is a diversity of consumers in the sector across several different categories including pastry shops, restaurants and individuals. They preferred several different varieties of date, the most consumed types over all categories being as follows:

Al-Hamra (red date): This variety is the most desirable and the most traded among consumers at 26.6%. It is characterized by its high quality, dark red color, distinctive taste, and high nutritional value, which enhances the body and blood. It is also useful for pregnant women in the last months of pregnancy. Additionally, this variety is used in popular dishes, where it is added to the components of a meal called Al-Maris, a mixture of flour, ghee, honey and red dates.

Al-Barhi: This variety is characterized by its appropriate size, sweet taste, and high moisture content. It is of high quality, and consumption of this variety constituted 17.7% of the market.

Al-Madani: This is one of the most requested varieties in terms of not containing a high amount of sugar and is suitable for diabetics. It is characterized by its excellent color, good size, and good taste. Consumption of this variety was 17.7%.

Al-Jahmi: This is another variety popular among consumers, where its consumption reached 15.5%. It is characterized by high quality and good taste, and is used in the food industry.

Al-Majrafi: This variety is not popular, but has a good taste. The consumption rate is 6.6%.

Finally, among the popular varieties palm leaves are used by 4.4% for their importance in many handicrafts such as food trays, bread holders, hats, and others.

The study found that consumers do not benefit from any events or exhibitions held in the date sector, and direct purchase of these products is for consumption purposes and is through retail traders such as stores, where they are sold by weight or by piece. As for wholesale traders, sales are made in kilos or metal cans, and the average cash purchase value reached YR 1,750 / kg of dates. 60% of consumers expressed that the price is too high and not within their purchasing power.

3.1.2.4.1 SWOT and PESTLE Analysis - Consumption

Strengths

For markets and consumers, the strengths lie in knowledge of the markets with a frequency rate of 27%, marketing competitive varieties at a rate of 13%, especially as there are approximately 66 types of dates grown in Hadhramaut that vary in price and quality. They are also characterized by patience and perseverance at a rate of 12%, accumulated experience at a rate of 9%, and good relationships with players at a rate of 7%.

Opportunities

Economically, opportunities for markets and consumers lie in a suitable environment for dates with a frequency rate of 18%, especially as the crop is locally desirable in Tarim, a suitable location at a rate of 13%, state encouragement for investing in dates at a rate of 13%, availability of workforce at a rate of 13%, as well as representing a good economic return at a rate of 10%.

Weaknesses

Economic weaknesses in the final markets are represented by low income, with a frequency rate of 21%, and selling on credit, at a rate of 17%, as well as the lack of storage facilities, at a rate of 17%. Poor storage of dates can lead to a loss of quality and accelerate their expiration. By using good storage facilities and refrigeration units, date loss can be reduced, and product quality can be maintained in the market. Additionally, capital shortage is one of the weaknesses, at a rate of 17%, and low quality, at a rate of 15%.

Threats

Economic threats are represented by high prices, with a frequency rate of 41%, the presence of external competitive varieties at a rate of 7%, and local product competition in terms of price and quality, which negatively affects the sustainability of the local product and weakens the return on investment in this sector. Additionally, among the threats are the rise in shipping costs, at a rate of 5%, the rise in labor costs, at a rate of 5%, and the absence of security, at a rate of 5%.

3.1.2.5 Enablers / Legislative and Supporting Bodies

Enablers and legislative bodies oversee and guide agriculture in the date palm sector in the district of Tarim, coordinating work between research bodies and institutions working in the sector. They provide technical and advisory support, supply necessary materials, conduct necessary studies to determine production seasons, techniques, and modern varieties that contribute to increased productivity and improved quality, among other opportunities available for the development of the date palm sector.

Supporting bodies are considered the links that connect different players in the value chain by providing options that contribute to raising and improving the capabilities of all players. Their absence from the chain causes losses to all players, especially producers. This cooperation between supporters and players in the chain, especially producers, can be divided into the following:

- **Advisory support** can be in the form of providing guidance and technical support to the players in the chain.
- **Financial support** in the form of providing necessary agricultural equipment and supplies such as fertilizers, pesticides, irrigation networks, etc.
- **Technical and information support** by enabling producers and other players with the skills and knowledge that allow them to continue their activities, such as training farmers on production tools and modern agricultural techniques, as well as enabling them to deal with and solve problems.
- **Legislative support** by enacting laws and regulations that ensure the continuity of this value chain.

The following headings detail the enablers and supporters of the date value chain in Tarim District.

Agriculture and Irrigation Office - Enabler

The Agriculture and Irrigation Office oversees and monitors the production process at all stages of agriculture, and provides technical and advisory services to farmers through regular training and qualification, with the aim of improving agricultural processes that ultimately reflect in enhancing and improving the quality of the final product. The core operations that the Agriculture and Irrigation Office performs in the service of the date palm production sector include the following.

- Participation in the preparation of the agricultural technical staff and assistance in setting plans, programs, and agricultural technical education curricula, and supervision of agricultural training institutes and centers affiliated with the ministry.
- Preparation and implementation of agricultural advisory plans that ensure the development of farmers' skills, improving their performance, and developing their production methods.
- Reclamation and settlement of agricultural land, and protecting it from floods and natural factors.

- Inventory and classification of agricultural land, conducting topographic surveys and preparing various maps to maintain their fertility, increase their productivity, make better use of them, and protect them from erosion and desertification.
- Estimating the agricultural sector's needs for agricultural supplies and inputs and monitoring their provision in coordination with relevant authorities.
- Working to introduce and disseminate the use of modern agricultural machinery and equipment to increase production and reduce costs.
- Organizing and encouraging investment in date palm cultivation and providing the necessary facilities.

Local Council in Tarim - Enabler

The local authorities, represented by official bodies and senior representatives of communities, work to provide facilities and facilitate the work of civil society organizations and other supporting bodies for the agricultural sector, including the date palm sector. In addition, they provide the necessary information, data, and lists to support farmers and develop the sector in general. The local council is one of the official bodies that represents the target communities and helps guide supporting bodies towards providing the required support to the community based on their actual needs. The local authority also makes significant efforts to provide everything that serves farmers in the district and motivates them to increase production.

Research Farm - Supporter

The primary objective of the Research Farm is to preserve local varieties that they consider genetic assets for them and the local people. This farm also focuses on improving the quality of local varieties and introducing new improved varieties. The Research Farm markets its date products to wholesale traders through intermediaries who transport the product to the customer. The number of varieties produced by the farm is more than 40, and the most popular and demanded variety in the market is Al-Medini, which is suitable for diabetics. The quality system is carried out by a specialist who examines and evaluates the quality of the varieties. The number of workers employed at the farm during the year is 42, including 5 male permanent workers and 37 temporary workers, including 27 females. During the one production season of the year in 2021, the farm's date production reached 700 kg. The biggest challenges and problems they face from their own perspective are the lack of a dedicated budget and support from the government, in addition to the high prices of agricultural inputs and labor wages. The farm aims to improve the quality of the product for local varieties in the future.

Tarim Agricultural Cooperative Association - Supporter

The association is a charitable cooperative society with more than 1,600 partners, including 8 females. The society has 8 workers during the year, including 5 permanent staff. The main activity of the society is organizing sales operations for

farmers, in addition to alleviating their suffering by providing some of the required supplies that may be scarce in local markets, such as pesticides, oil derivatives, and fertilizers, which are the inputs most demanded by farmers. The society purchases dates from farmers and then processes 13% of the purchased quantity, with processing operations varying between sorting, drying, and packaging, while another 38% of the product is preserved and stored. The remainder of the product is sold directly in the market. The association evaluates the quality of the dates that it purchases from farmers. They are examined and evaluated based on experience by color, size and weight. There are two production seasons during the year, and the production quantity during 2021 reached 18,000 kg. During the worst production season the productivity rate decreased to 13% of natural production. The association faces a set of problems and challenges, the biggest and most important of which is the high cost of transportation due to road insecurity, the absence of other sources of income, in addition to high taxes. The association seeks in the future to open a market for selling agricultural products, especially dates, as this will contribute to improving and developing the production and marketing of the product, which in turn will be reflected in improving and developing the date production chain in general.

Civil society organizations - Supporter

Civil society organizations have not paid much attention to supporting date palm production in Tarim District, despite the challenges faced by producers and all actors in the sector. A field survey revealed that all those who were interviewed mentioned that they had not received any support or interventions to improve their production or training on practices for development and improvement of production, and the sector has been declining significantly in recent years and is still declining.

The United Nations Development Programme (UNDP) and its local partner SMEPS may take the lead in shedding light on this important economic sector and helping producers and other actors in the sector to revive it. This can be done by conducting a study on the sector's status and the challenges faced by the players, and providing assistance to enhance production, increase quality, and profit margins for producers and other actors in the sector.

During the same period of preparing this study, the project team at SMEPS visited the palm oases and producers to identify their needs, determine intervention priorities, and outline the broad aspects that require support at both financial and technical levels. Financial support involves providing water distribution networks and agricultural inputs, processing inputs, and post-harvest inputs. Technical support involves training farmers on correct production practices, improving quality and quantity for the benefit of the producer, trader, and ultimately the consumer.

3.1.2.5.1 SWOT and PESTLE Analysis - Enablers and Supporting Bodies

Strengths

The strengths for supporting and enabling organizations were social and represented by taking responsibility and finding solutions with a frequency rate of 23%, and having a good relationship with players at a rate of 18%. Additionally, enablers and donor organizations have institutional strengths by providing facilities to obtain financing to support small projects at a rate of 14%, encouraging investment at a rate of 9%. They can be included in laws and regulations related to supporting and organizing the date sector. Another strength is also awareness-raising about the rational use of water at a frequency of 9%.

Opportunities

The economic opportunities for this sector lie in the stability of currency exchange rates with a frequency of 38%, the availability of training courses from some donor organizations at a rate of 25%, the revival of the agricultural sector at a rate of 25%, and the renaissance of society at a rate of 13%, as the country's trend is towards relying on agricultural production.

Weaknesses

Weaknesses for supporting and enabling organizations economically ranged from a lack of awareness of the importance of palm trees with a frequency of 18%, to environmental weaknesses such as a lack of quarantine at a rate of 18%. Palm trees face diseases, epidemics, and insects that lead to widespread death of palm trees and a high burden and responsibility at a rate of 18%. Additionally, difficulties in communicating with foreign markets at a rate of 18% to keep up with developments in the sector and connect producers to foreign markets and expand the circle of marketing Tarim dates. The absence of training and qualification at a rate of 14% is also a weakness.

Threats

The spread of diseases and pests represents the most significant environmental threats to the date sector with a frequency of 13%, as it costs official authorities a lot to combat and prevent their spread. Additionally, the rise in oil derivative prices at a rate of 13%, water waste at a rate of 10%, land erosion due to floods at a rate of 10%, and water scarcity at a rate of 10%, especially since farmers in the area primarily rely on groundwater (springs and wells).

Table no. 5 SWOT analysis of the stages of the date value chain in Tarim District * (Primary Sources, 2022)

Chain Stages	الامداد مدخلات Supply Inputs	الانتاج Production	والتصدير والمعالجة التجارة Trade, Processing and Export	الاستهلاك Consumption	والداعمة الميسرة الجهات Enablers and Supporters
نقاط Strengths	• Ability to provide inputs (23%) • Knowledge of the market (18%) • Possession of qualified laborers (14%) • Accumulated experience (14%) • Patience and perseverance (99%)	• Patience and perseverance (23%) • Accumulated experience (22%) • Provision of the product on time (10%) • Pride and love of the profession (8%) • Possessing qualified manpower (8%)	• Accumulated experience (18%) • Production of competing items (15%) • Patience, persistence (12%) • A strong relationship with players (11%) • Qualified manpower (910%)	• Knowledge of the market (27%) • Marketing of competing items (13%) • Patience and perseverance (12%) • Accumulated experience (9%) • A strong relationship with players (7%)	• Taking responsibility and finding solutions (23%) • A strong relationship with players (18%) • Facilitating access to funding to support small projects (14%) • Investment promotion (9%) • Awareness-raising on rational use of water (9%)
الفرص Opportunities	• Awareness training courses (27%) • Date suitable environment (13%) • Availability of water (13%) • Increased demand (13%) • Stability of currency exchange (13%)	• Date suitable environment (23%) • Ease of selling (20%) • Availability of water (13%) • Good economic return (11%) • Inheritance of date palm trees (17%)	• Knowledge of the market, easy to sell (32%) • Good economic return (20%) • Appropriate site (15%) • Availability of manpower (10%) • Investment promotion (5%)	• Date suitable environment (18%) • Appropriate site (13%) • Encouraging the state to invest in dates (13%) • Availability of manpower (13%) • Good economic return (10%)	• Stability of currency exchange (38%) • Providing training courses by some parties (25%) • The agricultural sector (25%) • Society's advancement (13%)
نقاط الضعف Weaknesses	• Palm service machines are not available (40%) • Great burdens and responsibilities (20%) • Inappropriate store location (20%) • Lack of safe warehouses (20%	• Low capital (23%) • Production decrease (12%) • Low crop quality (9%) • Great burdens and responsibilities (8%)	• Low capital (31%) • Inappropriate store location (12%) • Production decrease (7%) • Low quality (7%) • Great burdens and responsibilities (7%)	• Low income (21%) • Credit sale (17%) • Lack of safe warehouses (17%) • Low capital (17%) • Low quality (15%)	• Poor awareness of the importance of palms (18%) • Poor quarantine establishment (18%) • Big burdens and responsibilities (18%) • Difficulty communicating with external markets (18%) • Absence of training and qualification (14%)
التهديدات Threats	• Prices volatility (50%) • Distant markets (8%) • Higher labor costs (8%) • Reduced interest in palm cultivation (8%)	• Diseases and epidemics (23%) • Prices volatility and increase (18%) • Urban sprawl and shrinkage of agricultural land (9%) • High transporting costs (7%) • Higher labor costs (5%)	• High prices (32%) • Diseases, pests and epidemics (23%) • High transporting costs (10%) • Rising prices of oil derivatives (7%) • Higher labor costs (7%)	• Prices increase (41%) • Competitive external items (7%) • High freight charges (5%) • Higher labor costs (5%) • Lack of security (5%)	• Spread of disease and pests (13%) • Rising prices of oil derivatives (13%) • Water waste (10%) • Land drift due to floods (10%) • Water scarcity (10%)

* Details of Table 5 are available in Appendix 2: SWOT and PESTLE Analysis Details

3.1.2.6 Parallel Channels for Ruttab and Dates

The data in Figure no. 13 shows two parallel paths through which dates pass from producers to the local market through a network of traders and processors who trade the product down to the consumer. The first path of high-quality dried and fresh dates is concentrated in the first, second, third, fourth, and seventh channels from producers towards the aggregators, wholesale traders, retail traders, and then to the final market, either inside or outside Hadhramaut province.

Photo illustrating dried dates

Photo illustrating fresh (wet) dates

The second path of lower quality dried and fresh dates is concentrated in the fifth and sixth channels from producers to wholesale and retail traders and processors who perform drying, sorting, and packaging operations before re-marketing the product in the local market inside or outside Hadhramaut Governorate.

Some high-quality varieties such as Al-Berhi, Al-Sukari and Al- Medini usually achieve higher prices when sold, whether fresh or dried. However, other types, such as Al-Jazaz, Al-Majraf and Al-Arqadi are usually left to complete maturity and become dried dates, as they do not achieve good prices when sold fresh.

When detailing the first channel, it is observed that 14.6% of producers sell their production to the major producers who in turn prepare or process the product and then re-market it. Major producers re-market it through three channels detailed as follows: :

- 12.5% of large producers market to **wholesalers**
- 12.5% of large producers market to **retailers**
- 62.9% of large producers market to **aggregators** or **brokers**

In the second channel, 10.6% of producers' product goes to wholesale traders in central markets in production areas, while 23.6% of producers sell their product to aggregators or brokers in the third channel.

In channel 4, 13.8% of producers tend to sell their product to retailers, while 1.6% of producers sell their product to processing retailers in channel 5, and 0.8% of producers sell their product to processing wholesalers in channel 6.

In channel 7, 30.1% of producers directly market their products to the consumer in nearby markets, while around 0.6% of the product is self-consumed by producers after being processed through traditional methods, such as cleaning, sorting, washing, drying, grinding, packaging in barrels, and stored for consumption for up to a year without damage.

Aggregators resell what they buy after processing to two types of traders. About 25% of them sell part of their product to wholesalers, and the remaining 75% sell to retailers.

Wholesalers obtain dried and fresh dates from three different sources, large producers, aggregators, and farmers. 12.5% of them sell directly to the local market and 87.5% sell to retailers.

Retailers are the most diversified in terms of sources of obtaining dried and fresh dates, obtaining them from four sources: major producers, aggregators, farmers, and wholesalers. They target local markets in different areas inside and outside Hadhramaut governorate, and sell 100% of their product to consumers.

Processing wholesalers and retailers sell 100% of their product directly in the local market inside and outside Hadhramaut governorate after processing, packaging, and transporting it to markets.

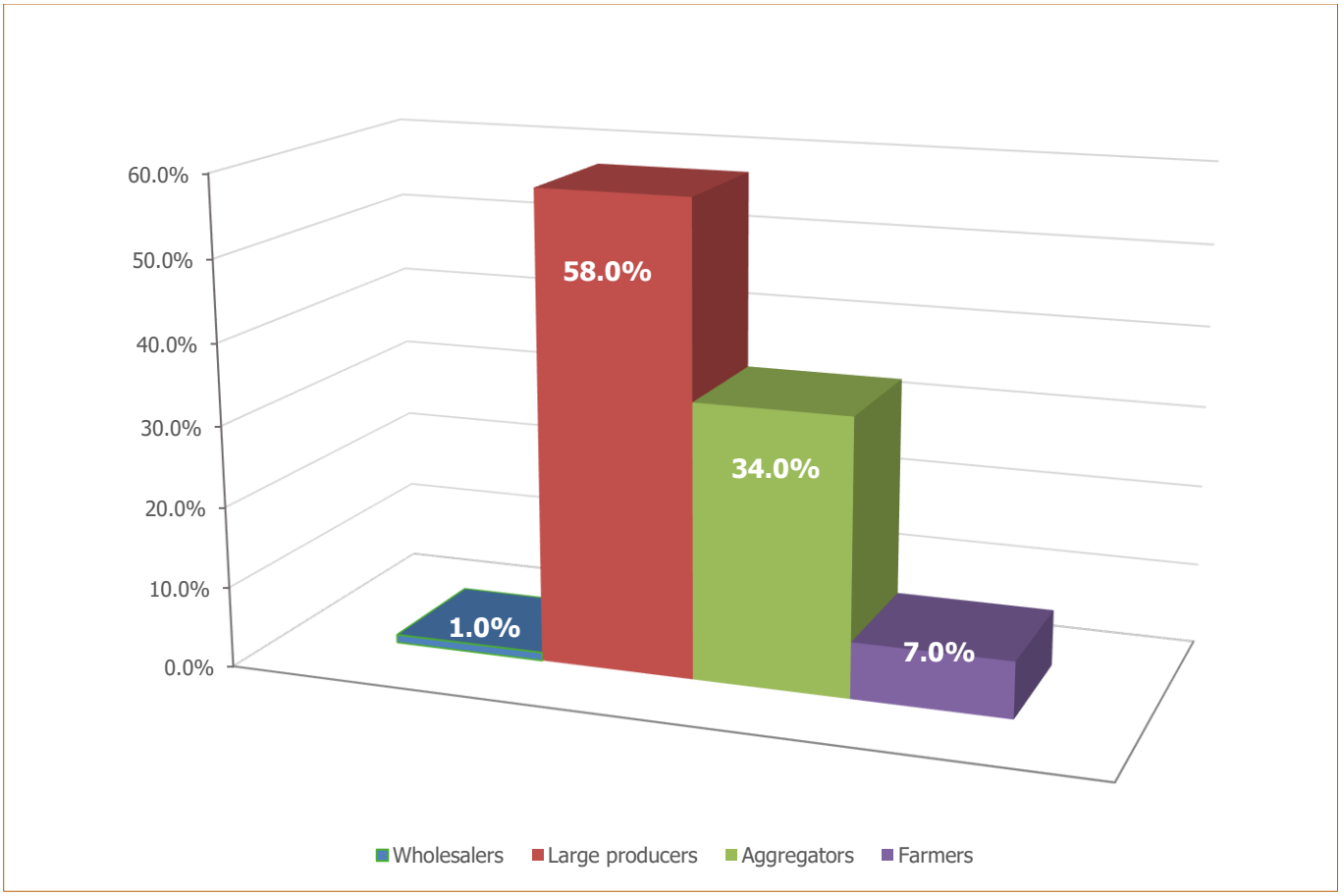


Figure no. 12: Date supply sources for retailers (Primary Sources, 2022)

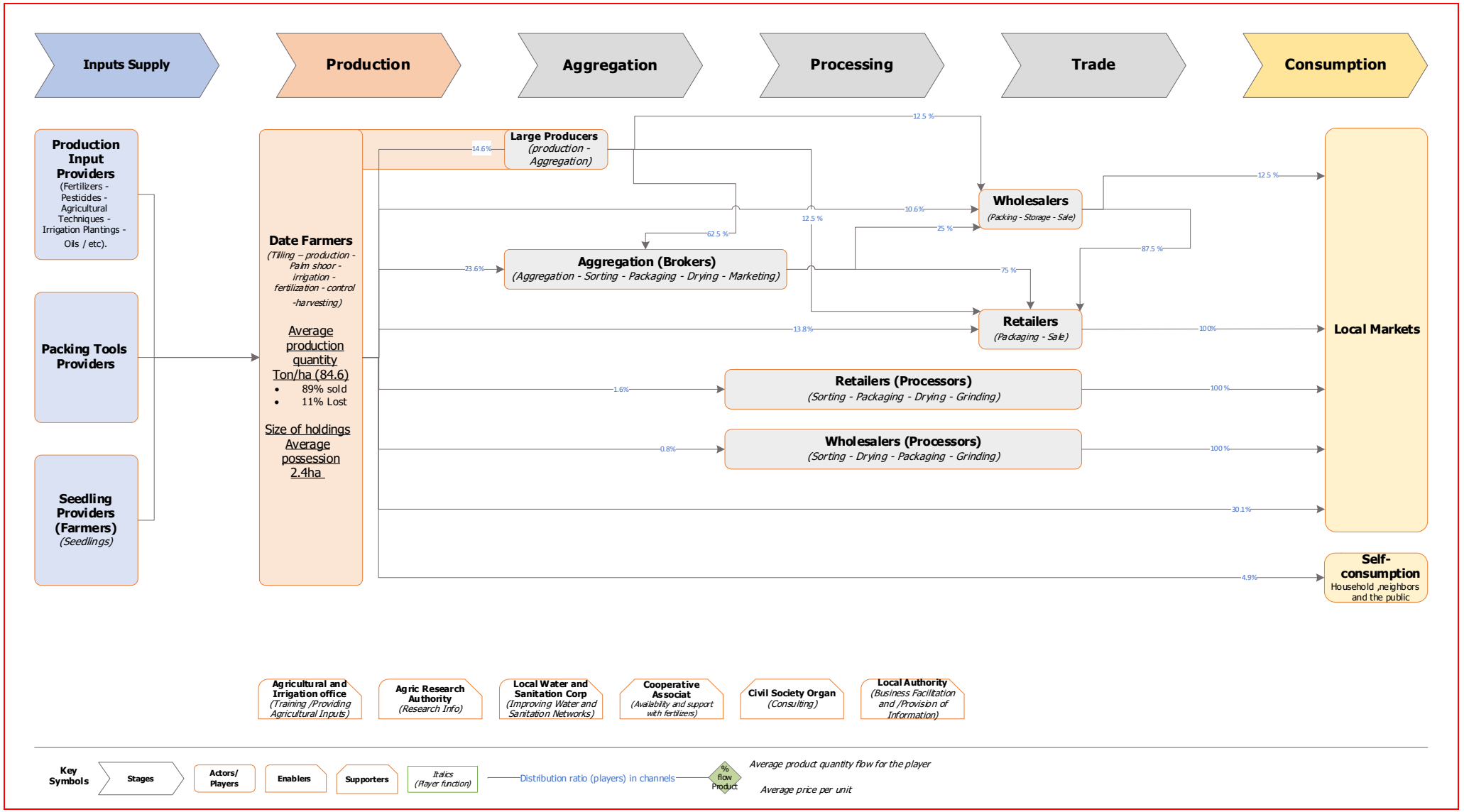


Figure no. 13: Map of the stages and functions of the players of the date value chain in Tarim District and the distribution of the players between different channels (Primary Sources, 2022)

3.1.3 Quantitative, Cash, and Profitability Flows in the Date Value Chain

There are various types of dates with wide quality differences and consumer preferences, creating a significant variation in prices across different marketing channels. The quality of the product, whether it is marketed in the fresh or dried stage, has a significant impact on the average selling price in each channel. The channels preferred by traders for buying and selling fresh dates achieve higher prices, especially for premium varieties such as Al-Sukari, Al-Burhi, and Al-Madani. The sale price in the direct channel between farmers and producers reached YR 1,925 / kg, and up to 26.3% of farmers' product is sold in this channel. This is a highly paid channel for farmers, while the selling prices in the other channels ranged between YR 385 / kg and YR 1,243 / kg.

The first four channels for producers have similar prices, ranging between YR 1,100 / kg and YR 1,243 / kg, where the production of high-quality dried and fresh dates, preferred by consumers, moves after undergoing grading, sorting, packaging, drying or pressing, and finally marketing. The following are the details of the quantitative flows and price from producers to other players:

- To large producers at YR 1,100 / kg, 10% of the production volume
- To wholesalers at YR 1,100 / kg, 8.3% of the production volum
- To aggregators at YR 1,243 / kg, 22.4% of the production volume
- To retailers at YR 1,243 / kg, 30.9% of the production volume

Each of these players resells the production in different channels and markets. Large producers sell their production to wholesale traders at a price of YR 1,975 / kg, which was 5.4% of their production, while they sell to retailers at a price of YR 1,650 / kg, which was 51.9% of their production volume. They also sell to aggregators at a price of YR 1,980 / kg, which was 42.6% of the production volume.

Aggregators sell a portion of their production to wholesale traders at a price of YR 2,123 / kg, which was 2.9% of their production volume. They also sell at the same price to retailers, which was 97.1% of their product volume.

Wholesale traders resell their product at a price of YR 2,145 / kg either directly to consumers, at a proportion of 11% of their production volume, or to retailers, at a proportion of 89% of the production volume.

Retailers sell 100% of their product at a price of approximately YR 2,123 / kg to the local market. The production is distributed to various areas within and outside Hadhramaut Governorate.

In channels five and six, lower quality types of dates are sold in small quantities. The producers sell 0.4% of their product to retail processors at an average price of YR 495 / kg, and 0.8% of their product to wholesale processors at a price of YR 385 / kg. Both retail and wholesale processors receive an average price of YR 1,750 / kg when selling the product in the local market, while wholesale processors receive a higher price of YR 2,000 / kg. All of them sell 100% of their products in the local market, and processing wholesalers get a higher price for marketing their products in regions and markets further away not reached by the processing retailers.

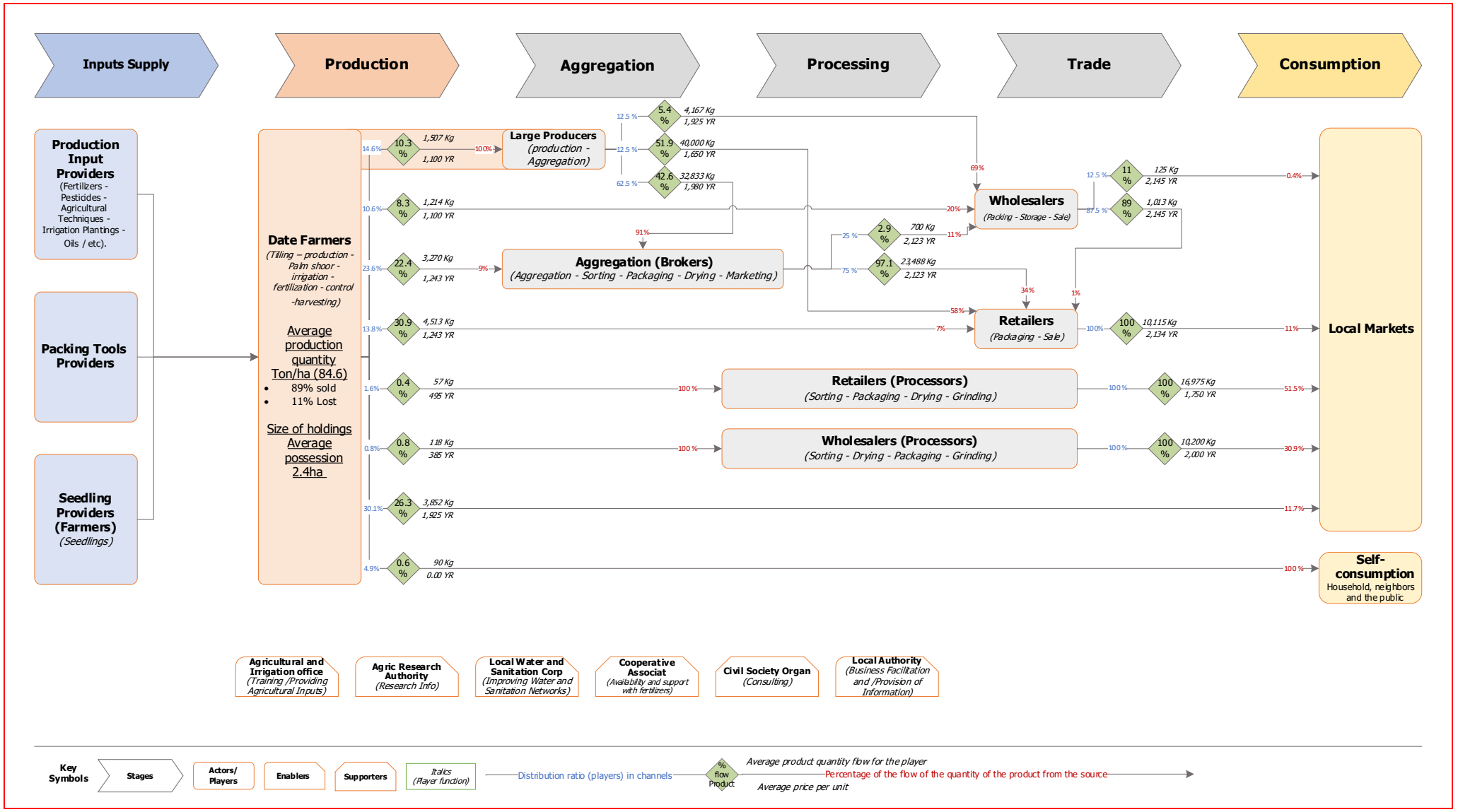


Figure no. 14: Map of quantitative and cash flows among date value chain players in Tarim District - Hadhramaut - Yemen (Primary Sources, 2022)

3.1.4 Marketing Channels and Marketing Margin Analysis for Chain's Players

Figure no.15: Marketing channels and the marketing margin of value chain players in Tarim District shows that there are 15 marketing channels for date palm producers in the value chain of dates in Tarim District. The best marketing channels for producers seem to be channel number 15, as the producers receive the full value of the marketing margin. The **marketing margin** is the difference between the price paid by the final consumer and the price received by the producers.

Through marketing margins, the share of the producers from the price paid by the final consumer in the chain can be determined, as well as the share of the traders between the producers and the consumers in the chain. The higher the share of the producers in the marketing margin, the higher the efficiency of the marketing in the chain. The marketing efficiency increases with the decrease in the number of intermediaries between the producers and the consumers due to the lack of value added to the product (Arafa & Hammam, 2015).

As mentioned earlier, channel number 15, which directly connects the producers to the market, is the best channel for producers because they receive the largest share of the marketing margin. However, 30% of the producers and about 26.3% of the production quantities are directed to other channels for wholesalers and traders due to the additional costs of transportation and marketing incurred by the producers, as well as the limited marketing area to the nearby markets.

Channel number 9, in which producers sell to wholesalers, is the second-best channel in terms of marketing margin for producers, accounting for 58% of the marketing margin. About 23.6% of the producers and approximately 22% of the production quantities move in this channel, and the producers in this channel are relieved of the marketing and transportation costs. They market date palm and dates products according to customer demand.

Channels 13 and 14 received a minimum marketing margin of 28% and 19%, respectively, for the two channels with low flow rates, as fewer quality dates are sold in this channel, where processing retailers resort to reproducing and packaging them to be sold at a better price to the market, and therefore traders in this channel bear additional costs for manufacturing and marketing.

Channels 13 and 14 had the lowest marketing margins for producers at 28% and 19%, respectively. These channels sell lower quality dates intentionally produced for processors and repackaged for sale at a better price in the market. Therefore, traders in these channels incur additional costs for manufacturing and marketing.

As for the remaining channels, the marketing margins for producers ranged from 49% to 56%, and the product moves through wholesalers and retailers at different percentages, as shown in Figure 15.

Figure no. 16 shows the percentage of producers moving in each marketing channel, the percentage of production flowing in each channel, and the percentage of the marketing margin received by producers in each marketing channel. It is noted that channel number 15 has the highest marketing margin for producers and the highest percentage of

producers marketing their production in this channel, but it is not the channel with the highest flow of product. Channel number 12, which connects producers to retailers, had the highest flow rate at 31% of production quantities.

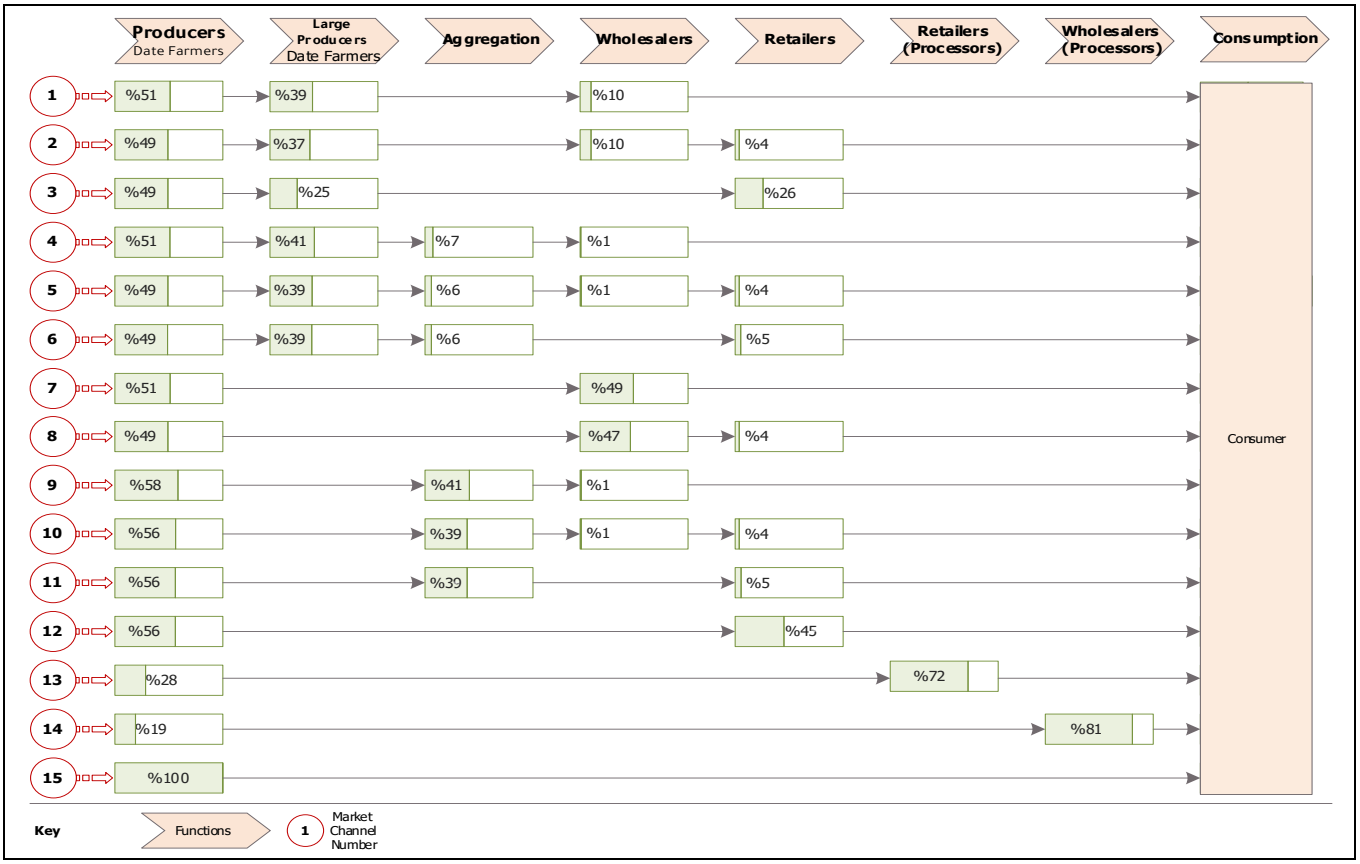


Figure no.15: Marketing channels and the marketing margin of value chain players in Tarim District (Primary Sources, 2022)

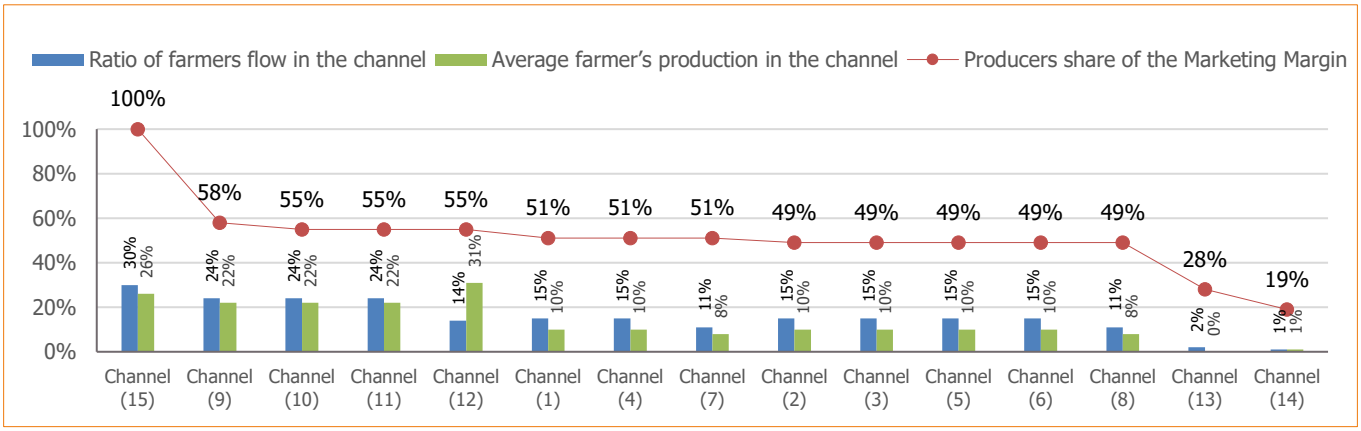


Figure no. 16: Comparison of marketing channels, flows and quantities of date value chain producers in Tarim District (Primary Sources, 2022)

3.2 Jobs Opportunities in the Date Value Chain

The dates are a highly valued cash crop with increasing demand, and is one of the most important sectors that provides numerous job opportunities due to the various stages it goes through. It begins with the cultivation and care of the fruit during growth, followed by the stages of production from picking, sorting, and other processing until it ends up as one of its products, such as fresh or dried dates, or date syrup.

Table 6 shows the number of permanent workers in the different players of the date value chain during one year, with an average of 5 permanent workers per player. An increase in the number of workers was observed at the stage of aggregate wholesalers and brokers, with an average of 13%, followed by the production stage, which reached 7%. The lowest percentage of permanent employment in the sector was for wholesale traders at 2%.

The date sector is largely dominated by men, with the percentage of female workers at 22% of the average permanent players in the sector. The reason for the low number of females in this sector is due to the danger involved in the production stage, starting from planting the seedlings and pollination of the palm trees, to harvesting the fruits, which require high skills in climbing. However, women's roles are evident in the date value chain in the district of Tarim, as permanent workers who participate in the production stage at a rate of 46% of the average production players, followed by wholesale collectors at a rate of 34%, due to the importance of their work in sorting, assembling, and packaging. The percentage of female workers was minimal, estimated at around 10% of the average retail traders. The presence of females in temporary employment played a significant role in the assembly work for aggregate wholesalers, with a rate of 49%.

It is evident from Table 6 that there is a significant convergence in annual labor costs and the number of workers in all players of the date chain, except for production, assembly, and intermediaries. It is also clear that the number of working days reached 28 days. Moreover, the further the product is from the production stage, the lower the percentage of family labor, whether permanent or temporary, as permanent family labor is higher in most players of the chain, and the percentage is similar in the production, assembly, and retail stages as a processing trader.

Table no. 6 Job opportunities available in the date value chain in Tarim District during the year (Primary Sources, 2022)

Players in the Value Chain	Average no. of permanent jobs	% of female permanent workers	% of household employment	Average no. of temporary jobs	% of temporary female labor	% of household employment	No. of provisional days of work	* Permanent labor cost /month (YR)	* Temporary labor cost / day (YR)	Total labor cost / year (YR)	Total laborers	Total working days
Production input providers	3	27	53	3	6	47	26	56,100	6,600	3,397,900	6	904
Producers (date farmers)	7	46	62	9	29	51	4	58,300	6,600	5,434,000	16	2,012
Retailers	3	10	41	4	20	54	22	55,000	5,500	3,577,200	7	948
Processing retailers	3	-	61	3	14	13	45	66,000	6,600	4,965,400	6	1,055
Wholesalers	2	11	37	4	-	55	17	60,500	8,800	3,734,500	6	714
Processing wholesalers	5	29	57	2	-	-	75	63,800	11,000	6,430,600	7	1,424
Aggregate (broker)	13	34	66	11	49	50	4	71,500	7,700	12,067,000	24	3,438
Average of one player	**5**	**22**	**54**	**5**	**17**	**39**	**28**	**61,600**	**7,700**	**5,658,400**	**10**	**1,499**

* The average shown in the table is for males. The average cost of employment for females is 52.97% of male labor costs for permanent employment, and 39.21% of male labor costs for temporary employment.

3.3 Analysis of Date Value Chain Constraints / Problems

The date sector holds significant economic importance due to its high food value, contributing to increasing economic benefits and securing national food security. Maximizing the economic return of the date product is of utmost importance as it is one of the most important food-producing plants. Dates are important non-traditional commodities and crops that can be utilized for local consumption or export, thanks to their high nutritional value, vitamins, and minerals.

However, the date sector faces many challenges and constraints. The study below presents an overview of the problems facing the date sector from the perspective of stakeholders in the sector, including proposed solutions and the responsible parties for implementing those solutions in terms of priority.

3.3.1 Inputs Stage

There are many challenges and obstacles facing input traders in the date sector, which in turn affect the development and improvement of the sector and ensure its growth and recovery. Table 7 highlights the top three most important problems ranked in order of importance, with the first problem or obstacle facing input traders being the high exchange rates and currency fluctuations. Exchange rates are of great importance as they affect trade and investment flows, and one of the best solutions proposed by supply traders is to enact laws to curb exchange rate manipulation by the relevant authorities.

The second problem according to the opinions of supply input traders is the high cost of transportation resulting from the high prices of oil derivatives. It is considered one of the main reasons for the high prices of dates in the markets, which has had a negative impact on the economic situation in Yemen and increased the suffering of supply traders. Input traders see it as necessary to support oil derivatives to contribute to alleviating this suffering.

The study reveals a third problem affecting the input stage, which is the weakness of the security authorities and the absence of protection from the government, leading to frequent thefts from input traders. This has made them reluctant to transport goods and deliver them to markets and consumers, as well as to expand and grow. One of the proposed solutions by stakeholders is to enhance security and provide security and protection services for goods.

3.3.2 Production Stage

The results of the study in Table no.7 show that producers (farmers) face several problems, with the most prominent being the spread of diseases and pests due to weak disease diagnosis and control programs. This problem has led to the death of many palm trees, a decline in product quality, and significant financial losses for farmers. Many of them have turned to work in other sectors, in addition to the problem of weak production. Producers believe that the solution to this problem is to implement a disease prevention program, activate the role of guidance, and support farmers with modern

agricultural technologies (spraying machines) from the Ministry of Agriculture, the Extension Office, and other organizations.

Exchange rate fluctuations and instability were the second most important problem for producers (farmers), leading to increased costs and damage to agriculture by affecting agricultural output. The high exchange rate leads to farmer frustration and neglect of agriculture, leading to increased demand for imported foodstuffs, which are more expensive than local products. Producers believe that the solution to this problem is to fix the problem of exchange rate fluctuations so that they can import fertilizers at lower costs, or for the government to provide financial support for fertilizers so that producers can continue to cultivate this sector.

The third problem that emerges for producers is the low quality of the date product due to old palm trees. The infestation of palm trees with pests and diseases and a lack of care has weakened their quality and economic performance, making it difficult to compete with imported date products. The proposed solution to this problem is to cultivate new areas of palm trees and be provided with high-quality seedlings by the government.

3.3.3 Trade, Processing and Export

The study results in Table no.7 showed that traders, processors and exporters face the challenge of limited capital due to the fluctuation and high exchange rates, which led to a weak agricultural season, shortage of agricultural products, and a rise in food prices. This situation, in turn, negatively affected the market and caused traders to suffer from a period of stagnation. To solve this problem, traders, processors and exporters proposed that stabilizing the currency and providing financial grants and loans from organizations would play a significant role in boosting capital, in addition to the importance of restoring the government's authority.

The second problem faced by traders, processors and exporters is the fluctuation and instability of prices and the currency, which led to a rise in price of products, loss of competitiveness, a decline in demand for date products, and the accumulation and spoilage of goods in warehouses, which caused traders to lose money. To solve this issue, traders, processors and exporters suggest that the currency should be stabilized.

The entry of foreign varieties competing with the local product is considered the third problem that hinders the work and activity of traders, processors and exporters in the dates sector due to the weakness of the local product and its low quality. It also led to high transportation costs for local and imported products, which many traders and farmers couldn't withstand. The proposed solutions to this problem is the partial ban of imported products, improving local product quality, and the provision of high-quality varieties by the Agricultural Research Center.

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3.3.4 Consumption Stage

Consumers in the date sector face several problems. The first problem faced by marketers and end consumers is the fluctuation in exchange rates and currency instability, which leads to an increase in date prices. The reason for this is the lack of a unified pricing system. Marketers and end consumers believe that currency stability and monitoring of exchange rates by relevant authorities are the most suitable solutions for this problem.

The poor quality of date products and the availability of varieties that do not meet consumer needs are the second biggest challenge for marketers and end consumers due to the farmers' neglect of local varieties. As palm trees require large amounts of water, the lack of rain during the agricultural seasons was one of the reasons that contributed to the poor quality of the product. One of the proposed solutions is to provide high-quality products, which can be achieved by providing high-quality palm shoots by the government.

The study also showed that the third problem facing consumers and markets is the variable supply of date products to the markets due to the delay in palm tree harvesting and packaging, which leads to product spoilage. One of the solutions proposed by consumers and markets is timely harvesting and packaging, and the government can play a role in this regard.

3.3.5 Enablers and Supporters

Despite the role of enablers and supporters in facilitating and easing the work of the supply chain, they face many problems. One of these problems is the lack of sufficient budget, which weakens the research and development or engaging in improved experiments that will in turn improve the quality of the date product. One of the solutions proposed by enablers and supporters is to adopt a sufficient budget to promote this important economic sector.

The absence of training and qualifications, and the weak awareness of the importance of the date palm was the second problem faced by enablers and supporters, in addition to the weakness of specialists in this field and the lack of awareness in the current generation of the importance of the date palm. This has led to neglect in the cultivation of date palms and sluggish work in this sector. To solve this problem, enablers and supporters see the need to provide support, training and qualifications, and to establish awareness courses by relevant authorities.

The third problem facing enablers and supporters is the scarcity of labor and employment due to the lack of technical expertise in this field, which has resulted in slow work progress. Therefore, enablers and supporters see the necessity of employing technical staff and specialized engineers by the Ministry of Agriculture and Irrigation.

Table no.7 Analysis of the three most important obstacles/problems for the stages of the date value chain in Tarim District ranked from the most important to the least important (Primary Sources, 2022)

Stages Chain	Ranking Based on Importance	Description Obstacles/ problems	Classification* (PESTLE) **	Main cause For Obstacles/problem	Most important obstacle/impact Obstacle / Problem	Proposed Solution to the Intervention (According to stakeholders)	In charge of Implementing solutions.
Inputs Supply	1	Rising prices	(Financial) Economic	• Currency exchange rate	• Low income	• Developing laws to limit manipulation of exchange rates	• Gov
	2	High operating costs	(Financial) Economic	• Increase in the price of oil derivatives	• An increase in the cost of goods	• Providing oil derivatives by supporting them	• Gov
	3	Weak security standpoint	(Administrative/Organizational) Legal	• Complete absence of government	• Too many robberies	• Enhancing security	• Gov
Production	1	Prevalence of diseases (epidemics - pandemics)	(Technical) Environmental	• Poor diagnosis of diseases in addition to weak control programs.	• Poor production	• Conducting a spraying program to prevent diseases and activate the role of guidance and support farmers with modern agricultural equipment (spraying machines)	• Ministry of Agriculture, Extension Office and Organizations
	2	Fluctuation of exchange rates	(Financial) Economic	• Exchange rate instability	• The lack of proven drainage, in turn, leads to high fertilizer costs	• Financial support for fertilizers	• Gov
	3	Low crop quality	(Technical) Technological	• Palm trees are ancient and old-fashioned	• Poor production and death of palm trees	• Providing very high-quality dates	• Gov
Trade / Processing / / Exports	1	Low capital	(Financial) Economic	• High exchange rates in addition to the poor agricultural season and the lack of products	• The high price of the product in addition to the stagnation of the market where the trader is going through a period of inactivity.	• Currency stability	• Gov
	2	Price volatility	(Financial) Economic	• Instability	• High product prices and therefore poor purchasing	• Currency stability	• Gov
	3	Entry of external items competing with the local product	(Financial) Economic	• The weakness of the local product and its low quality in addition to the high transportation costs	• Lack of sales due to the high price of imported products	• Partial prevention of imported products while improving the quality of the local product and providing high-quality items and branding of the product.	• Agricultural Research Centre
Consumption / Market	1	High rates of real estate	(Financial) Economic	• Instability	• High prices for all date products	• Currency stability	• Gov
	2	Poor quality of date product	(Technical) Technological	• Farmers' reluctance and lack of interest in local varieties in addition to lack of rainfall and lack of agriculture for local varieties	• A poor product that does not meet the needs of consumers	• Providing very high-quality date	• Gov
	3	Unsuitable product supply quantities	(Financial) Economic	• Delay in sleeve sieve process	• Dates have been damaged	• Wrapping on time	• Gov
Enablers and Supporters	1	Lack of sufficient budget	(Financial) Economic	• Lack of budget from the state	• Delay of payment to workers - not to enter into other improved experiments	• Approval of a budget	• Gov
	2	Lack of training and qualification and poor awareness of the importance of palms	(Administrative/Organizational) Social	• The weakness of those assigned to this aspect and the current generation's ignorance of the importance of dates	• Works in a state of inactivity and neglect of imagination	• Providing support, training, rehabilitation and awareness courses	• Gov
	3	Lack of workers and employment	(Administrative/Organizational) Social	• Low technical specialties	• Slow to work	• Increase technical staff and engineers	• Ministry of Agriculture and Irrigation

• **= General Rating**: 1. Technological 2. Financial 3. Administrative/Organizational ** = **PESTLE Classification**: 1. Political 2. Economic 3. Social 4. Technological 5. Legal 6. Environmental

4 Development Strategy

Some possible solutions and strategies that will contribute to the development of the date sector in Tarim District

4.1 Development Strategy

The study results show that date producers face many challenges that hinder the development of the sector. Many of those involved in the study suggested that it is possible to overcome these challenges by implementing interventions that contribute to the development of the date production sector and its workers. The stakeholders involved in supporting and developing the sector should work together to establish clear strategies that address the challenges and improve production conditions for workers in the sector, enabling them to continue their work. The study summarizes the most important interventions in the date production sector according to the stages specified in the date value chain. Table no. 8 summarizes the most important results obtained from those involved in the study and their proposals for developing the sector.

4.1.1 Supply Inputs

The study results show that the inputs used in production are traditional due to most farmers following traditional methods in agricultural operations and crop management. Therefore, interventions that contribute to providing high-quality palm inputs that are resistant to agricultural pests are considered one of the most important interventions proposed by the study participants from agricultural input suppliers.

The study results show that the inputs used in production are traditional due to most farmers following traditional methods in agricultural operations and crop management. Therefore, interventions that contribute to providing high-quality palm inputs that are resistant to agricultural pests are considered one of the most important interventions proposed by the study participants from agricultural input suppliers.

Undoubtedly, modern agricultural techniques are a priority for interventions in the sector. Such interventions will contribute to improving the quality and quantity of production and reducing operating costs for producers. This, in turn, will lead to increased income and profits, which will lead to an increase in their activity and continued production.

Technology and knowledge represents one of the most important pillars of the success of any intervention. Workers in the date palm production sector suffer from a significant lack of information and knowledge in modern production methods. Therefore, conducting training courses in modern production methods, crop management, as well as in administrative and financial fields, will help enhance the capacity of project owners and input traders to manage and develop their projects.

One of the challenges facing input traders is the difficulty of obtaining financing to develop their projects. Therefore, interventions in the field of financing and lending are a priority for input traders according to the majority of the study participants.

4.1.2 Production

Most date palm producers face significant challenges in production processes, where agricultural pests, difficulty in finding funding sources, technical knowledge in crop management, and weak organization cooperation in production are among the most important challenges and obstacles to developing production.

Most study participants suggested that localizing modern agricultural inputs and accompanying technical support would contribute to solving most of the challenges and difficulties faced by date palm producers in their production processes and developing their income sources. Training and qualifications in crop management, production development, and proper production practices will increase the quality and quantity of production. Additionally, training in financial and administrative skills is also important for date palm producers in the study areas.

Providing support to producers with modern agricultural technologies will improve production processes, increase product quantity, improve product quality, improve producers' income, and enhance their working and living conditions. The study results indicate the need for interventions in the provision of production inputs and agricultural equipment in the areas of irrigation, fertilization, pest control, and the provision of high quality palm varities that resist agricultural pests and have high productivity characteristics.

Organizing production and producers by forming entities and associations that connect them and work on providing services, organizing production, and marketing products are among the most important issues that help producers develop their businesses and protect their interests. The study participants suggested that establishing agricultural cooperative associations and building their institutional and organizational structure is one of the important interventions in the date palm sector. This will help in organizing producers and facilitating negotiations on product prices and obtaining the services that producers need.

In addition, one of the significant challenges facing date palm producers (farmers) is obtaining financing or loans to help them develop their production and provide the supplies they need in production processes. It is possible to link producers with financing institutions and encourage these institutions to implement financing and lending programs that suit the culture of producers in rural areas, and facilitate access to financing and loans for the community segments that work on date palm production in remote areas.

4.1.3 Aggregation, Processing and Trade

Interventions in adding value, processing, and transformation of dates into new or standardized products that meet market demands are among the priorities of date value chain actors, as indicated by most of the study participants.

Sorting, processing, and packaging are important interventions in the date sector, and the provision of modern equipment for such activities is possible. The conversion of dates into derivative products such as date syrup and other products can help date sector actors find alternative markets, especially given the competition faced from large date-producing countries in the region, such as the Arab Gulf states and Iraq.

Access to finance remains a significant challenge for date traders, and providing them with financing and lending sources is among the most important interventions that will improve their production conditions and enable them to continue their businesses. Undoubtedly, training and capacity building are crucial needs for date sector actors.

Most study participants emphasized that technilogical, financial, and administrative training and capacity building are of paramount importance for them. Most date sector actors lack knowledge of modern production methods and standards and the required quality for domestic markets. Training programs and awareness campaigns for date producers and workers can be implemented to enhance their knowledge and enable them to keep pace with modern production methods.

4.1.4 Consumption

Based on the study results, developing trademarks for local date products is considered a top priority in the process of marketing dates and their products. Consistent with what was mentioned by the majority of the study participants, trademarks for local date products will contribute to defining and promoting the products, increasing confidence in them, and improving marketing conditions for local products in all targeted markets.

The study results also indicate that interventions that contribute to diversifying products will enhance the ability to market date products. There is no doubt that market requirements for date products are very diverse and not limited to raw dates alone. There is a great demand in local, regional, and global markets for secondary date products, and interventions in producing secondary products will improve the ability of producers and workers in the date sector to compete in markets, improve their situation, and sustain and develop their businesses.

4.1.5 Enablers and Supporters

Laws and regulations play a prominent role in developing any economic or productive sector in any country. In this regard, most of the study participants and workers in the date value chain have expressed that issuing laws and regulations to regulate the date production process in Yemen will contribute to developing the sector. It will also protect producers and workers in the sector, encourage their investments, and enhance their productive and marketing capacities. Activating the role of legislative and regulatory institutions is a priority in the sector to monitor the application and adherence of workers in the date sector to existing regulations to protect consumers, producers, and workers. This is to ensure the provision of products that meet market needs and comply with quality standards.

Forming entities and cooperative associations in the date sector will facilitate access to producers and improve their production and organize the production and marketing process for products. One of the advantages of these associations is that they provide services, guarantees, and facilities for other entities operating in the sector, contributing to the sector's overall development.

Most of the study participants pointed out that building a database for workers in the date value chain will facilitate communication between them, which will improve production conditions and facilitate obtaining products and services in this sector more easily. It will also contribute to organizing the date value chain in general.

As stated previously, interventions in lending and financing represent an urgent priority to address the difficulty of finding sources of financing in the date sector. Working with financing entities to develop financing and lending programs suitable for the groups working in the date sector could revitalize their culture and their standard of living. Financing would improve work in this sector by developing all production and marketing processes, especially with the application of modern machinery and methods.

Table no. 8 Strategy for developing the stages date value chain in Tarim District

Stages of VC	Type	Development Needs	Appropriate Interventions	Expected Impact
Inputs Supply	Technical	• Developing the process of producing and supplying offshoots • Effective agricultural tools, fertilizers, and pesticides	1. Providing good, locally produced palm seedlings that are compatible with the environment 2. Providing effective pesticides and fertilizers to combat diseases and epidemics affecting date palms 3. Providing modern agricultural supplies and tools to improve agricultural practices 4. Training and qualifications in project management and finance 5. Providing soft financing to farmers	• Providing high-quality date varieties • Palm trees are healthy and free from diseases and epidemics • Improving agricultural processes and practices • Improving financial and technical capabilities
	Financial	• Financing / loans • Training and rehabilitation		
	Administrative/Organizational	• Good agricultural plans, programs, and practices		
Production	Technical	• Agricultural techniques used • Methods and means of irrigation • Fertilization and control of epidemics and diseases	1. Training farmers on modern agricultural practices to provide high-quality products 2. Providing production inputs, modern agricultural and irrigation equipment, and providing fertilizers and pesticides to combat diseases affecting palm trees 3. Establishing entities that protect producers and ensure appropriate sales returns that help in continuity and development 4. Providing financial support and soft loans to encourage farmers and producers to continue and increase production 5. Training and qualifying farmers in the financial and organizational aspects	• Provide high-quality products and reduce production losses • Improving the living conditions of producers and the development and continuity of palm cultivation • Ensuring suitable sales returns for producers • The development of the cultivation of palm trees
	Financial	• Financial support • Appropriate marketing		
	Administrative/Organizational	• Institutional and organizational structure • Weakness and absence of cooperative societies • Training farmers on modern agricultural practices		
Trade / Processing / / Exports	Technical	• Provide good and diversified products • Improving quality standards in the manufacturing process	1. Provide good production and manufacturing standards 2. Developing new products that meet market needs 3. Providing modern tools and equipment for manufacturing, drying, and storage 4. Providing funds, loans, and grants to producers to improve the production process 5. Training, rehabilitation, and institutional building for producers	• Providing a variety of high-quality products of dates and their derivatives • Increase sales and revenues and encourage the industry
	Financial	• Financing / loans • Develop regular marketing plans		
	Administrative/Organizational	• Plans, programs, and good manufacturing practices • Rehabilitation and training of employees		
Consumption / Market	Technical	• Trademarks and classification of products • Building consumer confidence in local products • Exporting dates	1. Creating brands and trademarks for the local product and presenting it competitively to foreign products 2. A variety of local products with high quality to cover the local demand for dates	• The great value of Yemeni dates and increased confidence in the local product • Better marketing for brands • The presence of the local product in the international markets
	Financial	• Providing the product at suitable prices		
	Administrative/Organizational			
Enablers and Supporters	Technical	• Rules and regulations • Disease and epidemic control programs • Productivity standards	1. Issuing laws and legislations that encourage and enable farmers to continue 2. Establishing cooperative societies to develop the players' performance in the date value chain 3. Conducting awareness programs and campaigns to combat diseases affecting palm trees 4. Training and qualifying technical cadres from the regions 5. Building a database of players in the date value chain 6. Providing loans and grants to research agencies and associations to help them carry out their duties in a better way	• Encouraging farmers and facilitating the production process • Ensuring the quality of the local product and presenting it to consumers with international standards • Increasing agricultural areas for palm trees
	Financial	• Providing loans and grants		
	Administrative/Organizational	• Training and development programs for players • Producers database		

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Appendices

4.1 Appendix 1: Adaptive Reuse Matrix

Table no. 9 SWOT - PESTLE adaptive reuse matrix in the value chain (Ioannis, et al., 2021)

Sustainability Indicators	Strengths	Opportunities	Weaknesses	Threats
Politics (Po) Political	(Po1) Blocking Neglect Policy	(Po2) Urban Re-development Strategies / Incentives	(Po3) Political Support Level	(Po4) Political Inertia
(Ec) Economic	(1Ec) Economic Growth Boost	(2Ec) Capitalization of Cultural Value	(3Ec) Inability to Estimate Economic Viability	(4Ec) Investment Returns
(SC) Socio-Cultural	(SC1) Cultural Values Preservation	(SC2) Quality of Life Improvement	(SC3) Facadism	(SC4) Gentrification
(TT) Technological-Technical	(TT1) Technological Innovation	(TT2) Cooperation in a wide range of scientific fields	(TT3) Asset Condition	(TT4) Technical Difficulties
(Le) Legal	(Le1) Current Legislative Context	(Le2) Land Use Plan and Zoning	(Le3) Current Building Standards	(Le4) Ownership Status
(En) Environmental	(En1) Reduced Environmental Footprint	(En2) Eco-Building	(En3) Achieving Net-Zero Energy Goals	(En4) Indoor Environmental Quality

4.2 Appendix 2: SWOT and PESTLE Analysis Details

Table no. 10 SWOT (**Strengths**) and PESTLE analysis for date value chain players (Primary Sources, 2022)

Chain Players for each Stage	*Description*	*Classification* (1/2/3)*	*PESTLE** (1/2/3/4/5/6)*	*Freq*	*Rate*	*Ranking*
Supply Inputs	Ability to provide input	Administrative/Organizational	Technological	5	23%	1
	Market knowledge	Administrative/Organizational	Economic	4	18%	2
	Possessing qualified manpower	Technical	Social	3	14%	3
	Accumulated experience.	Administrative/Organizational	Social	3	14%	4
	Patience and perseverance	Administrative/Organizational	Social	2	9%	5
	Possess multiple sources of income	Financial	Economic	2	9%	6
	Having good capital	Financial	Economic	1	5%	7
	The ability to collect the value of materials	Administrative/Organizational	Economic	1	5%	8
	Provision of pest and agricultural disease control	Financial	Technological	1	5%	9
Production	Patience and perseverance	Administrative/Organizational	Social	61	23%	1
	Accumulated experience.	Administrative/Organizational	Social	58	22%	2
	Provision of the product on time.	Administrative/Organizational	Economic	26	10%	3
	Pride and love of the profession	Administrative/Organizational	Social	20	8%	4
	Possessing qualified manpower	Technical	Social	20	8%	5
	A strong relationship with players	Administrative/Organizational	Social	16	6%	6
	Market knowledge	Administrative/Organizational	Economic	16	6%	7
	Choose the appropriate location	Administrative/Organizational	Economic	11	4%	8
	Use good water in agriculture	Financial	Environmental	10	4%	9
	The ability to collect the value of products	Administrative/Organizational	Economic	7	3%	10
	Negotiation and persuasion skills.	Administrative/Organizational	Social	6	2%	11
	Production of competing items	Financial	Economic	4	2%	12
	Experience in dealing with pesticides and fertilizers	Technical	Environmental	4	2%	13
	Owning Fire extinguishers	Financial	Technological	2	1%	14
	Ability to expand and open branches	Administrative/Organizational	Economic	1	0%	15
Trade / Processing / Exports	Accumulated experience.	Administrative/Organizational	Social	18	18%	1
	Production of competing items	Financial	Economic	15	15%	2
	Patience and perseverance	Administrative/Organizational	Social	12	12%	3
	A strong relationship with players	Administrative/Organizational	Social	11	11%	4
	Qualified manpower	Administrative/Organizational	Social	10	10%	5
	The ability to provide the product on time	Administrative/Organizational	Economic	9	9%	6
	Pride and love of the profession	Administrative/Organizational	Social	9	9%	7
	Market knowledge	Administrative/Organizational	Economic	5	5%	8

Chain Players for each Stage	*Description*	*Classification** *(1/2/3)*	*PESTLE*** *(1/2/3/4/5/6)*	*Freq*	*Rate*	*Ranking*
	Having good capital	Financial	Economic	3	3%	9
	Taking responsibility and finding solutions	Administrative/Organizational	Social	2	2%	10
	Hoods/flushers	Technical	Technological	2	2%	11
	Negotiation and persuasion skills.	Administrative/Organizational	Social	2	2%	12
	Attention to product quality and cleanliness	Technical	Technological	1	1%	13
	The ability to collect the value of products	Administrative/Organizational	Economic	1	1%	14
	Accountant	Administrative/Organizational	Social	1	1%	15
Consumption / Market	Market knowledge	Administrative/Organizational	Economic	21	30%	1
	Marketing of competing items	Financial	Economic	10	14%	2
	Patience and perseverance	Administrative/Organizational	Social	9	13%	3
	Accumulated experience	Administrative/Organizational	Social	7	10%	4
	A strong relationship with players	Administrative/Organizational	Social	5	7%	5
	Punctuality	Administrative/Organizational	Economic	3	4%	6
	Taking responsibility and finding solutions	Administrative/Organizational	Social	3	4%	7
	Multiple income sources	Financial	Economic	3	4%	8
	Pride and love of the profession	Administrative/Organizational	Social	2	3%	9
	Qualified manpower	Administrative/Organizational	Social	2	3%	10
	Negotiation and persuasion skills.	Administrative/Organizational	Social	2	3%	11
	Ability to continue product value collection	Administrative/Organizational	Economic	1	1%	12
	Globally licensed Input	Financial	Technological	1	1%	13
Enablers & Supporters	Taking responsibility and finding solutions	Administrative/Organizational	Social	5	23%	1
	A strong relationship with players	Administrative/Organizational	Social	4	18%	2
	Facilitating access to funding to support small projects	Administrative/Organizational	Economic	3	14%	3
	Investment promotion agency	Administrative/Organizational	Economic	2	9%	4
	Awareness-raising on the rational use of water	Administrative/Organizational	Environmental	2	9%	5
	Accumulated experience.	Administrative/Organizational	Social	2	9%	6
	Pest and agricultural disease control	Technical	Environmental	2	9%	7
	Issuing laws that support investment	Administrative/Organizational	Legal	1	5%	8
	Social networks	Technical	Technological	1	5%	9

*** = Classification**: 1. Technical 2. Financial 3. Administrative/Organizational **** = PESTLE**: **1**. Political 2. Economic 3. Social 4. Technological 5. Legal 6. Environmental

Table no. 11 SWOT (**Opportunities**) and PESTLE analysis for date value chain players (Primary Sources, 2022)

Chain Players for each Stage	*Description*	*Classification* (1/2/3)*	*PESTLE** (1/2/3/4/5/6)*	*Freq*	*Rate*	*Ranking*
Supply Inputs	Awareness training session	Administrative/Organizational	Technological	4	27%	1
	The environment is suitable for the date	Financial	Environmental	2	13%	2
	Availability of water	Financial	Environmental	2	13%	3
	Increase demand	Financial	Economic	2	13%	4
	Stability of currency exchange	Financial	Economic	1	7%	5
	Providing electricity.	Financial	Economic	1	7%	6
	Enhancing the production of palm fruits in the region	Administrative/Organizational	Economic	1	7%	7
	Abundance of manpower	Administrative/Organizational	Social	1	7%	8
	Good Economic rectum	Financial	Economic	1	7%	9
Production	The right environment for dates	Financial	Environmental	49	23%	1
	Ease of sale	Administrative/Organizational	Economic	43	20%	2
	Availability of water	Financial	Environmental	28	13%	3
	Good economic return	Financial	Economic	23	11%	4
	Inheritance of palm trees	Financial	Social	17	8%	5
	Availability of modern technologies and machines	Financial	Technological	9	4%	6
	Availability of manpower	Administrative/Organizational	Social	8	4%	7
	Awareness training session	Administrative/Organizational	Technological	7	3%	8
	The state encourages investment in dates	Administrative/Organizational	Legal	7	3%	9
	Famous for growing dates	Administrative/Organizational	Economic	6	3%	10
	Easy access to funding (country + organizations) to support small projects	Financial	Economic	6	3%	11
	Farms stability	Administrative/Organizational	Social	3	1%	12
	Increase demand	Financial	Economic	3	1%	13
	Globally licensed input	Financial	Technological	2	1%	14
	Stability of currency exchange	Financial	Economic	1	0%	15
	Safety and protection of the factory worker	Technical	Environmental	1	0%	16
	Recovery of the agricultural sector	Financial	Economic	1	0%	17
	Reviving local markets and shops	Financial	Economic	1	0%	18
	The proximity of manufacturing factories to market centers	Administrative/Organizational	Economic	1	0%	19
	Society advancement	Administrative/Organizational	Social	1	0%	20
Trade / Processing / Exports	Knowledge of the market Easy to sell	Administrative/Organizational	Economic	19	32%	1
	Good economic reuturn	Financial	Economic	12	20%	2
	Convenient location	Financial	Economic	9	15%	3
	Availability of manpower	Administrative/Organizational	Social	6	10%	4
	Investment promotion agency	Administrative/Organizational	Legal	3	5%	5

Chain Players for each Stage	*Description*	*Classification* (1/2/3)*	*PESTLE** (1/2/3/4/5/6)*	*Freq*	*Rate*	*Ranking*
	Lack of competing markets	Administrative/Organizational	Economic	2	3%	6
	Training and qualification in packaging	Administrative/Organizational	Technological	2	3%	7
	Expansion and opening of branches	Financial	Economic	1	2%	8
	Inputs	Financial	Technological	1	2%	9
	Revitalizing the market and shops	Financial	Economic	1	2%	10
	Modern technologies and machines	Financial	Technological	1	2%	11
	Available near manufacturing factories to market centers	Financial	Economic	1	2%	12
	Increase demand	Financial	Economic	1	2%	13
	Accessibility	Administrative/Organizational	Economic	1	2%	14
Consumption / Market	The right environment for dates	Financial	Environmental	11	18%	1
	Convenient location	Administrative/Organizational	Economic	8	13%	2
	Encouraging the state to invest in dates	Administrative/Organizational	Legal	8	13%	3
	Availability of manpower	Administrative/Organizational	Social	8	13%	4
	Good economic return	Financial	Economic	6	10%	5
	Increase demand	Financial	Economic	5	8%	6
	The fame of the region with dates	Administrative/Organizational	Economic	3	5%	7
	Making transport available;	Financial	Economic	2	3%	8
	Easy access to funding (country + organizations) to support small projects	Administrative/Organizational	Economic	2	3%	9
	Stability of currency exchange	Financial	Economic	1	2%	10
	Inputs	Financial	Technological	1	2%	11
	Reviving local markets and shops	Financial	Economic	1	2%	12
	Product validity date	Technical	Technological	1	2%	13
	Goodwill	Administrative/Organizational	Economic	1	2%	14
	Lack of competing markets	Administrative/Organizational	Economic	1	2%	15
	Lack of imports from abroad	Financial	Economic	1	2%	16
	Laws that support investment	Administrative/Organizational	Legal	1	2%	17
Enablers & Supporters	Stability of currency exchange	Financial	Economic	3	38%	1
	Availability of training courses from some parties	Administrative/Organizational	Technological	2	Universal anti-terrorism instruments	2
	Recovery of the agricultural sector	Financial	Economic	2	Universal anti-terrorism instruments	3
	Society advancement	Financial	Social	1	13%	4

*** = Classification**: 1. Technical 2. Financial 3. Administrative/Organizational **** = PESTLE**: 1. Political 2. Economic 3. Social 4. Technological 5. Legal 6. Environmental

Table no. 12 SWOT **(Weaknesses)** and PESTLE analysis for date value chain players (Primary Sources, 2022)

Chain Players for each Stage	*Description*	*Classification* (1/2/3)*	*PESTLE** (1/2/3/4/5/6)*	*Freq*	*Rate*	*Ranking*
Supply Inputs	Palm service machines are not available	Financial	Technological	2	40%	1
	Great burdens and responsibilities	Administrative/Organizational	Technological	1	20%	2
	Inappropriate store location	Administrative/Organizational	Economic	1	20%	3
	Lack of safe warehouses	Financial	Economic	1	20%	4
Production	Low capital	Financial	Economic	45	23%	1
	Reduced productivity	Financial	Economic	23	12%	2
	Low crop quality	Technical	Economic	18	9%	3
	Great burdens and responsibilities	Administrative/Organizational	Technological	15	8%	4
	No other sources of income	Financial	Economic	12	6%	5
	Lack of safe warehouses	Financial	Economic	10	5%	6
	Lack of experience (processors)	Technical	Technological	9	5%	7
	Difficulty in obtaining financing or loans	Administrative/Organizational	Economic	7	4%	8
	Lack of experience in agricultural practices	Technical	Technological	7	4%	9
	Sale on credit	Financial	Economic	4	2%	10
	Poor marketing	Administrative/Organizational	Economic	4	2%	11
	Lack of knowledge of agricultural pests	Technical	Technological	4	2%	12
	Difficulty communicating with foreign markets	Administrative/Organizational	Economic	3	2%	13
	Difficulty negotiating with customers	Administrative/Organizational	Social	3	2%	14
	Poor awareness of the importance of palms	Administrative/Organizational	Social	3	2%	15
	Inability to keep up with rising rents	Financial	Economic	3	2%	16
	Lack their alternative energy	Technical	Technological	3	2%	17
	Unconfigured accounts	Administrative/Organizational	Technological	3	2%	18
	Difficulty in obtaining modern irrigation networks	Financial	Technological	2	1%	19
	Depletion of funds in the purchase of pesticides	Financial	Technological	2	1%	20
	Inability to compete	Administrative/Organizational	Economic	2	1%	21
	Lack of tillage	Financial	Economic	2	1%	22
	Lack of agricultural pest traps	Financial	Environmental	2	1%	23
	Purchasing power is weak	Financial	Economic	1	1%	24
	Choosing packages that are not suitable for the market	Technical	Technological	1	1%	25
	Ignorance of nutritional value	Administrative/Organizational	Social	1	1%	26
	Use of traditional methods of packaging	Technical	Technological	1	1%	27
	Poor efficiency manufacturing	Technical	Economic	1	1%	28
	Poor production and marketing data	Administrative/Organizational	Economic	1	1%	29
	Low capital	Financial	Economic	18	31%	1

Chain Players for each Stage	*Description*	*Classification* (1/2/3)*	*PESTLE** (1/2/3/4/5/6)*	*Freq*	*Rate*	*Ranking*
Trade / Processing / Exports	Inappropriate store location	Financial	Economic	7	12%	2
	Reduced productivity	Financial	Economic	4	7%	3
	Quality	Technical	Economic	4	7%	4
	Great burdens and responsibilities	Administrative/Organizational	Technological	4	7%	5
	Lack of safe warehouses	Financial	Economic	4	7%	6
	Sale on credit	Financial	Economic	3	5%	7
	Inability to compete	Administrative/Organizational	Economic	3	5%	8
	Low income	Financial	Economic	3	5%	9
	Difficulty negotiating with customers	Administrative/Organizational	Social	2	3%	10
	Lack of security safety tools	Financial	Technological	2	3%	11
	High rentals	Financial	Economic	1	2%	12
	Cheating	Technical	Economic	1	2%	13
	Difficulty communicating with foreign markets	Administrative/Organizational	Economic	1	2%	14
	Electricity	Technical	Technological	1	2%	15
	Lack of used machines	Financial	Technological	1	2%	16
Consumption / Market	Low income	Financial	Economic	10	21%	1
	Sale on credit	Financial	Economic	8	17%	2
	Lack of safe warehouses	Financial	Economic	8	17%	3
	Low capital	Financial	Economic	8	17%	4
	Quality	Technical	Economic	7	15%	5
	Reduced productivity	Financial	Economic	3	6%	6
	Great burdens and responsibilities	Administrative/Organizational	Technological	1	2%	7
	Inability to compete	Administrative/Organizational	Technological	1	2%	8
	Lack of safety tools	Technical	Technological	1	2%	9
Enablers & Supporters	Poor awareness of the importance of palms	Administrative/Organizational	Social	3	18%	1
	Poor quarantine establishment	Technical	Environmental	3	18%	2
	Big burdens and responsibilities	Administrative/Organizational	Social	3	18%	3
	Absence of training and qualification	Administrative/Organizational	Social	2	12%	4
	Uniformity of prices controls	Administrative/Organizational	Economic	2	12%	5
	Financial deficit	Financial	Economic	2	12%	6
	Difficulty communicating with external markets	Administrative/Organizational	Economic	2	12%	7

*** = Classification**: 1. Technical 2. Financial 3. Administrative/Organizational **** = PESTLE**: 1. Political 2. Economic 3. Social 4. Technological 5. Legal 6. Environmental

Table no. 13 SWOT (**Threats**) and PESTLE analysis for the date value chain players (Primary Sources, 2022)

Chain Players for each Stage	*Description*	*Classification* (1/2/3)*	*PESTLE** (1/2/3/4/5/6)*	*Freq*	*Rate*	*Ranking*
Supply Inputs	Prices volatility	Financial	Economic	6	50%	1
	Distant markets	Administrative/Organizational	Economic	1	8%	2
	Higher labor costs.	Financial	Economic	1	8%	3
	Reduce interest in the palm grove	Administrative/Organizational	Environmental	1	8%	4
	Lack of agricultural land for palms	Financial	Environmental	1	8%	5
	The presence of a crop that kills palms	Financial	Environmental	1	8%	6
	High rentals	Financial	Economic	1	8%	7
Production	Diseases and epidemics	Financial	Environmental	85	23%	1
	Prices volatility	Financial	Economic	67	18%	2
	Urban sprawl and shrinkage of agricultural land	Financial	Environmental	32	9%	3
	High operating costs	Financial	Economic	24	7%	4
	Higher labor costs.	Financial	Economic	18	5%	5
	Lack of security	Administrative/Organizational	Legal	16	4%	6
	The presence of competitive items in the market	Financial	Economic	13	4%	7
	Distant markets	Administrative/Organizational	Economic	12	3%	8
	The problem of rising irrigation costs	Financial	Economic	10	3%	9
	Prevalence of illiteracy	Administrative/Organizational	Social	10	3%	10
	Useless crop	Financial	Economic	7	2%	11
	Cheating	Technical	Technological	6	2%	12
	Weakness and death of palm trees	Technical	Environmental	6	2%	13
	Lack of modern network engineers	Technical	Social	6	2%	14
	High freight charges	Financial	Economic	5	1%	15
	Increase in the prices of oil derivatives	Financial	Economic	5	1%	16
	Threat to landowners	Administrative/Organizational	Social	4	1%	17
	Date cultivation is very stressful	Administrative/Organizational	Economic	4	1%	18
	Increased electricity costs	Financial	Economic	3	1%	19
	Poor agriculture Policy	Technical	Environmental	3	1%	20
	Weakness and interruption of electricity	Financial	Economic	3	1%	21
	Uniformity of prices controls	Administrative/Organizational	Economic	3	1%	22
	Low income	Financial	Economic	3	1%	23
	Climate changes - temperature - rain	Technical	Environmental	2	1%	24
	High taxes	Financial	Economic	2	1%	25
	Variance of output	Financial	Economic	2	1%	26
	Production input providers	Financial	Technological	2	1%	27
	Lack of spare parts for machines	Financial	Technological	2	1%	28
	The presence of anonymous inputs	Financial	Technological	2	1%	29
	Lack of cooperation between farmers	Administrative/Organizational	Social	1	0%	30
	Windbreaks	Financial	Environmental	1	0%	31
	Late season.	Administrative/Organizational	Environmental	1	0%	32
	Monopoly and control of the market	Administrative/Organizational	Economic	1	0%	33
	Unfair use of water	Financial	Environmental	1	0%	34
	Lack of product processing centers	Administrative/Organizational	Technological	1	0%	35
	Degradation of roads	Financial	Economic	1	0%	36
	Non-cooperation of the authority with traders	Administrative/Organizational	Legal	1	0%	37
	Lack of support for manufacturing centers	Administrative/Organizational	Economic	1	0%	38
Trade / Processing / Exports	Rising prices	Financial	Economic	26	32%	1
	Diseases, pests, and epidemics	Technical	Environmental	19	23%	2
	High operating costs	Financial	Economic	8	10%	3

Chain Players for each Stage	*Description*	*Classification* (1/2/3)*	*PESTLE** (1/2/3/4/5/6)*	*Freq*	*Rate*	*Ranking*
	Increase in the prices of oil derivatives	Financial	Economic	6	7%	4
	Higher labor costs.	Financial	Economic	6	7%	5
	Lack of security	Administrative/Organizational	Legal	3	4%	6
	Non-provision of cooperative loans to entrepreneurs	Financial	Economic	1	1%	7
	Expiry date	Technical	Technological	1	1%	8
	Lack of high-quality bags	Financial	Technological	1	1%	9
	High costs of processing and marketing	Financial	Economic	1	1%	10
	High taxes	Financial	Economic	1	1%	11
	Distant markets	Administrative/Organizational	Economic	1	1%	12
	The varying volume of output	Financial	Economic	1	1%	13
	Uniformity of prices controls	Administrative/Organizational	Legal	1	1%	14
	Lack of product processing centers	Administrative/Organizational	Technological	1	1%	15
	Obstructive laws	Administrative/Organizational	Legal	1	1%	16
	Unsuitable product supply quantities	Financial	Economic	1	1%	17
	The presence of anonymous inputs	Financial	Technological	1	1%	18
	Useless crop	Financial	Economic	1	1%	19
Consumption / Market	Rising prices	Financial	Economic	30	41%	1
	Competitive external items	Financial	Economic	5	7%	2
	High freight charges	Financial	Economic	4	5%	3
	Higher labor costs.	Financial	Economic	4	5%	4
	Lack of security	Administrative/Organizational	Legal	4	5%	5
	Increase in the prices of oil derivatives	Financial	Economic	4	5%	6
	Cheating	Technical	Technological	3	4%	7
	Highrrentals	Financial	Economic	3	4%	8
	Distant markets	Administrative/Organizational	Economic	2	3%	9
	Monopoly and control of the market	Administrative/Organizational	Economic	2	3%	10
	Price increase due to the presence of brokers	Financial	Economic	2	3%	11
	Financial deficit	Financial	Economic	2	3%	12
	Unsuitable product supply quantities	Financial	Economic	2	3%	13
	Increased electricity costs	Financial	Economic	1	1%	14
	High production and marketing costs	Financial	Economic	1	1%	15
	Material losses	Financial	Economic	1	1%	16
	Uniformity of prices controls	Administrative/Organizational	Legal	1	1%	17
	Absence of training and qualification	Administrative/Organizational	Technological	1	1%	18
	Lack of sourcing information	Administrative/Organizational	Technological	1	1%	19
Enablers & Supporters	The spread of disease	Technical	Environmental	4	14%	1
	Increase in the prices of oil derivatives	Financial	Economic	4	14%	2
	Water waste	Financial	Environmental	3	10%	3
	Land drift due to floods	Financial	Environmental	3	10%	4
	Water scarcity	Financial	Environmental	3	10%	5
	Weak security standpoint	Administrative/Organizational	Legal	2	7%	6
	Urban sprawl and shrinkage of agricultural land	Financial	Environmental	2	7%	7
	Prices volatility	Financial	Economic	2	7%	8
	Obstructive laws	Administrative/Organizational	Legal	2	7%	9
	Death of palm trees	Financial	Environmental	2	7%	10
	Prevalence of illiteracy	Administrative/Organizational	Social	1	3%	11
	Cheating	Technical	Technological	1	3%	12

*** = Classification**: 1. Technical 2. Financial 3. Administrative/Organizational **** = PESTLE**: 1. Political 2. Economic 3. Social 4. Technological 5. Legal 6. Environmen