

TAMPERE UNIVERSITY OF TECHNOLOGY

Department of Industrial Engineering and Management

ONUR TAMUR

**CREATING PRODUCT PORTFOLIO STRATEGY VIA ACTIVITY BASED
COSTING APPLICATION IN FOOD PRODUCTION**

Master's Thesis

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ABSTRACT

TAMPERE UNIVERSITY OF TECHNOLOGY

Department of Industrial Management

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Application in Food Production

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With the rise of globalization and saturated local markets, many companies started chasing international opportunities that would help them expand to new countries and increase their brand recognition around the globe. This has also increased the level of competition in global perspective. The rising competition and the price cuts of the global market leaders narrow the price range and shrink the profitability of late comers in the industries. The only way that these firms survive in the fierce competitive markets is to control their costs which will eventually lead to an increase in profit margins. In the light of these trends, companies tried to search for ways to control their cost and get accurate product cost information that can be used in pricing decisions. Activity-based costing has been founded to fulfill this need in the market and it started to gain significance in the market immediately because of its efficiency and practicality. Moreover, activity-based model can also be used in decision making and strategy creation which would be used to guarantee long term success of the firm and help them gain the ability to react to the emerging trends in the markets.

One of the biggest challenges for companies that want to implement activity-based costing in their organization is to understand their industry dynamics and production environment so that they can adapt the existing methods to their specific case by identifying their business activities and analyze the cost they generate on products. Thus, the organization-wide trainings and top management buy-in are very important for the success of the project that is being implemented.

This research focuses on creating an activity-based costing model for UGS Foods by considering the industry specific dynamics of food production and unique methods that are present in olive processing environment. The activities that are being done during olive production will be listed to understand their impact on product costs. This will enable UGS Foods to totally understand the consequences of their decisions and optimize their business activities by considering the cost they

create. After the accurate cost information for products are deduced from the system, they are mapped on profit potential – volume matrix to analyze their position and value for the company and to take specific decisions on long-term market strategy.

This study in general provides methods to implement activity-based costing in complex production environment like olives where the production flow and activities are complicated to differentiate from each other. Moreover, it presents a framework to analyze profit potential and volume of each product and create product portfolio strategy according their position on the matrix. This study helps UGS Foods to understand the role of each product for the company and support them to improve the product position in the market by giving recommendations depending on their position on the graph.

The drop strategy portfolio covers small and medium sized pitted green olives, small whole green olives and large sliced black olives. The main focus of this product group is to analyze how the strength of the product in hand can be utilized in different channels without harming the long term customer relations. As a result, the large black olives will not be pitted because it diminishes their value drastically and will be sold as a whole product. The pitted and whole green olives will be used in mixtures with black olives to neutralize the profitability of the mixture and create more value. The repositioning strategy portfolio includes small and large whole black olives, medium and large whole green olives and large pitted green olives. The main focus of this group is to reposition the products in the market so that the customer can perceive the products differently which will have impact on the sales volumes of the products. As a result, the repositioning strategy will be implemented by using premium packaging and herbal mixtures to change the perception of these products in customers' eyes.

The promotion strategy product portfolio has small, medium and large pitted black olives and medium whole black olives. These are the flagship products of UGS Foods in international markets because they both have high profit margin and sales volume. These products are important for UGS Foods so they need to pay good attention to this product group and try to increase their sales volume by following correct promotion strategies so that the profitability can be expanded in company level. As a result, the above mentioned products are the flagship products for UGS Foods to survive and gain competitive advantage in foreign markets. Thus, these products will be handled with care in strategic perception and the company will maximize its effort to maintain if possible increase the volumes to sustain long term growth. The cost reduction portfolio group is the final segment and it consists of small and medium sliced black olives. These products have good amount of sales volume but they lack in profitability. The cost reduction strategy will enable UGS Foods to increase the profit margin of the following products so that they can

create good amount of profit thanks to their high amount of sales volume. Even though, there are limited opportunities to reduce costs in the facilities, the company will do efforts to lower its manufacturing costs by focusing on the water wastage and changing the layout of the production zone. There is also possibility to make a foreign investment where the production costs would be lower compared to Turkey for some specific product groups.

PREFACE

This thesis is structured on the case study of UGS Foods in collaboration with Tampere University of Technology. The objective of the project was to analyze the production environment of UGS Foods and implement an activity-based costing model in UGS Foods to solve their product costing problem. Throughout the research steps, I had chance to understand the dynamics of activity-based costing model and how it can be used to optimize business activities and take part in strategic decision making. Personally, it was interesting to analyze industry-specific dynamics of olive production and learn the cost impact of different processes that food products pass through and recommending a product portfolio strategy gathered from the advanced costing model was a very interesting task and taught me how to use financial data in strategy creation.

I would like to express my gratitude to UGS Foods managers and employees for their contribution to the fruitful discussions in the analysis phase of the research project and their full support and belief in the project's success. Without their outstanding contribution and interest in this topic, it was impossible to create a beneficial application that will be used to create a long term vision for UGS Foods in competitive markets.

Last but not least, I would like to thank to Professor Olavi Uusitalo and Lecturer Tommi Mahlamaki. Their extensive knowledge in the field and their experience in research area have significantly contributed in structuring my work and combining practical findings with the related management theories and literature. Furthermore, I am really thankful to my family and friends who supported me during my studies and motivated me to do my best in everything I accomplish in life.

Tampere, May 2013

Onur Tamur

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1 INTRODUCTION

1.1 CONTEXT OF THE STUDY

According to Lee & Carter (2005), globalization is an inevitable and irreversible process fundamental to the future of world economic development. The growing integration of national economies around the world will lead to rapid economic growth and poverty reduction in developed and developing countries. However there are also some arguments supporting that globalization exacerbates poverty and inequality between rich and poor, cultural convergence and spread of deadly diseases (Lee & Carter 2005).

Even though there are many debates on globalization, it is accepted as an industrial reality and an increasing trend in current business environment. As the developing technology is reducing the transportation costs, the interests of organizations working in international markets will keep on spreading around the globe. This presents organizations with unlimited opportunities to grow and transform to become not only larger but also more competitive and efficient (Lee & Carter 2005). On the other hand, it covers some risks as well. The competition in the industries are arising which narrow the price range and shrink the profitability of companies in order to be able to compete with other international companies and local competitors in the market and to keep on widening their business operations around the world.

The only way to increase profitability without going over the price range the market dictates is to manage the costs of the company by reliable cost management methods and systems. After 80's there have been wide discussions in business economics area to solve this problem and plenty of new costing methods have been developed in collaboration of academic and industrial experts. Activity-based costing is also created in this period to respond to the need of companies retrieve correct cost information per product and also use this information in strategic decision making to evaluate the business activities and product strategy of the firm (Lee & Carter 2005).

1.2 BACKGROUND OF THE CASE

The research is based on the case company UGS Foods that is a key member of business-to-business Turkish food manufacturers in international markets founded in 1982. The production plant of UGS Foods is located in İzmir, Turkey and has approximately fifty employees. The revenue of the company is 11 Million Turkish

Lira (1 Euro = 2.35 Turkish Lira) and mainly exports its products to US market. The facility is constructed in 10000 square meter area as 5000 square meter closed, in which 30000 tons of olives per year are processed as pitted, sliced halved, wedged, chopped, marinated, etc. packed in a variety of packing formats. UGS Foods is one of the leading olive exporters in Turkey. They provide private label goods to American wholesalers so the wholesalers use their own brand in U.S. market. This strategy enables UGS Foods to minimize their sales and marketing costs which leads to a competitive pricing strategy and higher profit margin in the markets.

UGS Foods operates in B2B markets and produce private label products for international wholesalers. The target of the company is to have competitive prices for standard quality products and increase their profitability by pursuing economies of scale. The case company is significantly expanding its dominance in the U.S market in sales of olive products and interested in entering new markets like South America and Middle East. The huge growth potential of the company in new markets comes together with new problems and challenges to tackle as well. UGS Foods plans to expand its product portfolio to be able to respond to a wider variety of preferences in the new markets which will significantly create new cost areas for the company.

1.2.1 The Dynamics of Food Industry and Olives Production

The food industry has many industry specific regulations, food safety and quality control methods in its production phase due to the nature of the goods produced. As it is directly related to human health, there is a strict approach which is controlled by the governmental organizations by double checking with safety and quality standards provided by international authorities in critical control points. Moreover, if the good being produced is a fresh product, pre-production phase and the time that the process is undertaken earns a more significant role compared to the productions in different industries. In addition to production challenges, there are also industry specific supplying complications usually because of perishable and unstandardized raw materials.

Olive tree is one the oldest cultivations of earth and have a very long life time such as 500 years. Company has always been seeking the ways of serving olive products as natural as possible, in harmony with its nature as Olives are recognized a gift of the nature with plenty benefits to human health. Even though, olives have a long-term tradition, they are non-consumable without passing through some chemical processes which differentiates olives from most of other food products. They are reserved in tanks filled with food preservatives such as water, acid and salt.

The complexity in olives productions starts with the first step in the production phase in which the olives are purchased and stored in fermentation tanks. Even though the olives are purchased mixed, they are tried to be classified visually before they are stored in the tanks so that the tanks would be opened according to the production needs of the day. However, this method is not applicable in all cases because the olives change color and texture depending on the period they stay inside the tanks. Thus, they need to pass through color separation and calibration phases before they start to be processed. This requires extra time to start the production of pitted olives and makes it more complicated to estimate the amount of olives that will come out of the fermentation tank that match with the production needs. Olives stored in the same tanks that have different sizes and colors are illustrated in Figure 1 below.



Figure 1. Olives with different sizes and colors

In the pitting phase of production the amount of olive seeds are considered as a loss of production as the olives lose some amount of weight and then these seeds are sold to other companies and used for burning purposes. In addition, there is also some amount of loss in pitting machines, chemical tanks and density separators depending on the size and softness of the olives which are considered as loss of production. Moreover, they are eliminated in the final selection if they don't match the final quality or they are not colored enough if the processed olive is black or vice versa. These complications in olives productions make costing calculations complicated as the olives are not passing through a standardized process like other kind of food products. These complications force UGS Foods to integrate scenario analysis within the implementation of activity-based costing which will be a new type of study academically.

1.2.2 Creating the Advanced Costing Model

As a result of its growing position in the market, UGS Foods is interested in controlling its costs by using an advanced costing model. The top management believes that having accurate cost information of products can be used as basis in pricing decisions and enables them to alter costly business activities aiming operational efficiency. Moreover, by having accurate cost information of their

products, UGS Foods will be able to understand the role of every product in their business performance individually by using product portfolio. As a result of above mentioned facts, UGS Foods decided to implement an activity based costing system to acquire the accurate cost information of each product that goes through different business process in the organization flow chart to able to implement product portfolio project in full performance.

In the current costing model, the costs are separated as fixed and variable costs and used in calculation of the product costs without differentiating the type of the product which ignores the different variety in production. Product costs are very significant to UGS Foods because they operate in very competitive international markets and pricing decisions are usually taken according to the competitive dynamics. The prior interest of the case company is to solve the costing problem in production environment which creates the highest amount of costs and has a complex production flow in different type of products. The management believes that the costing challenge starts from production and if the problem is solved in this area, it would be a great base for further research and the findings can be very beneficial in product strategy.

It is also important to notice the high amount of implementation costs of the project and the need of organizational maturity to analyze every business activity from the perspective of the new advanced costing model. The efforts in the implementation process will be minimized thanks to the advanced costing tracking system that the company owns. It is only critical to find the correct information from the system and use it in the analysis. However it is also challenging the correct responsible to ask for the information in the production phase as well as the accountant to track that activity and find the corresponding costs in the accounting system. Thus, production manager and financial accountant of UGS Foods have a key role in the success of the project also. The key stakeholders of the activity-based costing project in UGS Foods are illustrated in the Figure 2 below.

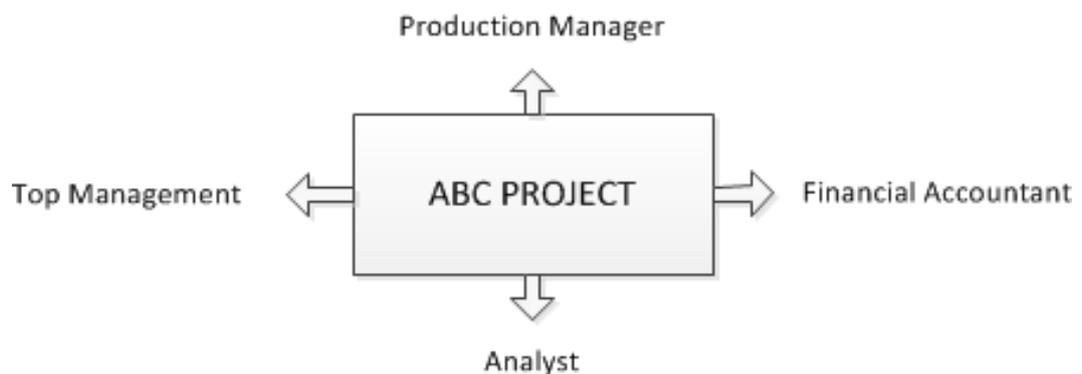


Figure 2. Project stakeholders inside the organization.

Even though above mentioned people have the highest amount of responsibility in the project, it is important to keep the understanding in organization level about what the project consists of and how it will change the business activities of the firm. The aim of the company is to use the findings in long-term product portfolio strategy. Thus, it is critical that every white-collar worker have a basic understanding of activity-based perspective to improve the operative functionality of the firm.

1.3 RESEARCH PROBLEM

In the case company, there is a well-structured financial reporting system which makes the data gathering for analysis easier to be able to conduct the research in full performance. UGS Foods has an organizational understanding of cost accounting and its importance for long-term strategy of the company so that every purchase and spending is tracked and reported in full details in the system. However, the costs of the company has never been analyzed in perspective of business activities and cost accounting is only differentiated as fixed and variable not on product basis which does not give accurate results in product costs. Therefore, the study mainly focuses on activity assignment problems that the company has neglected in their cost accounting systems which will also provide process development in production area and support the product portfolio management project. When the activities are analyzed and matched the right resources, the implementation of the organization-wide activity-based costing model will be much easier and efficient. Moreover, it will require a reduced amount of work in the implementation phase by following an optimized product portfolio in product costing.

The study analyses how activity-based costing can be successfully implemented by taking the complexity of olive production into consideration. Thus, it is scheduled to follow different production scenarios and compare the result from a costing perspective to be able to get the most accurate results. The scope of the study requires fully understanding of the theories related to product portfolio management, activity assignment and cost allocation methods in complex production environments which are directly related to the final quality of the research report.

The research problem has been analyzed and defined in cooperation with the case company, UGS Foods. The top management believed that the most complex area of understanding the cost is in production zone where each type of olive follows different activities. The managers believe the problem should be solved in production first which creates the highest amount of cost on products and then the research would be extended to understand sales, marketing, purchasing and

logistics areas which will be used as a based on finding the customer profitability in the next steps. The long-term perspective of the research collaboration enables the top management to fully understand and inherit the development of the process and make some iterations or re-examinations if needed which will improve the practicality of the case findings.

1.4 OBJECTIVE AND SCOPE OF THE RESEARCH

The target of this Master of Science Thesis is to define an effective cost accounting system that takes the industry specific dynamics of olives production into consideration by assigning the cost of activities on right products that consume these specific resources. This strategy provides answer to the key research problems mention previously which is the target of the case company to solve the product costing problem. The corresponding result is achieved in four key areas mentioned below:

- Evaluate the current costing method used in UGS Foods.
- Understand the industry specific dynamics in olive production and how business activities affect the costing dynamics.
- Define the activity assignment of each product and how this activity.
- Create a product portfolio by using the accurate costing information derived from the new costing method.

First, the current cost structure and costing model used to calculate the product costs will be evaluated. Second, the olive production environment will be analyzed and production flow will be evaluated from the costing point of view. Third, the activities that each type of olives passes through in the production flow will be deducted. Finally, the products will be analyzed according to their costs in new activity-based costing model. The research will be based on theoretical framework of activity-based accounting and the new product costs for UGS Foods will be evaluated and improvements will be highlighted.

In theory, the main focus is on displaying the traditional costing strategy and activity-based view in comparison and compares both perspectives to deduce the best method in complex manufacturing environment. In some cases, hybrid models of traditional costing methods and activity-based model will be used to be able to get more accurate cost information for some specific activities. The basics of success in activity based method in olive production is to understand the process flow of the manufacturing and formulate the amount and type of olive produced in each step for an optimized costing model in product costing. Thus, cost accounting

has a significance role in success of the project to simplify cost allocation, cost tracing and data retrieval.

1.5 STRUCTURE OF THE REPORT

The Master of Science Thesis consists of 6 chapters. Every chapter has specific dynamics and targets to build up the story consistently. The content and objectives of each chapter is expressed in the list below:

1. Chapter 1 introduces give the background of the case company and the industry they operate. This information enable readers the complexity that the company is facing in costing their products and their need for an advanced costing model. Moreover, the objective and scope of the research is defined in this chapter to be able to combine the academic and practical benefits of the research in this field by taking the problems that are expected to be faced during the research process into consideration.
2. Chapter 2 discusses the research approach in business economics briefly and introduces the research method that will be followed throughout the process and it will be discussed in more details to state the benefits that the case company and academic literature will gain after constructive research methodology is followed. It is also important criteria of success to keep the research findings generalizable for further studies in activity-based costing area.
3. Chapter 3 introduces the activity-based cost modeling and how it add value to firms for understanding their costing structure with a focus on products and how it can be used as a strategic force that can be used in decision making. Major focus in this chapter is in the theoretical aspects of the case and how the theory can be optimized to give the best result in olive production environment.
4. Chapter 4 highlights the business perspective of UGS Foods ad their long term strategy in the market. After understanding the dynamics of the case company, the implementations steps and calculations of ABC model are presented to fully understand operative aspect of the new system and how much each product cost by analyzing the activities they follow in production flow.
5. Chapter 5 analyses the findings and give recommendations on how to use the results of the study in building a long-term growth strategy for the company by creating a product portfolio by analyzing the profit potential

and volume of each product. This information will ease the planning of product strategy individually per product group in UGS Foods to pursue long-term success in competitive markets.

6. Chapter 6 concludes the report by discussing the weaknesses and the areas of improvements of the findings by considering the managerial implications of the results. The study leaves an open door for further discussions in the field of activity-based accounting models in complex manufacturing environments.

2 SELECTION OF PRODUCT PORTFOLIO VIA ABC

2.1 PRODUCT PORTFOLIO MANAGEMENT

Product portfolio management has become one of the key top management functions in enterprises and keeps on gaining attention in the last decade continuously (Cooper and Kleinschmidt, 1996). The rapidly changing technologies and increased global competition force the firms to carefully analyze every investment decision they take to avoid investing the future of their company to a wrong service or product that will hamstring the market position of the organization (Cooper et al., 2001). Thus, it is important to understand the role and essence of every product for the firm that is producing it. By using a well-established product portfolio management model, companies are able to focus on the product that are vital to their business, create new strategies for low performing products and use it in new product development as a roadmap to analyzing the evolution of the products that are leading the market. The basics of product portfolio management are illustrated in Figure 3 below.



Figure 3. Basics of Product Portfolio Management Cycle

In product portfolio management, there are five key activities that are applied throughout the process. The company needs to understand the dynamics of the target markets and evaluate them carefully to be able to create an effective market & portfolio strategy. After the plan is created, the next step is to create product plans and marketing programs for a successful implementation of the strategy created. It is also important to develop new products or alter the existing one to align the product portfolio of the firm with the plan created and deliver the solutions to the target markets efficiently. These steps should be repeated continuously to be able to align the firm with market needs and create a market driven organization. The goals of product portfolio management are as follows (Cooper et al., 2001):

- Value Maximization
- Balance
- Business Strategy Alignment
- Pipeline Balance
- Sufficiency

First goal of production portfolio management is value maximization. It enables the target firm analyze and evaluate the performance of their product individually and make alterations if required which maximizes the value that the product generates. Second, it gives the opportunity to differentiate the target markets and create a balanced product portfolio to attract all of the target market groups. Third, product portfolio management enables the firms to align their products strategy with business strategy they follow. Fourth, it is beneficial for firms to calculate the consumption of their resources for product development, marketing and sales of their products and optimize their expenses accordingly. Last, product portfolio management helps companies to ensure the goals are achievable which are set out in product innovation strategy (Cooper et al., 2001). These goals are essential for the success of every firm which target to be a world class company in competitive global markets.

2.2 PRODUCT STRATEGY FRAMEWORK

It is important to use a solid framework for product strategy analysis and product portfolio creation according to the groups that the products fall into after the analyses are complete. Profit–Volume Analysis Framework is illustrated in more details in Figure 4 below.

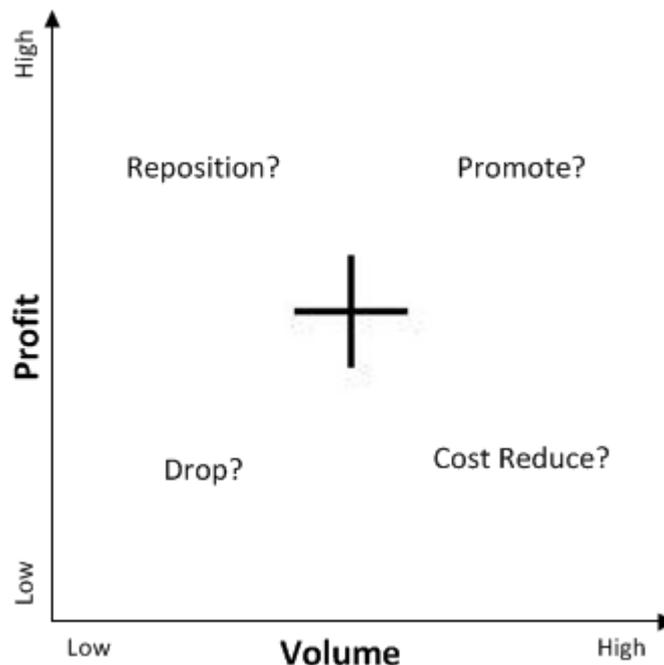


Figure 4. Profit-Volume Analysis Framework (Turney, 1991).

For successful implementation of the framework above, the company needs accurate information of their sales volume and profits. After the products are placed on the graph by using the profitability and volume data in hand, it is

possible to offer drop strategy, repositioning strategy, promotion strategy and cost reduction strategy for four product groups depending on their position on the graph. The volume data is easy to retrieve by checking the sales information of the firm. However, defining the product profitability is dependent on the cost of the product being sold (Turney, 1991). Thus, it is important to have accurate cost information of the products before using profit-volume analysis framework to achieve satisfactory consequences after the analysis are complete. Otherwise, it may lead the company to create misleading strategies for their product groups because of the incorrect product cost information.

2.3 COSTING METHODS

In the fast changing business landscape, organizational learning and knowledge management are key steps to success and they are vital to leapfrog the competition in the market (Huber, 1998). Thus, management accounting tools are important service functions for companies to gather the financial information they need to be used in decision making (Lyly-Yrjänäinen, 2010). Costing is a key concept in management accounting and it is extensively used in pricing by adding a profit margin to the total cost of a product. Even though it is not an appreciated pricing method anymore, knowing how much a product costs is critical to know the bottom-line for prices to guarantee profitability. It is also an important concept for product developers to understand the cost implications of their actions (Lyly-Yrjänäinen, 2010). Costing methods are analyzed according to their cover of cost areas in Figure 5 below.

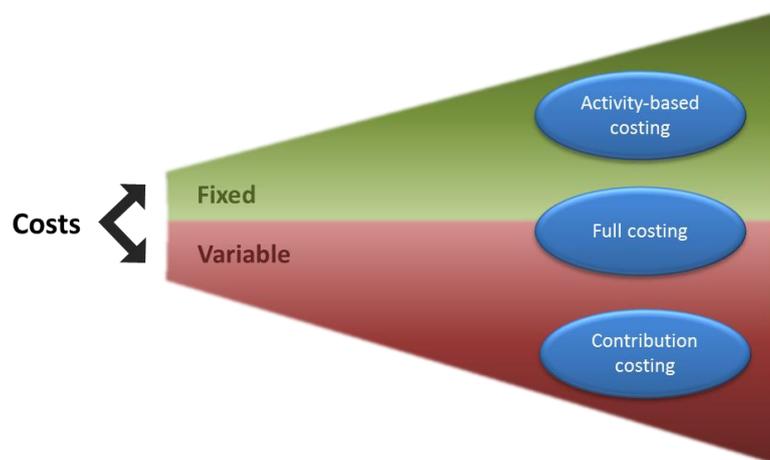


Figure 5. Costing methods

Contribution costing is a costing method that focuses on the variable costs of a product and neglects the fixed costs. Despite its simplicity, contribution costing is widely accepted in retail business and many industrial companies (Lyly-

Yrjänäinen, 2010). Full costing enables companies cost their products by taking all the expenditures (fixed and variable) of a company into consideration (Lyly-Yrjänäinen, 2010). It is considered as an advanced method compared to contribution costing because it takes the overhead costs into account. Activity-based costing is a costing model used for identifying the activities of a company and assigning each of them to products or services. Activity-based costing has been developed to assign more indirect costs to direct costs to increase accuracy and it mainly focuses on taking fixed costs into account while making costing analysis. The above mentioned models are widely used and accepted in the industry. However, there are many companies that develop their own cost model according to their own needs or use hybrid models derived from the above mentioned costing methods.

2.4 FROM TRADITIONAL COST ACCOUNTING TO ACTIVITY-BASED VIEW

Production lines marketing channels are steadily increasing with the growing impact of information technology. As a consequence of these trends in business; manufacturing, marketing, logistics, engineering and other indirect costs have increased their significance and direct labor cost started to cover a small percentage of costs of a firm (Cengiz, 2011). The correct cost values of products of a firm have a direct impact to profitability of a firm. Thus, any kind of inaccurate information on the indirect cost segments would lead a company focus on wrong products or unprofitable customers. As the companies grow and expand their product portfolio, it is inevitable to implement an advanced costing model in the organization that takes all the indirect costs into consideration and assign them on products of the firm which lead to an advanced level of cost and activity tracking and increased profitability (Cooper and Kaplan, 1988).

As a response to above mentioned needs, activity-based costing (ABC) has been developed in 1980's which strengthens the ability of a firm in strategic decision making (Gupta and Galloway, 2003). The main idea of activity based view is to track the activities of products follow during their production phase and analyze these steps to improve operational efficiency and use these data in long term strategy creation. Activity-based costing is also defined as a centralized system that consolidates value, process, quality and cost analysis in a single solution (Drucker, 1995).

After activity-based costing method is launched, it took attention of plenty of firms that has production methods matching with the implementation dynamics of activity-based costing including highly reputable firms. After activity-based costing started to become an industry trend, the academic world keep an eye on this shift in the industry and conduct academic researchers in activity-based view field.

Nicholls (1992) conducted plenty of interviews in the firms that have implemented activity based costing in their facilities and found out that the main purpose that the new model is implemented is to obtain accurate costs per products. Moreover, companies benefit from cost reduction possibilities via activity analysis, understanding of the customer profitability concepts, product portfolio and pricing strategies. It also helps companies identify non value creating activities in their production flow. Mc. Gowan and Klammer (1997) states that US firms are satisfied with the results they obtained from the ABC implementations in their organization. The success with the new method requires support from top management, clear business targets and organization understanding and capability of the firm in obtaining the functions of the new system. Krumwiede (1998) states that the interviews with top managers of firms from different countries unveil that the satisfaction from costing has significantly increased after the implementation of the new costing model with the activity based attributes. They also state that the satisfaction will keep on increasing as the costing model gets mature and will be able to react to emerging trends in different industries.

There are also plenty of complications in ABC implementations and the new costing model is sometimes criticized because of some dynamics that it follows. According to Innes and Mitchell (1991), the usage rate of activity-based costing is around 6% in firms in United Kingdom. In the same years, the usage rate is found out as 27% in the companies in United States of America. In the following years, activity-based methods managed to persuade the top managers in reputable firms so the dominance of activity-based costing increased drastically. Even though activity-based costing is being used in plenty of firms and started to be accepted as a standard in some industries, there are many companies that are wary of trying new methods and prefer to use traditional volume dependent costing methods. According to Cooper (1996), a successful implementation of activity-based costing requires an organizational shift and understanding which is impossible to implement without a comprehensive restructuring in some cases. This aspect is considered as the most important criteria why many firms avoid using activity-based costing.

The success in activity based view is not homogenous and it requires some alterations for adapting some industry specific cases. Thus, experience and understanding of the industry dynamics are critical in the complex cases to deduce the requirements of the hybrid costing model. According to Sharman (2003), plenty of firms believe that activity-based costing model is too complex and hard to maintain because they are not well integrated with the management and production systems which is derived from the lack of understanding of the industry specific dynamics in the implementation process. Kaplan and Anderson (2007) summarized the main problems in activity-based costing as follows:

- Interview and research process is time consuming and costly. It is hard to define how much time each employee spends per activity. Employees can also switch their work during the day due to the production needs which makes the analysis complicated.
- Storing, processing and reporting activity-based costing data is expensive.
- Many activity-based costing models are localized thus they don't give accurate information in general level.
- It neglects the idle time of employees as the calculations are done as the factory always work at 100%.

Since activity based view is founded, it provides a new perspective to managers in costing and profitability analysis. Even though there are many firms that cannot benefit from activity based view because of the above mentioned challenges and complications, this new perspective is beneficial for firms to have another data source to validate their performance and compare the results of each concept to have a better understanding of their cost structure in organizational level.

2.5 THE DEFINITION OF ACTIVITY-BASED COSTING

According to Acar and Papatya (1997), activity-based costing is defined as a strategic approach to cost analysis by forming cost pools which are used for burdening the indirect costs to products. It is also defined as a costing model used for identifying the activities of a company and assigning each of them to products or services. Activity-based costing has been developed to assign more indirect costs to direct costs to increase accuracy and it mainly focuses on taking fixed costs into account while making costing analysis. According to Turney (1991), activity-based costing is a well-structured information system which forms, operates and maintains a database that covers the company's operations activities and products. This system defines the activities that the company performs, traces these activities to understand their impact on company's costs and loads these previously defined costs on products by using a cost driver which reveals how much a product consumes the company's resources. The basic model of activity-based costing is illustrated in Figure 6 below.



Figure 6. Basics of activity-based view (Lyly-Yrjanainen et al. 2000)

As illustrated in the figure above, the activity-based approach consists of three stages mainly which are the assignment of cost factors to resources, resources to activities and activities to cost objects (Lyly-Yrjanainen, 2002). The resources are

assigned to activities via resource drivers and the activities are assigned to cost objects via cost drivers in activity-based view models which form the basic functionality of the concept. The last step which is assigning activities to cost objects is considered as the most complicated step in activity-based costing because it is difficult to state the activity each cost object consume individually.

2.6 THE NEED FOR ACTIVITY-BASED COSTING

Technological advancements have a significant impact on business in many industries including the production of the firms. The use of workforce is decreasing significantly as firms started to use automated production systems. IT-enabled manufacturing systems are highly valued in current business world because of the benefits they provide in process optimization and cost reduction and these systems are increasing their dominance in the industrial markets thanks to the continuous technological improvements in information technology sector. Even though automation systems require high amount of capital investment, they usually pay back in a short period of time depending on the values enabled to their users. Thus, major firms are eager to adopt automated systems in their manufacturing facilities to able to benefit from these opportunities and guarantee steady growth (Acar and Papatya, 1997).

Since the 1970s, manufacturing firms have increasingly adopted IT-based production management and resource planning systems (David et al., 2011). After this impact, IT systems have started to be used intensively in manufacturing processes. Manufacturing machinery is controlled by embedded systems that are used to optimize the manufacturing process and increase productivity. They also have a role to minimize the ambiguity and uncertainty in the manufacturing process. Differentiated customer needs, high product varieties and higher inter-dependency across the supply network increase the significance of IT integrated systems in the market and usage rate of similar systems is increasing drastically recently as a result of this trend.(David et al., 2011).

The above mentioned improvements have significantly changed the production process which also affected the cost structure of the firms. The low amount of labor used in production activities led to a notable decrease in direct labor costs. As expected, indirect cost increased significantly because of the peak in costs derived from automated systems. This increase in indirect costs triggered a paradigm shift in cost accounting and companies started to look for new ways to implement cost accounting systems. Thus, the new cost accounting systems focus on indirect cost for planning, controlling and reporting purposes. The main functionality of activity-based view is to distribute the indirect costs of the firm to direct objects

which enable the firms to obtain accurate costs of their products in the market (Karcioglu, 2000).

According to Karcioglu (2000), if the firm has the required technical capabilities in information systems management, implementing an activity based costing study is cheaper to implement compared to other companies without the required capabilities. However, if the data is not centralized, data needs to be collected from different departments simultaneously which is a time demanding and costly activity in global scale firms. Thus, using a centralized data storage systems have potential to cut the costs of activity-based costing implementation significantly.

Consolidated production costs of firms are also increasing rapidly especially in Turkey where there is an industrial growth rate of 8% country wise. The growth means that there is also a significant rise in costs which makes it complicated to deduce for which areas the increased cost should be distributed. Moreover, the new age costing methods need to be compatible with just in time production method which is also an important trend in all kind of production environments. By considering all of the above mentioned facts, Öker (2003) states that activity-based costing can be beneficial to the firms with the following attributes:

- High margin of indirect costs in total cost of production
- Indirect costs do not occur on unit bases.
- Wide variety of products

The above mentioned attributes are the key concepts that should be analyzed to deduce if a firm is suitable to implement activity-based costing model or not. If the firm does not match these criteria, the results gathered from activity-based costing model would be similar to result acquired in traditional methods which means that the company would waste its time and resources in implementation of the study. Thus, pre-analysis and understanding of industrial environment and business dynamics of the case firm have direct effect on the success of the study being undertaken.

2.7 THE TARGET OF AN ACTIVITY-BASED COSTING STUDY

To maintain competitive positions in the market, companies started adopting activity-based costing models in their business and started to track their business activities to be able to implement this system which enables them to protect their position in the competitive markets or gain competitive advantage against their competitors. Thus, it is important to understand what is possible to gain from an activity-based costing model and what is not possible to obtain from this

implementation to evaluate the investment decision. According to Karcioğlu (2000), the target of an activity based costing study is as following:

- To minimize or eliminate the cost of activities that have low amount of value added.
- To prepare an efficient information system to ease the growth of value added activities
- To spot the root of problems and possibility to fix them
- To eliminate inaccurate cost allocations
- To provide accurate cost information to be used in decision making by managers.

These above mentioned features that are key components of activity-based methods. In a well analyzed implication, these benefits enable firms to learn the accurate cost of their products, the costs that each activity generate in the firm and most importantly these information is used in decision making and strategy creation which is vital for the long-term success of the firm (Yli-Äyhö, 2003). The activity-based costing concept can then be upgraded to activity-based management model when the organizational knowledge is mature and top management fully support activity-based perspective in their decision making.

2.8 KEY CONCEPTS IN ACTIVITY-BASED COSTING

The successful implementation of an activity-based costing model is highly dependent to the general understanding of the theory, the implementation steps and the key terms that are used in activity-based model by the project stakeholders. Key concepts that are used in in activity-based costing are as follows (Arzova, 2002):

Resources: Resources are economic realities that are consumed in order to realize business activities (Arzova, 2002). The resources of a firm mainly consist of labor costs, raw material costs, indirect cost related to production and other costs apart from production environment of the firm.

Activities: Activity-based costing focuses on activities instead of sections. The purpose of defining these activities is assigning costs on products via the activities performed in the production phase as the products are produced by following this activity flow. Activities are grouped as major and minor activities and major activities formed by a group of minor activities performed together (Arzova, 2002).

Cost pools: Cost pools are defined as grouping cost by activities considering the total amount consumed by these activities. After the activities are defined, it is critical to assign these activities with the right costs to be able to achieve accurate

results. The assignment steps can be either easy or complicated depending on the production environment and business activities of the firm. Thus, it is critical to analyze activities in groups and define the minor and major activities for a more successful implementation (Arzova, 2002).

Cost drivers: Activity-based cost accounting follows several steps in cost allocation. In the initial phase, resources used for performing the activities are assigned to activities by using resource cost drivers. In the next step, the costs that are grouped in activity pools are assigned to products by using the activity cost drivers. As they are used in two different areas in the above mentioned areas, they can also be differentiated as resource cost drivers and activity cost drivers (Arzova, 2002).

Cost objects: In cost accounting, the material that has a defined cost attribute is called a cost object. There are high amount of cost object in a firm from purchased raw materials to a new building inside the facilities. These values are essential for accounting to be able to keep track of costs of a firm (Arzova, 2002).

Performance measures: Performance measures are attributes derived from the outcome of a performed activity from both financial and operational perspectives. Activity-based costing recognizes activity-driven and operational performance measures as a key attribute of an activity. Performance measures indicate how efficient an activity has been performed and how flexible the activity is in terms of responding to the emerging trends in the production environment (Arzova, 2002).

2.9 ABC METHOD IN PRACTICE

The basic approach to activity-based costing consists of unique features compared to traditional costing methods which also make the implementation steps different than the existing ones. The main difference with the traditional approach is that activity-based costing's main focus is on activities when traditional costing approaches mainly focus on product itself (Helminen 2003). The shift of focus from products to activities has changed the understanding of the costs as well. With activity-based view, it is possible to assign indirect costs on business activities and distribute them on products by using an appropriate activity driver which increases the accuracy of product cost information drastically. The steps that are needed to be followed are described in more details in the following sub-chapters.

2.9.1 Creating Resource Groups

Resources are economic elements directed to activities and they are considered as the sources of cost (Turney, 1991). Resources in a manufacturing company mainly include direct labor costs, material costs, production support costs, indirect costs of production and the cost out of the production zone. These resources are more or less similar in all kind of manufacturing company. However, there can be some unique additions to these groups depending on the industry and the production method that the company follows in their facilities.

Activity-based costing operates by calculating the cost of resources consumed by activities. Thus, salaries that are paid to employees, energy consumed by the machinery and the amortization expenses are considered as different resources. The key requirement in grouping the resources is that they should be linked to activities by using the same resource driver.

2.9.2 Activity Mapping

After resource grouping is complete, the next step to map the activities that the firm performs in their facilities. Activity mapping have plenty of other benefits than being used in cost assignment only (Helminen, 2003). If a company can clearly identify its production activities and map them accordingly, they can fully understand the benefits and handicaps the activity creates to the firm. Moreover, it is also possible to use this data in product development or production flow changes to optimize the process. Thus, it is important to group the activities into their functions in the firm. Activity analysis process is defined in seven steps:

1. Defining the scope of the activity analysis
2. Define the departments of the activity analysis
3. Define the activities
4. Rationalize the activities
5. Classify the activities as major and minor activities
6. Make a map of the activities
7. Document the activities

First step is defining the scope of the activity analysis. This is an important part of the process to define the coverage of the analysis and defining the exact problem. Second, it is essential to define the part of the organization that the research is going to be performed. Third, the activities are defined by making observations, analyzing historical data and business functions (Helminen, 2003). The next step is rationalizing the activities by optimizing the level of details that the activity analysis will cover. After, it is the classification of activities as minor and major

activities and linking the minor activities to major ones. This step is the most critical phase in order to map the activities correctly. After all the activities are classified and grouped according to the phase of the business they are related to, they are mapped to illustrate them more efficiently. It is also beneficial for brainstorming on improvement possibilities and can be used for presentation purposes (Helminen, 2003). Last but not least, it is also important to document the activities to keep track of their progress and their fluctuation in cost generation and execute the necessary changes or take precautions when needed. The most important part of activity analysis process is the classification of the activities where they are separated as minor and major activities and linked to each other. This step has direct effect on the final result of the study and should be analyzed thoroughly and carefully. Five different categories are identified for classifying activities according to their type:

- Repetitive or non-repetitive activities
- Primary or secondary activities
- Required or discretionary activities
- Influential or non-influential activities
- The degree of leverage within an activity

First, repetitive activities are executed continuously by contrast non-repetitive activities are performed only once or several times. Second, it is also possible to analyze activities as primary or secondary activities according to their significance to the business process. Secondary activities support the primary activities in the process chain. Third, required activities are essential to the business continuity of the firm in contrast discretionary activities are easily replaceable by other activities. Finally, activities can also be classified as influential / non-influential or depending on their degree of leverage according to nature and importance of the company to the firm. Another classification is done by using the hierarchy in activities. Cooper (1990) has proposed five levels in hierarchical classification approach to activities which are illustrated in Figure 7 below.

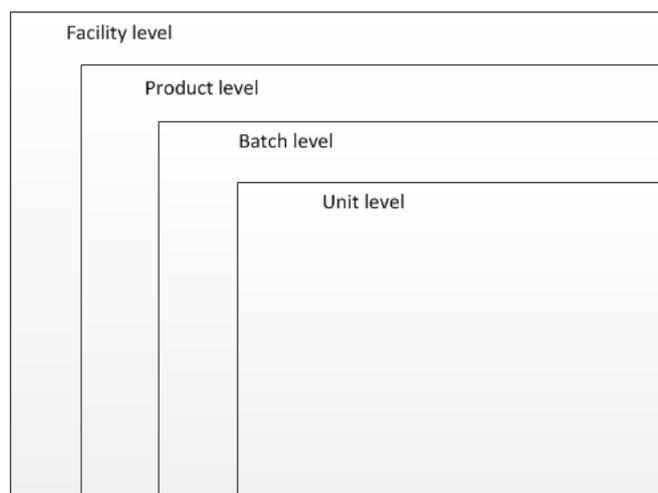


Figure 7. Level of Activities in ABC Model (Cooper 1990)

The most traditional activity categories are unit-level, batch-level, product-level and facility-level (Cooper, 1990). A unit-level activity is an activity that is performed in each unit of product produced. It is the most specific activity level in activity hierarchy. A batch-level activity is an activity that is performed for the whole production batch and it covers the unit-level activities in the hierarchy. Product level activities are the ones that are related to new product development and it is a difficult activity to classify and assign in the model (Lyly-Yrjanainen, 2002). Facility-level activities are activities essential to the firms but not directly related to the product being produced and sold. Activity hierarchies have been one of the key improvements in activity-based costing because it enabled companies to analyze financial impacts of individual activities in different hierarchical levels (Helminen, 2003).

2.9.3 Matching Activities with Resource Centers

After activity mapping is complete, the next step is to match the activities with resources by using resource drivers to define how much resource an individual activity consumes from resource centers. Resource drivers are the connections between the resources and activities and they operate by taking a cost from the resource centers and assigning it with the right activities (Turney, 1991). Resource centers are initially linked with major activities and then the costs are distributed to the minor activities that are connected to the major activities.

There are two methods to assign costs of resources to activities. First method is top-down approach which is done by calculating the total cost in resources centers and then distributing them to the activities by using the resource driver. The second method is called bottom-up approach done by calculating the major activities cost consumption and linking them to resource centers by using the resource driver again. Both ways are commonly used methods and the selection depends on the researcher choice in this stage.

2.9.4 Defining Activity Cost Drivers

Activity drivers are attributes that are used to assign the cost of activities to the products of the firm and their main focus is on measuring how often activities are performed on each individual product to calculate the cost impact of the activity on the product (Turney, 1991). The objective is to pick the right numbers and the activity driver so that the accurate cost information of the product can be retrieved by using the model. Thus, it is also important to keep the model as simple as

possible to avoid inaccurate results derived from the complexity of the model. Activity drivers are the links between the activities and product and they can be used for product improvement of process design (Turney, 1991). The type of activity cost drivers are as follows (Kaplan and Atkinson, 1998):

- Transaction drivers
- Duration drivers
- Intensity drivers

Transaction drivers focus on number of times an activity is being performed (Helminen, 2003). These are the least expensive activities and the easiest one to maintain compared to the other types. The annual cost of an activity is divided to number outputs in order to calculate the cost of each activity. However, it is an efficient method, it ignores the time required to produce an output may differ according to certain situations. In this kind of situations, duration drivers should be used. Duration drivers are more accurate in results but more expensive and time consuming in implementation (Helminen, 2003). It assigns the activity cost on the product by using the time required to realize the activity. However, the time required can also vary in some cases as well. To solve this issue, intensity drivers have been proposed. They assign the cost of resources used for performing the activity to products directly which enable the companies to avoid the generalization problem in two previous methods. The only disadvantage for transaction drivers is that they are expensive to maintain (Kaplan and Atkinson, 1998). Defining the activity cost drivers is the most interesting activity in activity-based costing model in contrast they are also considered as the most problematic area of the model and should be well analyzed by the project stakeholders to be able to get accurate results.

2.9.5 Assigning Costs to Products

The final step in activity-based cost modeling is assigning costs of activities on products to find out how much each product consumes the resources of the company. After resources are grouped, they are connected to activities to understand how much each activity use the resources by using resource drivers and then these activities are connected to cost objects to be able to finalize the model and retrieve the accurate cost data. Cost assignment steps are illustrated in details in Figure 8 below (Kaplan and Atkinson, 1998).

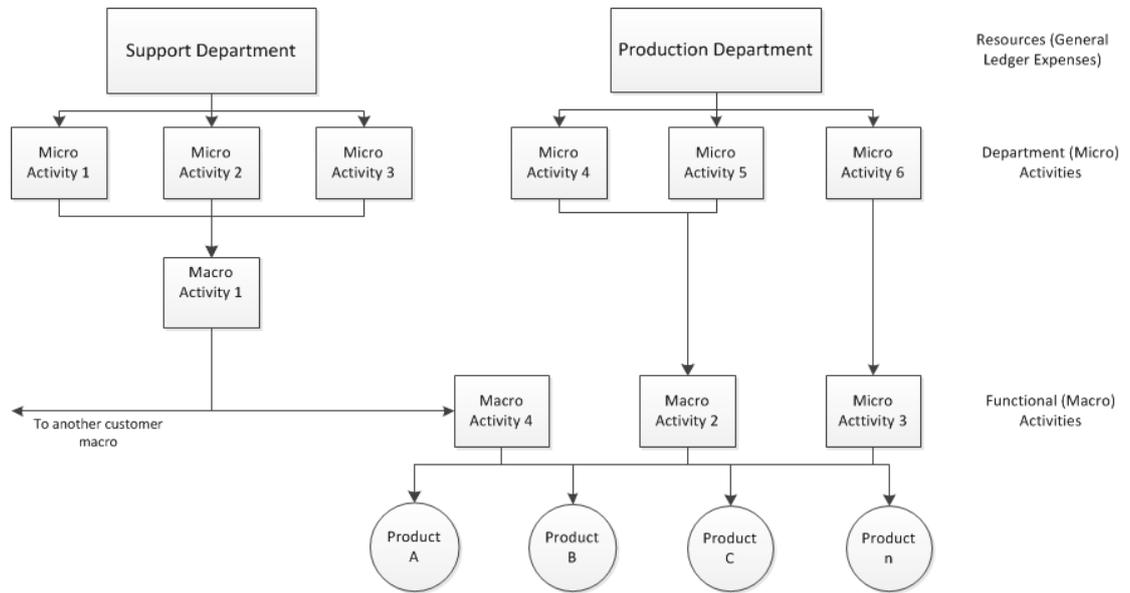


Figure 8. Cost assignment process in activity-based costing (Kaplan and Atkinson, 1998).

The link between activity cost drivers and products is the most complicated step of activity-based costing. Even though the presence of connection is clear, it is hard to understand the scale of the linkage. Weight index approach is a method that is used to classify the products into categories with different index of weights (Kaplan and Atkinson, 1998). Weighted approach is useful especially when the firm has high amount of products that goes through similar processes. When the activity assignment to cost objects is complete, the firms are able to retrieve accurate cost information to any of their specific product by using new costing approach.

2.10 WHY DOES ABC REALLY WORK?

The traditional costing methods are not specialized to support decision making and used in taking strategic decisions. The main purpose of traditional costing methods are understanding the general costing structure in the firm and use them in pricing and accounting purposes. However, it is clear that these out-dated approaches are not satisfactory to challenge the competitive environment nowadays (Turney, 1991). There has been dramatic changes in the way of companies handle the competitive markets and any information is power to challenge the fierce business world. Traditional methods are not taking business activities into consideration while reporting costs and it has direct labor focus which is significantly decreasing with the automation trend and they are not functional in decision making (Turney, 1991). Turney (1991) has proposed five facts to show how activity-based costing can reach to the emerging trends in the industry in Table 1 below.

Table 1. Why ABC really works? (Adapted from Turney 1991)

Criteria of world-class cost information	Why ABC works?
<i>Is customer focused</i>	Information about what matters to customer, when you want it.
<i>Reveals profit sources</i>	Accurate product and customer costs.
<i>Economical</i>	Does not require unnecessary measurements. Can be as simple or as complex as necessary.
<i>Identifies opportunities</i>	Cost and non-financial information about activities, helps direct and reinforce improvement efforts.
<i>Encourages improvement</i>	Direct measures of activity performance. Activity drivers help identify improvement opportunities. The problem of excess capacity is confronted head on.

First, Activity-based view reveals what matters to the customers by analyzing the contribution of each business activity. Second, it enables companies to investigate the profitability of products and customers individually and create a vision by using this data. Third, it is a low-cost system by considering the amount of benefits it provides to the companies. Fourth, it helps companies identify the financial or non-financial opportunities by providing accurate activity data. Last, it presents considerable amount of useful information to the top managers so it motivates them for continuous development and progress in their business by turning the analysis to practical decisions. The benefits of ABC are identified as follows:

- Profitability and its reasons could be understood.
- Productivity and possibilities to affect to it are known.
- Investments are controllable.
- Costs of complexity become evident.
- Content of overhead costs is understandable and managers know possibilities and demands to affect those.
- Accounting will be simpler.

The benefits that a well-designed activity-based costing model are countless and the companies that take advantage of these factors have great potential to grow steadily and target to become a world class company with their management and decision making mechanism. Thus, it is important to do a well-defined investment analysis by understanding if it is possible to solve the costing problem of the firm before implementing an activity-based costing model by evaluating the resources and time needed for the study and expected benefits after the project is complete.

2.11 KEY CONCEPTS AND RESEARCH FRAMEWORK

Understanding the theory and creating a research framework via linking it with the problem in hand is an integral part of academic research. It is important to understand the theory well as well as how it can be linked to solve the case specific issues. Research framework of the case in hand is illustrated in Figure 9 below.

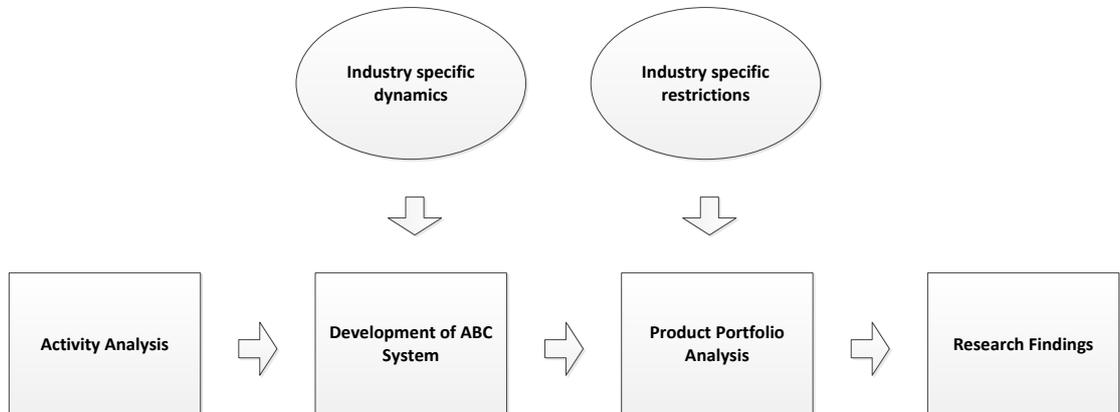


Figure 9. Research framework

The research will start by implementing activity analysis to understand the production dynamics of olives in UGS Foods. It is an internal part of the research because the right activity will lead to right product costs during the implementation of ABC costing model. To be able to understand the activity dynamics UGS Foods, several meetings were held with Erol Bozkurt and Emre Bozkurt in the initial phase. The next step was to examine the production zone with the operations manager Mustafa Gök and food engineer Pelin Polat to define the industry specific production and product dynamics for olives which will be used to customize the general activity based costing literature. It is a key step to achieve accurate results and provide a tailored solution for top management.

After analyses are complete the next step was to build the activity based model in collaboration with Raziye Yılmaz who is the financial accountant of the firms. By using the cost information provided by her, the ABC model was developed which calculates the cost of each activity that the company use in its production zone and their cost impact on the products by considering the industry specific dynamics in calculation.

After the accurate costs for each product are calculated by using the ABC model, the next step was to create product portfolio strategy by using the profit-volume matrix to better understand the role of each product for the firm and define their long term strategy in competitive markets. It was important to take the long term customer relations of the firm and industry specific situations into consideration

because every analytical finding may have a different impact which cannot be seen via data analysis. To overcome this issue, several meetings were done with Emre Bozkurt to better understand the plan and strategy of UGS Foods and what the priorities are for the firm. When the discussions are complete, the product portfolio strategy for the firm was created and the drop, reposition, promotion and cost reductions groups were defined for further managerial actions.

3 RESEARCH METHODOLOGY

3.1 CASE STUDY RESEARCH

Research is a widely used term in academic environment and case study research is a one common area in the field of research. The application of the case study research is very common in many areas and disciplines such as sociology, law, medicine, government and management (Zairal, 2007). It is widely accepted method by professional and it is commonly used by researchers to analyze a situation or solve a specific problem in business field. The general reason of conducting management case study research is to better understand complex business situations such as change in processes (Gummesson, 1993).

A case study research follows well-defined steps in its implementation and it can be applied by using quantitative and qualitative methods. Quantitative research methods focus on data generation and relation identification. On the other hand, qualitative research methods include the researcher, his knowledge and his experience in the scientific process in order to generate data for higher quality analysis. Their aim is to cover an in-depth awareness of human behavior and the reasons behind the behavioral concepts. According to Gummesson (1993), this analysis enables the researcher to explore hidden phenomena that do not easily come up to the surface. There are several categories of case study as well which are:

- Explanatory cases
- Exploratory cases
- Descriptive cases

First, explanatory cases have the purpose to explain and answer “how” and “why” questions. They examine the data closely both at a surface and deep level in order to explain the phenomena in the data (Zainal, 2007). Second, exploratory cases aim to explore an area that is little known. It is a pilot study or foreplay to a more rigorous quantitative research. Third, descriptive cases usually just describe a process or an event without analysis or value judgments. The goal set by the researcher is to describe the data as they occur (Zainal, 2007). These are the three most common seen case types and there are plenty of other case types that are derived from them or a combination of them.

3.2 RESEARCH METHODS IN INDUSTRIAL MANAGEMENT

The practicality and applicability of the research in the field of industrial management is a key success factor and these attributes are considered more essential compared to the method that is being used while conducting a research in business field. The results of research in industrial management field focus on improving the existing method and target usability, feasibility and functionality instead of pursuing the ultimate truth which is usually seen in scientific researches. Research methodologies in industrial management are classified according to whether they are theoretical and empirical in one way and they are descriptive or normative in the other perspective. The positions of the five different research methods in industrial management field are illustrated in Figure 10 below.

	Theoretical	Empirical
Descriptive	Conceptual-analytical research	Nomothetical research Action-analytical approach
Normative	Decision-making-methodological research	Constructive research

Figure 10. Classification of research approaches (Kasanen et al. 1993)

Conceptual-analytical research emphasizes on creating new theoretical concepts or analyzes the existing theories for improvements. The conceptual-analytical research requires logical reasoning and previous researches and theories make a strong contribution to the new research that is being conducted. The target of conceptual-analytical approach is to create new terminology by using analysis and synthesis.

Nomothetical research is a descriptive approach in research and uses empirical data which is derived by conducting surveys in specific people. Thus, it is critical for the research to ask the right questions to be able to reach satisfactory results. The hypotheses that are going to be tested should be retrieved from the existing theory. Hence, the theoretical aspects play an important role in preparation of the survey questions (Lyly-Yrjanainen, 2002). It is a commonly used method in natural sciences and behavioral analysis.

Decision-making-methodological research is commonly used for creating models and concepts that are used in decision-making. It is commonly used approach in

logics and mathematics and it is highly theoretical (Lyly-Yrjanainen, 2002). The model emphasizes the importance of creating a concept to analyze the problem in hand and creating a clearly defined solution to the existing problems. It is a highly respected method used in decision making because of the normative way it follows and the deep connection with existing theories.

Action-analytical approach is an empirical approach but it is complicated to differentiate if it is descriptive or normative which varies depending on the problem that is being analyzed. This approach aims at understanding the process of the implementation of the solution instead offering the ultimate truth and it is often used in teleological explanations and the scientific ideal is an aristothelic action science and human science. The results of action-analytical approach are usually conceptual systems and the outcome is dependent on how the analyses are made throughout the problem solving.

Constructive research is a normative approach and uses empirical data. It aims at defining the problem and solving it by constructing an innovative system on the existing literature. It focuses on improving the previous theory or adapting it to the research problem in hand. The scientific ideal of constructive method is technical sciences, finance, management accounting and it is a commonly used approach in activity-based costing studies. The constructive research approach means problem solving in a real-life organizational setting by constructing a management system which is originally developed in the field of management accounting in the 1980s. The research methods in the field of industrial management are summarized in the Table 2 below.

Table 2. Research methods

Conceptual-analytical approach	Nomothetical approach	Decision-making-methodological approach	Action-analytical approach	Constructive approach
Aims at constructing conceptual systems	Aims at explaining and finding casual connections	Aims at developing problem-solving methods	Aims at understanding; sometimes the aim vary	<i>Aims at defining and solving problems</i>
Background: Previous research	Background: Positivism	Background: micro theory, decision theory, game theory and positivism	Background: Often teleological explanations	<i>Background: Developing the previous model further.</i>
Method: reasoning, uses analysis and synthesis to create new terminology	Scientific ideal as in natural sciences; behaviorism	Scientific ideal as in logics and mathematics	Scientific ideal is an aristothelic action science, human science	<i>Scientific ideal is technical sciences, finance, management accounting</i>
Research results may both report and make suggestions	Results are often law-like rules	Results are ways of solving clearly defined problems	Results are often conceptual systems of different levels	<i>Results are improved existing methods</i>

As seen at table above, all of the research methodologies have different aim, background and follow different processes in action. Thus, it is important to understand the unique aspects of each method before starting a study to be able to get the best results in the implementation steps. It is also possible to combine the above mentioned methods and use hybrid approaches depending on the nature of the problem in hand that is targeted to be solved.

3.3 SELECTING THE APPROPRIATE RESEARCH METHODOLOGY

Selecting the right research methodology is commonly derived from the objective and scope of the study in hand. Previous studies and existing literature on the subject is also beneficial for defining the right research approach. Usually, they give a clue about how the research can be conducted by following the approach of previous researchers even though it is a totally innovative research in a different field. Thus, the research question is an important criterion to define the research methodology that will be used in the study especially in the field of industrial management which is considered as a field of applied sciences and focuses on solving problems for businesses in the most practical way.

Case study research is increasing its significance in the research area especially in the field of business because of its practicality and the extensively use of empirical

data. The study in hand can be viewed as corresponding to the “how” question which is the most common case that is encountered in explanatory and descriptive cases (Yin 1994). However, it is not possible to approach the study in hand by using case study research methodology only because activity-based costing study in UGS Foods requires development of a unique and innovative solution idea and it is a necessity considering the complexity of olive production (Kasanen et al., 1993). The study is normative and requires empirical data so conceptual-analytical research, decision-making-methodological research and nomothetical research methods can be ignored. Action-analytical approach is also an alternative method that can be used in this case but it is not the most appropriate solution because action-analytical research focuses more on analysis of the development process of the project itself than constructing an efficient method to solve the existing problem (Lyly-Yrjanainen, 2002).

Therefore, constructive research methodology which is also a commonly used technique in management accounting area is the most appropriate approach in the specific case of UGS Foods. Taking the objectives of the research into consideration, the unique aspects and complexity of olive production force the researcher to understand the existing theory in the field of thoroughly and construct a model to solve the costing problem in UGS Foods which is the key strength of constructive research approach. In the initial stages of the research, the existing problems and challenges that UGS Foods is facing will be analyzed depending on the existing theory and the sub areas in management accounting field by following the research questions that the research method provides to the researcher. There will also be sections that case study research methodology will be used because of the nature of the research and it is important to merge the dynamics of two methods in the light of constructive research approach.

3.4 UNDERSTANDING CONSTRUCTIVE RESEARCH

Constructive research focuses on defining and solving problems and improving to the existing system or performance by using the existing body of knowledge or combining different methods in one (Oyegoke, 2011). It is a method used in applied sciences and it uses normative approach in implementation of the research. The most fundamental feature of constructive research is its practicality in improving the performance of the existing system that is being used. According to Kasanen et al. (1993), all problem solving exercises cannot be considered as constructive research. In the constructive approach, the researcher is supposed to combine the research problem and the optimal solution together with theoretical knowledge and it is essential to build an innovative method to solve the research problem by benefiting from the existing literature. Constructive research can be qualitative or quantitative or both, an inherently goal-directed problem-solving

activity normative in nature and typically applied case method through a normative case study approach (Oyegoke, 2011). The fundamentals of constructive research methodology are illustrated in Figure 11 below.

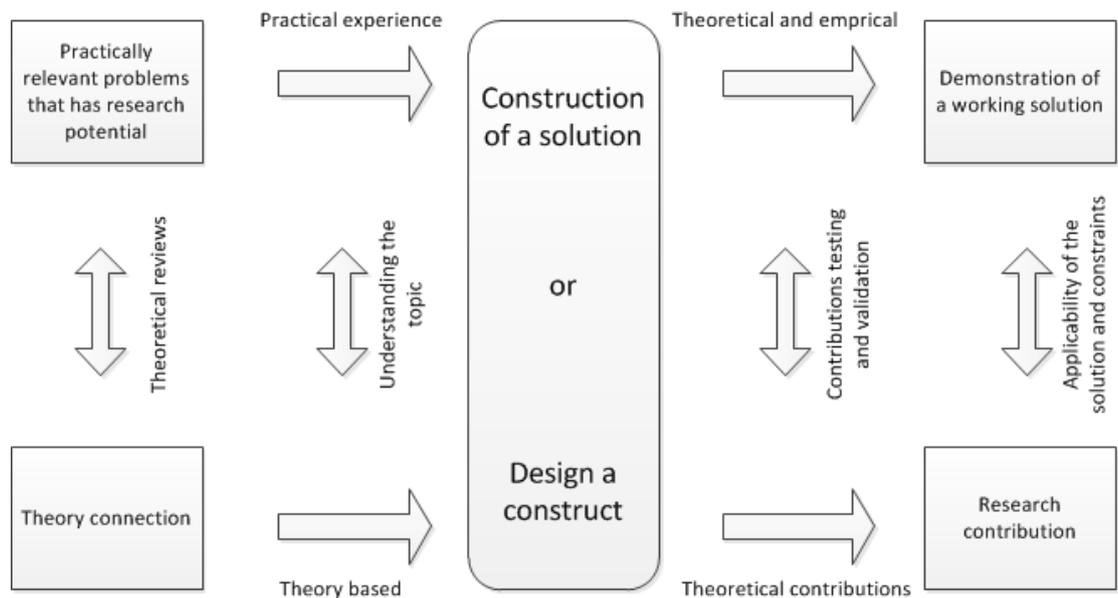


Figure 11. The features of the constructive approach (Oyegoke 2011)

Figure 11 shows how constructive research approach performs in action. The first step is to identify the problem with a research potential by using theories in the research field which is an important step to increase general understanding of the research topic as well. The correct combination of the theoretical knowledge with the practical experience will ease the construction of the new solution. The next steps are testing, justification and validation which can be empirical or theoretical, or quantitative or qualitative or both to prove that the solution really works. Consequently, it is important to highlight the contribution of the research to the theory as well the contribution to the business itself (Oyagoke 2011).

Different from Oyegoke (2011), Lukka (2000) has followed a different approach and identified constructive research approach in seven steps. According to Lukka (2000), seven steps of structuring a constructive research approach are as following:

1. Find practically relevant problem which also has potential for theoretical contribution.
2. Examine the potential for long-term research co-operation with the target organization.
3. Obtain deep understanding of the topic area both practically and theoretically.
4. Innovate a solution idea and develop a problem solving construction, which also has potential for theoretical contribution.
5. Implement the solution and test how it works.

6. Ponder the scope of applicability of the solution.
7. Reflect the findings to prior literature.

Constructive research approach starts with problem recognition and identifying the practically relevant problem that has also potential to contribute to the theory (Lindholm, 2008). The second step is to examine the long term collaboration possibility between the researcher and the target organization. This step is important in constructive research because the long term collaboration between two parties enable the researcher to continuously develop the new constructed model which requires optimizations regularly. The next step is to deeply analyzing the problem. According to Labro and Tuomela (2003), the linkages between theories are essential to be able to expose meaningful research projects. Afterwards, the researcher should be able to propose an innovative problem solving construction that will also contribute to the existing theory. Next is the implementation of the research and analyzing the scope and applicability of the solution that is being developed in the light of prior research.

3.5 RESEARCH PROCESS

The starting point of this research derived from the need of investigating the accurate product costs in UGS Foods by understanding the dynamics of the production flow to create a strong product portfolio strategy to compete in foreign markets. The top managers have realized that the costing method used in UGS Foods does not reflect accurate results per products because they follow volume based approach without focusing on every single type individually which leads to minimum understanding of value generation of each product because of the inaccurate cost information. Each type of olives pass through a different production process and their amount of resource being consumed vary according to the type of olives being produced.

Olive production is considered as a complex production environment because of its industry specific dynamics and the understanding the costs of the products requires detailed analysis of production flow. Thus, the resources provide plenty of valuable empirical study opportunities to be analyzed within the production zone and then be extended to sales, marketing and logistics department in long term. The study will be aligned with the theoretical studies in activity-based costing field by taking unique aspects of olive production into consideration. The accurate cost information in hand will enable UGS Foods to understand the profitability of each product in hand and by combining this information with the sales volumes, it will be possible to create a strong product portfolio strategy by forming a solid product line up which take the role of each product into consideration.

The research was based on existing literature and utilized both existing material and constructive research method. Initially, data was mined from the existing publications and the main means of data gathering were internet, books, academic papers and meetings with the stakeholders of the project within the firm. By exhaustive analysis of the collected data, the big picture about the production and costing dynamics in the food production has been acquired. Moreover, close connection and communication with project stakeholders throughout the project enabled the researcher to grasp the requirements of each step and conduct the research according to their specific needs. Project timeline is illustrated in more details in Figure 12 below.

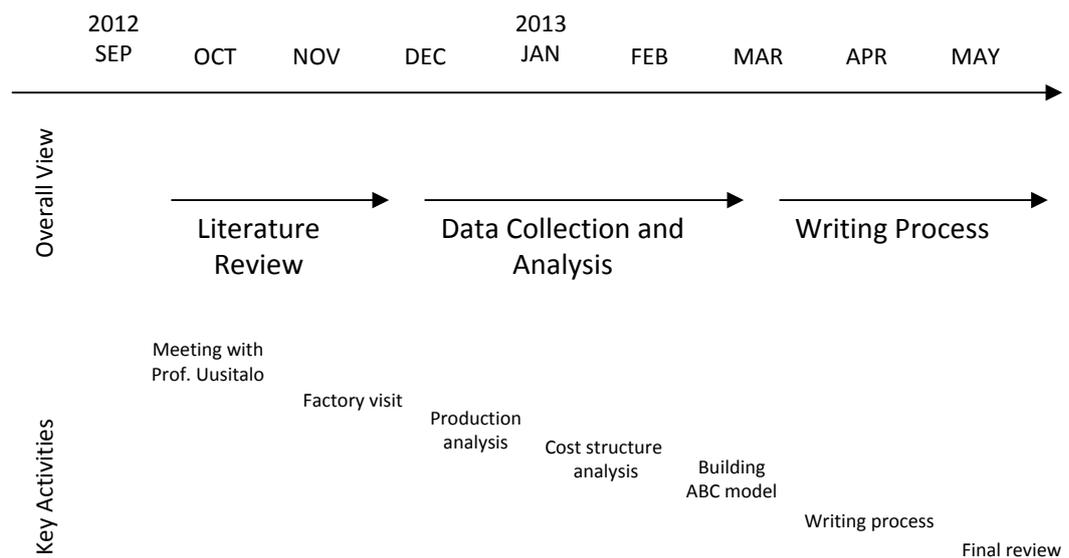


Figure 12. Research process timeline.

The research study started officially in the beginning of September 2012. There have been several meetings with the thesis supervisor to deduce the objective and scope of the research. After several meetings with thesis supervisor, researcher has made a visit to stakeholder's facilities to increase the general understanding of olive production and costing dynamics in the company. The next step was to analyze the unique aspects in olive production so that the activities and the cost they are responsible of can be deduced easier. The general understanding of the olive production enabled researcher to understand the activity and costing structure in the firm. Then, these findings have been used to build the activity-based costing model which is specially developed and modified for UGS Foods. The research process continued with fruitful discussions, improvement suggestions and combining the ideas with theoretical concepts. Finally, the collected data has been analyzed and the writing process has started which then lead to final review and submission of the complete report.

4 THE IMPLEMENTATION OF THE PROJECT

4.1 PRESENTING UGS FOODS

As one of the leading companies of the market, UGS Foods is serving to its clients for more than 30 years. Company exports its products to countries all over the world, mainly USA, Canada, Australia, Israel, Saudi Arabia, Dubai, United Kingdom and some other European countries. UGS Foods has always been open to new trends, developments in its sector and, new investments to production lines and process systems in order to raise its capacity, quality and compatibility.

The facility is constructed in 10000 square meter area as 5000 square meter closed, in which 30000 tons of Olives are processed as pitted, sliced halved, wedged, chopped, marinated and packed in a variety of packing formats. The production facility is equipped with the technology of sector's leader machinery suppliers from Spain and Italy, Global Food Safety and Quality system BRC managed by qualified and experienced staff.

As the first rule of being a food processor, UGS Foods pays great attention to food safety and quality, hygiene in compliance with domestic and international food regulations and standards. Most of the quality and safety tests are performed in the company's laboratory. It is believed that as an organizational culture it's the company's responsibility to keep and serve the olives as natural as possible without destroying its health promoting properties and recognized reputation of being a natural product.

UGS Foods controls all its purchasing processes which are critical to product safety, legality and quality to ensure products and services procured match with the defined requirements. The facility site is well located and maintained so as to prevent contamination and enable the production of safe and legal products. All incoming materials, packaging materials, raw materials, semi-finished products when needed and final products are monitored in compliance with the specifications, legality, product safety and quality. Raw materials are sampled and analyzed for safety and quality criteria including the foreign materials. Magnets are placed in the production line in order to control the contamination of metal pieces to the product. The quality department ensured all necessary steps to identify, avoid or minimize the risk of metal or other foreign material contamination. The company follows an approach from purchasing to dispatch to minimize the risk of any potential physical, chemical or microbial contamination risk.

UGS Foods carries out risk assessments of raw materials such as avoiding the cross contamination of allergens by ingredients with put in place control measures during storage and production. Considerations are given to environment which may have potentially adverse impact where measures have been put into place to protect the site from any potential contamination. The facility is located in an industrial site and environmental tests are performed and controlled by the site authorities in daily basis. Waste disposal meets the legislative requirements, where appropriate waste is removed by licensed contractors.

4.2 PRODUCTION FLOW OF OLIVES IN UGS FOODS FACILITIES

Olives are the fruit of olive trees. According to oliveoilsource.com, even though they are technically fruit, culinary, they can be falsely considered as vegetables because of the way they are consumed by the population. However, they are not consumable as they are picked from the trees so they need to pass through some processes to be able to reach the final quality which has direct impact on taste. Olive production is known as one of the most complex food production and it can also be considered as food processing in that sense as they pass through predefined activities to reach the final quality and taste to be delivered in consumer markets. The first production stage of olives in UGS Foods facilities can be found in Figure 13 below.

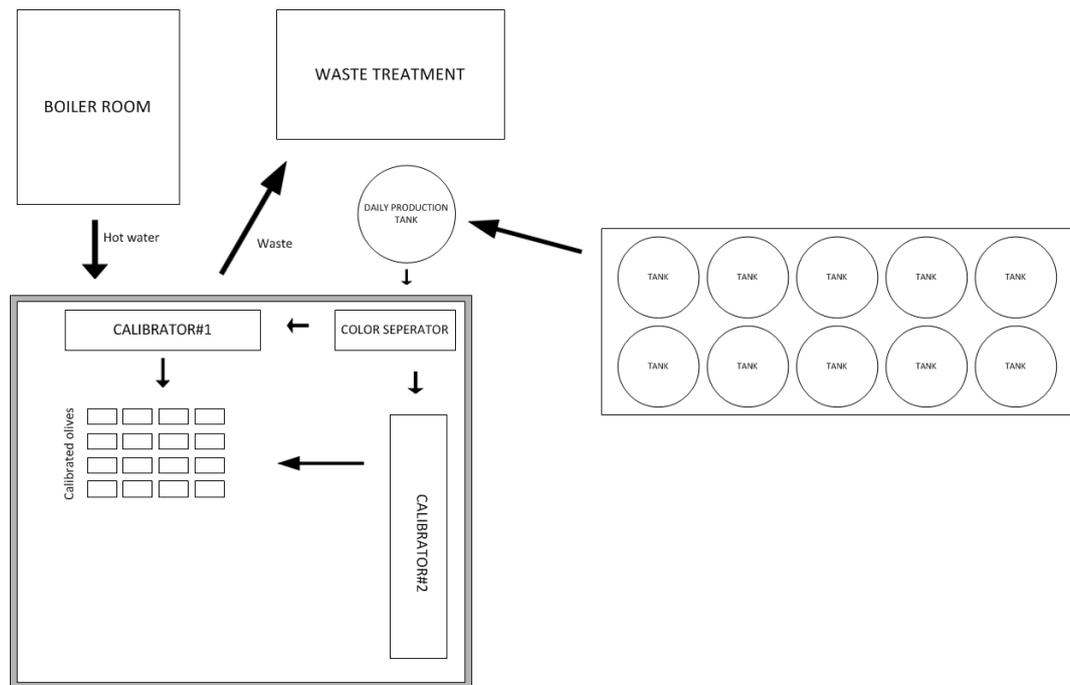


Figure 13. First stage of olive production in UGS Foods' facilities.

As illustrated in the figure above, there are plenty of steps in olive production that are considered essential to the operational flow. UGS Foods has a highly automated

production method so human interaction is minimized in every step which is beneficial to align with the food safety and quality regulations also. UGS Foods supplies its olives from Aegean region in Turkey where there is a long tradition of olive farming for centuries. The purchased olives are not differentiated in color or size as the farming in Turkey is not technologically advanced. However, these operations are handled in UGS Foods facilities.

The purchased olives are stored in the tanks which are placed close to the closed area where the production starts. They are kept in fermentation tanks with salty water and some chemicals if required to ferment and get rid of the bitter taste that the olives have when they are collected from the trees. As all the olives are not produced at once, they are stored in fermentation tanks longer waiting for their production round. The daily production amount is transferred to the daily production tanks depending on the production schedule.

In the production zone, there is high amount of water used that are mixed with some additives which are essential to olive production. However, this aspect states that the water used in production has to be treated before they are thrown out of the facilities for environmental friendly production. Thus, water treatment zone next to the production area where the water is decontaminated and dispatched out of the company. The hot water is also used in some production steps and also for heating purposes. Thus, the boiler room is used to warm up the hot water to be used when there is a need.

After the olives are moved into the daily production tank, the process starts with color separation. In this step, olives are separated as black or green olives. The machine used in separating the colors work with a camera and uses pressured air to separate the olives in two different containers by hitting the olive with pressured air and forcing a predefined color to go to a different containers. Usually black olives have a bigger percentage compared to the green olives after the separation process is over. The next step is the calibration where the olives are separated according to their sizes. After the calibration process, the olives are stored in front of the pitting machine for ventilation. This is the last zone for seeded olives and they are directly transferred for packing from the ventilation zone and the other olives continue with the pitting process which can be analyzed in more details in Figure 14.

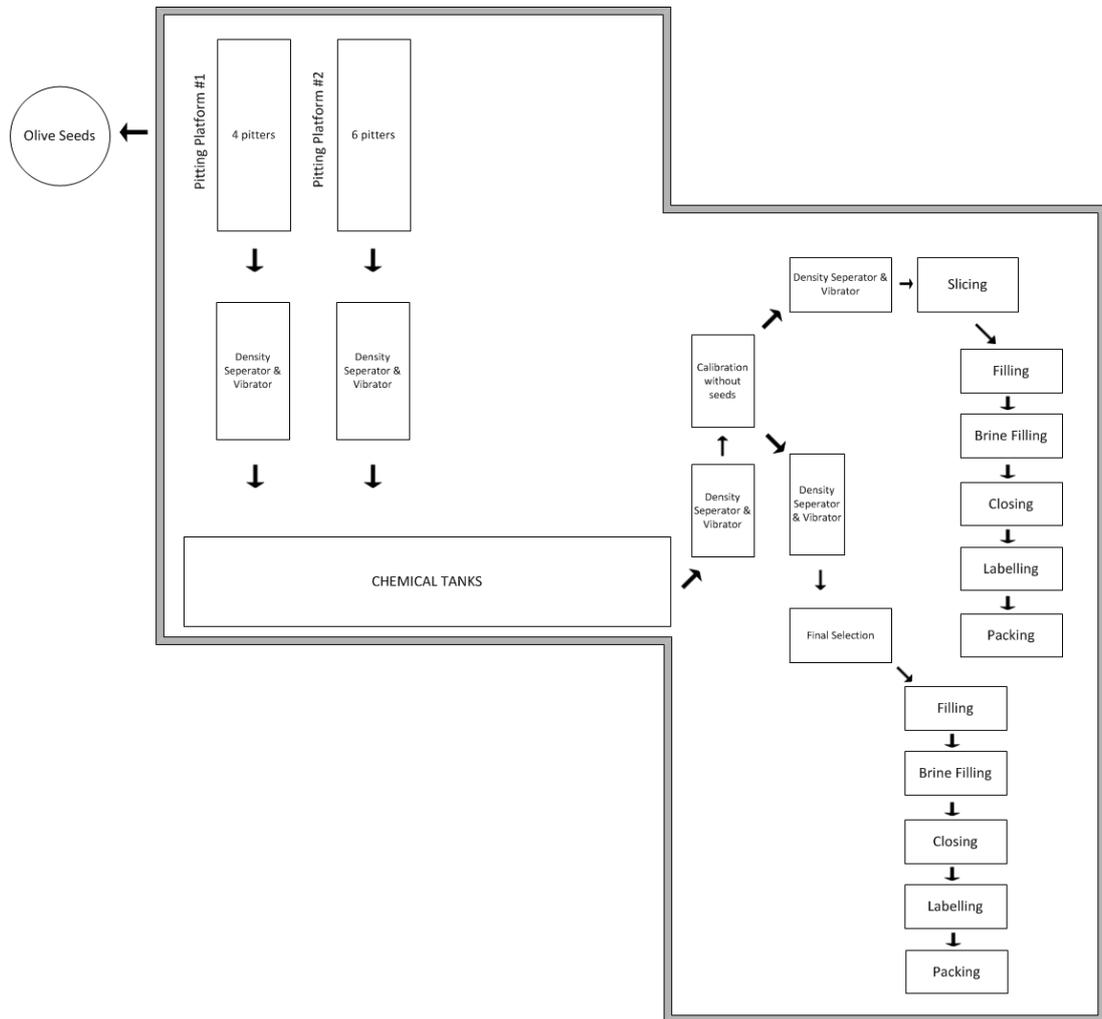


Figure 14. Second stage of olive production in UGS Foods' facilities.

Pitting process is done in two different platforms which consist of 4 and 6 pitting machines respectively. In this step the seeds are taken out of the olive without destroying its form. However, there is also a considerable amount of loss in this step due to deformation of soft olives. After the pitting process, the olives pass through a density separator where successfully seeded olives flow and the olives that the machine failed to pit sink to the bottom. These olives return to the zone before the pitting process and retaken to be pit in the machines later. Vibrator is used to eliminate the deformed oils by sending a vibration to a line which forces them to fall between two metal sticks. Density separator and vibrator are essential parts to improve the overall quality of the final product.

After the vibrator phase, the olives are stored in tanks which are filled with food additives for olives to obtain the final taste and quality. The duration of the stay inside the tanks is determined according to the state and type of the olives being processed. After the period in chemical tanks, the olives move to density separator and vibrator once again for another round of quality verification. When the product quality is verified in this segment, the olives go through a seedless calibration for

final segmentation. The calibration process is followed by four alternatives. The pitted olives either gets sliced, halved, cut or wedged and continues with filling, labeling and packing steps or they are filled, labeled and packed without being processed as a whole pitted olive which is the last activity in the production process. When packing is complete, the olives are ready for shipment to the customers.

4.3 DEFINING RESOURCE CENTERS

The activity-based assignment process starts with defining the resource centers in UGS Foods production facilities. After the analysis, eight main resource groups are defined that are consumed by olive production activities. The costs in resource centers are collected from the data for olive season 2011-2012 for UGS Foods which started from November 2011 until October 2012. Resource centers, totals costs that cover and resource drivers that link the resources to activities are explained in more details in Table 3 below.

Table 3. Resources centers of UGS Foods production

Resource centers	Total costs	Resource driver
Direct Labor Work	1 139 908 TL	Labor hours (h)
Facility Amortization	194 437 TL	Area covered (m ²)
Machine Amortization	411 350 TL	Machines used (TL)
Operation & Maintenance	2 481 760 TL	O&M expenses (TL)
Water	212 238 TL	Amount consumed (m ³)
Electricity	227 718 TL	Energy expenses (TL)
Total Sum	4 667 413 TL	

Even though UGS Foods automated most of their production, one of the major costs of the firm is still direct labor work which is 1 139 908 TL in total. The resource driver for this resource group is labor hours and it will be used when assigning resources to activities in the next step of implementation. Facility amortization is another resource group and it is 194 437 TL in total. It takes the depreciation of UGS Foods' facilities into consideration and the resource driver is meter square covered by the activity areas. Third resource group is machine amortization which is 411 350 TL in total and it covers the depreciation of the machines used in olives production. The resource driver for this group is the machine used by activities. Operation and maintenance costs cover a large amount of company's expenses which is 2 481 760 TL in year 2012. The resource driver for maintenance resource group is maintenance expenses per activity. As olive production requires a lot of water and electricity during the process, the major resource groups are water and electricity used in production of goods which are

212 238 TL and 227 718 TL respectively. They both have the same resource drivers which is amount used per activity. After the resource centers are identified, the next step in activity-based model is creating the activity maps to understand the dynamics of each activity that is being done in olive production process.

4.4 ACTIVITY MAPPING IN UGS FOODS

Activity mapping is an important part in activity-based costing implementation. The production flow is analyzed in details in the beginning of the project to understand the activities that natural olives pass through in the firm. After the analyses are complete, activities are mapped into different groups that have similar dynamics in their implementation. The activity map of UGS Foods' production zone is illustrated in Figure 15 below.

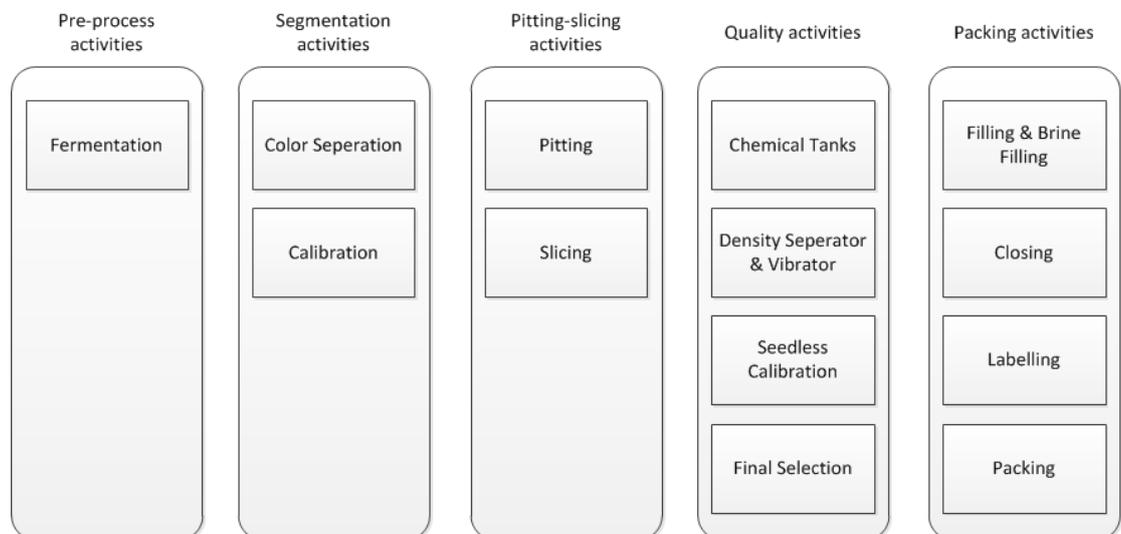


Figure 15. Activity map of olive production in UGS Foods

Olive production activities in UGS Foods are grouped in five main categories according to the nature of the activity being accomplished. They are pre-process activities, segmentation activities, pitting & slicing activities, quality activities and packing activities. Each category consists of minor activities that are important steps in activity chain in production of natural olives in the facility. The minor activities share similar dynamics in the model so that they can be connect to the major group and form a complete structure.

Pre-process activity group consist of only fermentation activities. Fermentation is an important process in olive production which gives the consumable taste to olives. It is the only preprocess activity in olive production. Second, segmentation activities consist of color separation and calibration activities. In color separation, olives are separated into green and black olives and in calibration activity; olives

are classified according to their sizes. Third group is pitting and slicing activities in which olives are processed. In this step, olives are pitted and sliced depending on the customer orders in hand. The next group is quality activities in which the products are tested if they reach the final quality or not. The activities in quality group are chemical tanks, density separator & vibrator, seedless calibration, final selection. The olives are stored in chemical tanks after being pitted so that they can obtain the solid color inside the tanks which are filled with citric acid and salt. Density separator & vibrator are used for eliminating the damaged or rotten olives. Seedless calibration is used for eliminating the olive particles and seeds that still exist in the production flow. Final selection is done manually and the workers separate the olives manually that do not meet the final quality requirements by observing the production band. The final activity group is packing activities. In this step, olives are filled into their packages, closed, labeled and packed into boxes for delivery to the customers. When the activities are grouped and mapped into sub-categories, next step is linking these activities to resource centers to understand their impact on costs and view the cost they generate individually.

4.5 INDUSTRY SPECIFIC ISSUES IN ABC IMPLEMENTATION

After the initial analysis, it is understood that olive production has great potential in understanding the production flow costs by implementing an activity-based costing as all the products are produced by a single type of raw material which is separated to different colors as green and black or different sizes in the further steps of the process. In that sense, it can be considered as following the same dynamics of slaughter houses. As all olive types pass through different process in the flow chart, the study will enable UGS Foods to understand the production costs of each type of olive being sold and enable UGS Foods to create a product portfolio strategy by using the accurate cost information in hand.

4.5.1 The Cost of Water Used in Activities

The cost of water spent has a significant impact on product costs in UGS Foods. As the production requires a lot of water consumption, the cost of water used in production increase significantly because of the water treatment expenses spent to purify the water used in production before expelling it to the reservoirs of the industrial zone. Thus, cost of water needs extra calculation which covers the water treatment cost per liter used. General graph of water supply to UGS facilities is in Figure 16 below. In some sterilization phases, hot water is used in production as well but it is not considered as a significant amount how it has also some impact on product costs.

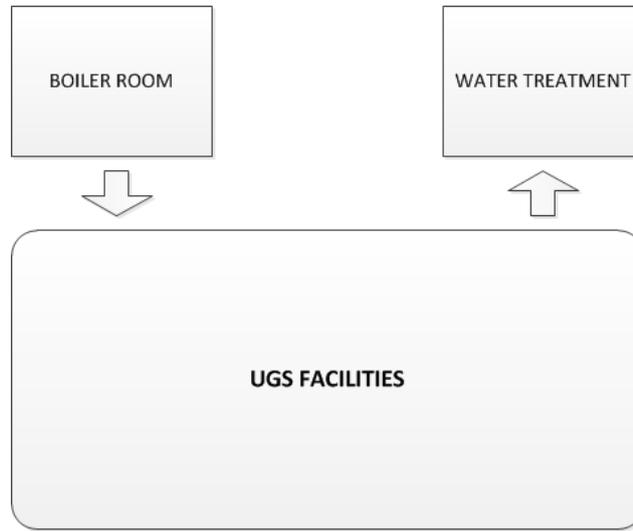


Figure 16. The supply and expulsion of water into UGS facilities.

As seen in the figure above, hot water is supplied to the facilities from the boiler room, after the water is used in production it is stored in a tank and end of a working day, the used water is transferred to the water treatment center to be purified before being expelled out of the factory. The calculation of water expenses will be done by adding the treatment expenses on water consumed and the calculated cost will be used in further steps of the activity-based costing calculations. The calculations are explained in more details in Table 4 below.

Table 4. Water expenses in UGS Foods

Expenses	Total costs
Water expenses	26 167.14 TL
Waste water expenses	36 645.48 TL
Water treatment zone amortization	9 000.00 TL
Water treatment zone expenses	116 425.57 TL
Labor cost	24 000.00 TL
Total cost	212 238.19 TL

The cost of water used in UGS Foods facilities is 26 167.14 TL. However the derived expenses related to water treatment center, employees working in water treatment and the expelling cost rise the total expenses on water used in production to 212 238.19 TL. This is considered as the consolidated amount and this amount will be distributed on activities according the percentage of water they use in the next steps of the implementation.

4.5.2 Fermentation Activity in Activity-Based View

Fermentation is an important process in olive production. The olives are stored in tanks filled with salty water in this step to remove the bitter taste of the olives so that they can reach the consumable quality. These tanks are also considered as a warehouse for olive production as the olives purchased for the season are reserved in these tanks to be processed later on. Autumn is the only season in a year for olives to get ripe and picked from the trees so olive producing companies purchase as much as olives possible in this period and store them in fermentation tanks throughout the year. It is important for olive producers to estimate their production for the year before the olive season starts so that they purchase adequate amount of olives which will be enough for one year and the company will not be out of olives to produce throughout the season. It is also a very competitive market for companies in this period to obtain the highest quality of olives in the market and put the competitors in complicated situation in market. Thus, good relations with the olive suppliers are considered as key to success in olive production. The fermentation concept is illustrated in details in Figure 17 below.

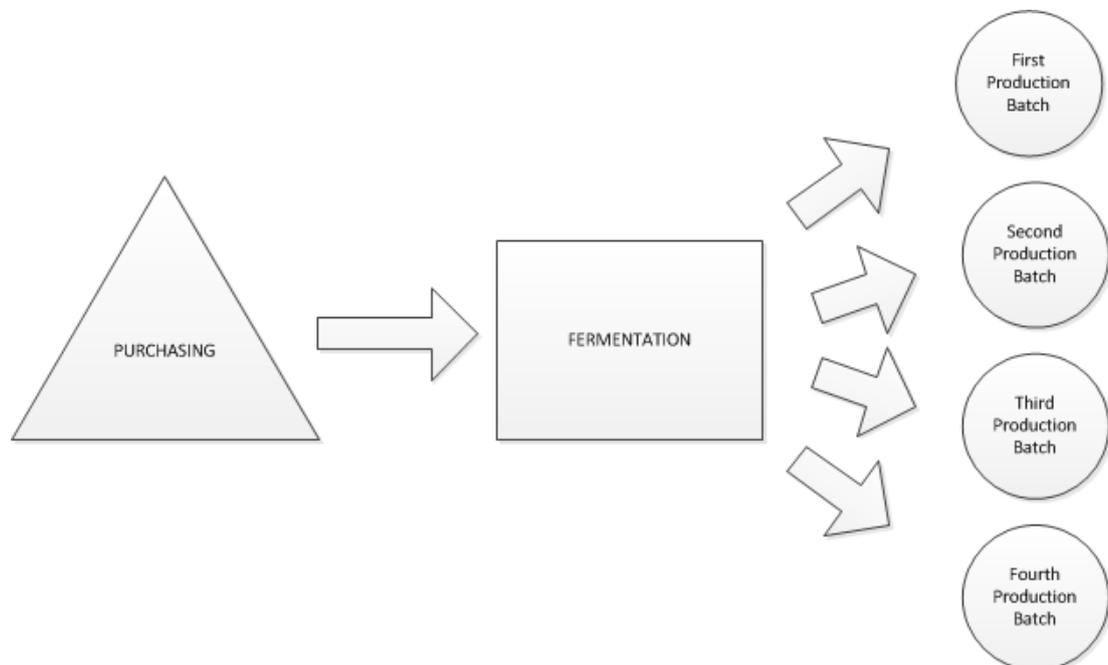


Figure 17. Fermentation process

One of the major challenges with the implementation of activity-based costing project in case firm is the fermentation activity that the olives pass through. It was challenging to analyze fermentation as a part of the activity-based costing model because the olives are filled to fermentation tanks which take around one month and then taken out of the tanks for daily production needs. After discussing this issue with project stakeholders, it is decided to add the cost of fermentation activity to raw material costs and analyze the fermentation as an outsourced activity for

UGS Foods as filling the fermentation tanks are only done in one month in a year and it is not an activity that is done regularly which violates the practicality of activity based costing method. The costs related to fermentation process are listed in Table 5 below.

Table 5. Olive cost per kilo after fermentation process

Cost per kilo in purchasing	1.30 TL
Total amount purchased	3000 tones
Operating expenses	26 915.35 TL
Fermentation tanks amortization	34 899.52 TL
Labor cost	12 000.00 TL
Cost per kilo after fermentation	1.325 TL

In costing analysis, fermentation activity will be analyzed as an outsourced activity as it does not meet the requirements of activity-based assignment view. One kilogram of olives cost 1.30 TL. However; after taking the cost that fermentation activity generates into consideration, the cost of 1 kilogram olive rises to 1.325 TL. The cost per kilo after fermentation will be used in the next steps of ABC implementation and the fermentation activity will not be included in activity-based costing model analysis.

4.5.3 Color Separation

Color separation is one of the key activities in olive production. As green and black olives are sold in different packages, they are separated by using a machine that handles the color separation process. Color separator works with a camera to spot the colors of the olives and separates them by using pressured air. Operations manager of the firm states that 80% of olives are black and only 20% of olives are green after color separation is complete. The outcome of the color separation activity is illustrated in Figure 18 below.

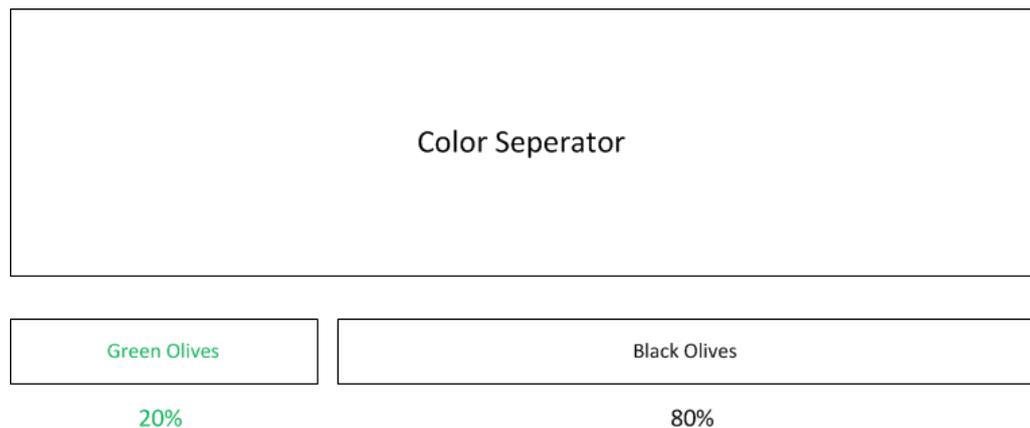


Figure 18. Color separation process

Color separation is an interesting activity to analyze because all the olives require the same amount of effort and in the end the outcome percentages highly differ from each other. Thus, the activity driver that will be type of olive that is being processed which is either black or green and the halved costs will be divided to volume of each type according on the output after color separation is complete.

4.5.4 Calibration

Calibration is the zone where the olives are separated in groups according to their sizes. The calibration process starts after color separation is complete and segments olives according to their sizes. The distributions of small, medium and large sized olives are 20%, 70% and 10% respectively. Color separation activity is illustrated in Figure 19.

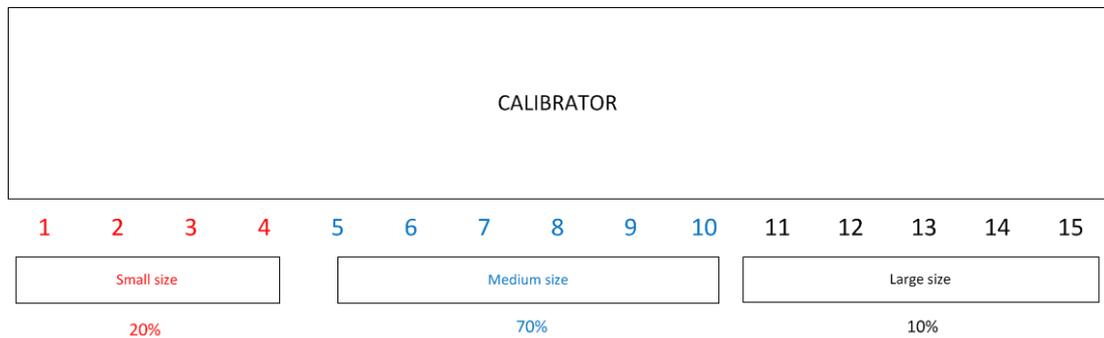


Figure 19. Calibration process

The calibration activities have similar dynamics as color separation. After the olives are segmented by their colors in the previous step, they are classified according to their sizes because every size has different market and sales prices in olive business. However, it is harder to obtain large sizes olives compared to medium sizes by equal effort spent on the activity. Thus, the olives activity driver will be defined as the olives sizes which are small, medium and large and the costs will be distributed to the produced amount according to the production volume.

4.6 DEFINING RESOURCE CONSUMPTION BY ACTIVITIES

After the resources centers are created and activities are mapped, the next step is to define how much each activity consumes from the resource by using the defined resource driver. In this step, it is important to distribute the activities consumption of resource via resource driver which has direct effect on the accuracy of the results. When the activities are assigned more or less than resource they actually consume, the mistake margin of product cost increases which is not good base

information for the product portfolio strategy creation as this research is based on accurate cost information to be able to obtain profitability values for each product. Thus, the observation phase of the production environment and defining the correct resource drivers with accurate values have direct impact on the results. The resource centers and resource drivers used in the research are listed in Table 6 below.

Table 6. Resources and resource drivers

Resource centers	Resource drivers
Direct Labor Work	Labor hours (h)
Facility Amortization	Area covered (m ²)
Machine Amortization	Machines used (TL)
Operation & Maintenance	O&M expenses (TL)
Water	Amount consumed (m ³)
Electricity	Energy expenses (TL)

By depending on the defined resources and resource drivers, the consumption of resources via business activities of UGS Foods is shown in Appendix 1 with their consumption percentages. These values are used in the next step as a coefficient to find the cost of the production activities.

4.7 DISTRIBUTING RESOURCE COSTS TO ACTIVITIES

After defining resource consumption per activity in the model, the next step is to allocate the costs of resources on activities depending on the percentage of resource that is being consumed which are examined in the previous chapter. This step is directly linked with the definition of resource consumption and if the resource consumption of activities is not accurately defined, it would be impossible to gather accurate cost allocation of resources to activities.

Appendix 2 contains the cost activities distributed by using the percentages in the previous chapter. The outcomes of the calculations are listed in Table 7 below.

Table 7. Activities and their costs

Activities	Cost of Activities
Color Separation	658 021.20 TL
Calibration	263 170.04 TL
Pitting	1 192 997.42 TL
Ventilation Tanks	220 168.11 TL
Density Separator & Vibrator	421 412.26 TL
Seedless Calibration	136 879.57 TL
Slicing	341 470.62 TL
Final Selection	253 004.07 TL
Filling	354 623.30 TL
Closing	80 265.99 TL
Labeling	270 043.69 TL
Packing	475 357.38 TL

As seen in the table above, the most costly activity for UGS Foods is Pitting and it is followed by color separation and packing respectively. These high cost in these activities mainly derived from the automated machines used in these steps which have high purchasing, operating and maintenance costs. Moreover, for packing activity, the cost of material used in packaging have also impact on the values.

4.8 DEFINING ACTIVITY COST DRIVERS

Defining activity cost driver is considered as the most complicated phase in activity-based costing model development and it had direct effect on the accuracy of the cost data gathered from the system. The activity cost drivers can be transaction drivers which focus on number of times the activity is performed or duration drivers which focus on the duration spent until the activity is complete. They can also be intensity drivers which emphasized the cost generated in realizing the activity which give the most accurate result in all three options. The activity cost drivers can also be unique drivers according to the activity that is being performed and should be defined clearly before the model is developed. The activity cost driver of each activity is described in more details in Appendix 3.

4.9 ASSIGNING COSTS OF ACTIVITIES ON PRODUCTS

After the activity drivers and their percentage of consumption defined, it is now possible to calculate the cost of each product by considering the business activities they pass through in the production phase and how much they consume from the resources of these above mentioned activities. Appendix 4 contains the whole

calculation method that is used to find the cost of each product that UGS Foods is producing. The costs of each product are listed in Table 8 below.

Table 8. Product costs via ABC

Products	Cost of Products
Black Whole Small	2.370 TL
Black Whole Medium	2.235 TL
Black Whole Large	2.540 TL
Black Pitted Small	3.144 TL
Black Pitted Medium	3.031 TL
Black Pitted Large	3.366 TL
Black Sliced Small	4.673 TL
Black Sliced Medium	4.560 TL
Black Sliced Large	4.896 TL
Green Whole Small	2.773 TL
Green Whole Medium	2.637 TL
Green Whole Large	2.942 TL
Green Pitted Small	3.589 TL
Green Pitted Medium	3.473 TL
Green Pitted Large	3.805 TL

As seen in the table above, the most costly products for UGS Foods are black sliced olives because they pass through the highest amount of activities in the production cycle of UGS Foods. In general the black olives except the sliced ones are less costly for UGS Foods because of the mass production amount and the middle sized olives cost less because they consume less resource per unit compared to the other less volume sizes.

5 THE FINDINGS AND RECOMMENDATIONS

5.1 THE PRODUCT COSTS GATHERED FROM ABC MODEL

After the assigning the cost of activities on products that are produced in the company, UGS Foods is now aware of how much each product cost for them. The accurate information gathered from ABC model that is being implement in the firm have enabled UGS Foods to understand the resource consumption of each product as well as to analyze and separate value generating and non-value generating activities. The accurate cost information derived from the activity-based costing model is illustrated in Figure 20 below.

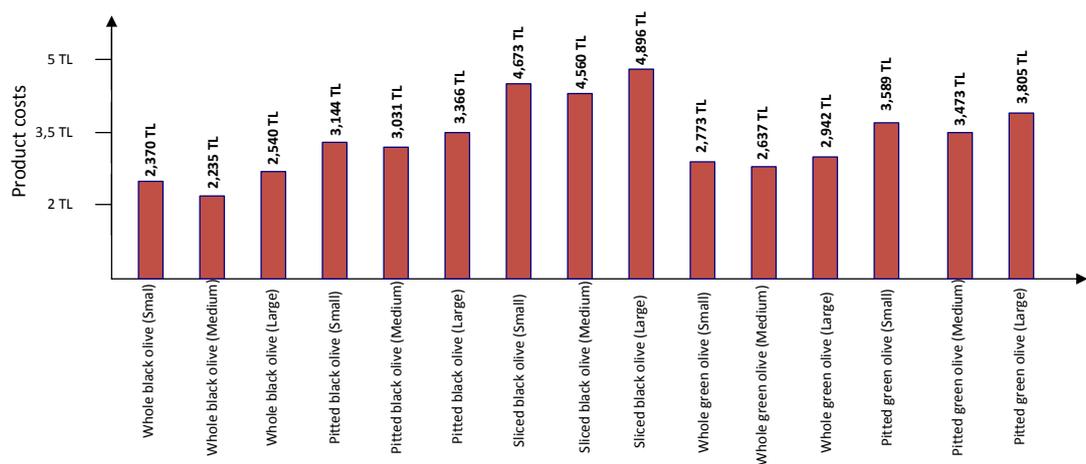


Figure 20. Product costs from ABC model

As seen in the figure below, the product costs vary with high margins depending on the type of olives that are being produced. As each type pass through different processes in production flow and consume different amount of resources according to their color or size, the activity-based view has significantly increased the accuracy of product costing system in UGS Foods.

5.2 PROFIT POTENTIAL AND VOLUME ANALYSIS

Sales volume and price information of all products that UGS Foods is producing can be found in the sales report of the company. After analyzing the available data and grouping the products according to their size and color, it is possible to go deeper in the analyzing and benchmark the products with their sales volumes and profit margins which will be used a key tool to conclude the research in the

following chapters. The sales volume, sales price per kilo and total costs can be found in Table 9 below.

Table 9. Product sales volumes, sales prices and total costs

Olive type	Sales volume (kg)	Sales price per kilo (TL)	Total cost per kilo (TL)	Profit per kilo (TL)
Black Whole Small	59670	4.00 TL	2.37 TL	1.63 TL
Black Whole Medium	23191	4.55 TL	2.23 TL	2.31 TL
Black Whole Large	8524	5.10 TL	2.54 TL	2.56 TL
Black Pitted Small	286730	5.10 TL	3.14 TL	1.95 TL
Black Pitted Medium	1003557	5.64 TL	3.03 TL	2.61 TL
Black Pitted Large	143365	6.19 TL	3.36 TL	2.82 TL
Black Sliced Small	49243	4.91 TL	4.67 TL	0.24 TL
Black Sliced Medium	172352	4.91 TL	4.56 TL	0.35 TL
Black Sliced Large	24621	4.91 TL	4.89 TL	0.02 TL
Green Whole Small	9166	3.09 TL	2.77 TL	0.32 TL
Green Whole Medium	32083	3.64 TL	2.63 TL	1.00 TL
Green Whole Large	4583	4.19 TL	2.94 TL	1.24 TL
Green Pitted Small	7358	3.97 TL	3.58 TL	0.38 TL
Green Pitted Medium	25755	4.51 TL	3.47 TL	1.04 TL
Green Pitted Large	3679	5.06 TL	3.80 TL	1.25 TL

The intense competition in global markets in olives business forces firms to follow market-based pricing strategy. The biggest olive producers are usually from Spain or Italy and the prices they charge for their products usually set the market price for that variety of olives in the markets. As they are the biggest producers in the industry, they can easily shrink their profit margins and pursue economies of scales to roughen the competition for smaller scale firms and create an entry barrier for new entrants. As the pricing decisions are made based on market environment, it is not beneficial for UGS Foods to discuss the pricing strategy and alterations that would be implemented. Thus, the research focus on the profit potential of all products by subtracting the market price from the accurate cost information that is derived from the activity-based model which is being used as a tool to identify the product portfolio strategy for the existing products. The profit potential of olives varieties produced in UGS Foods' facilities is illustrated in Figure 21 below.

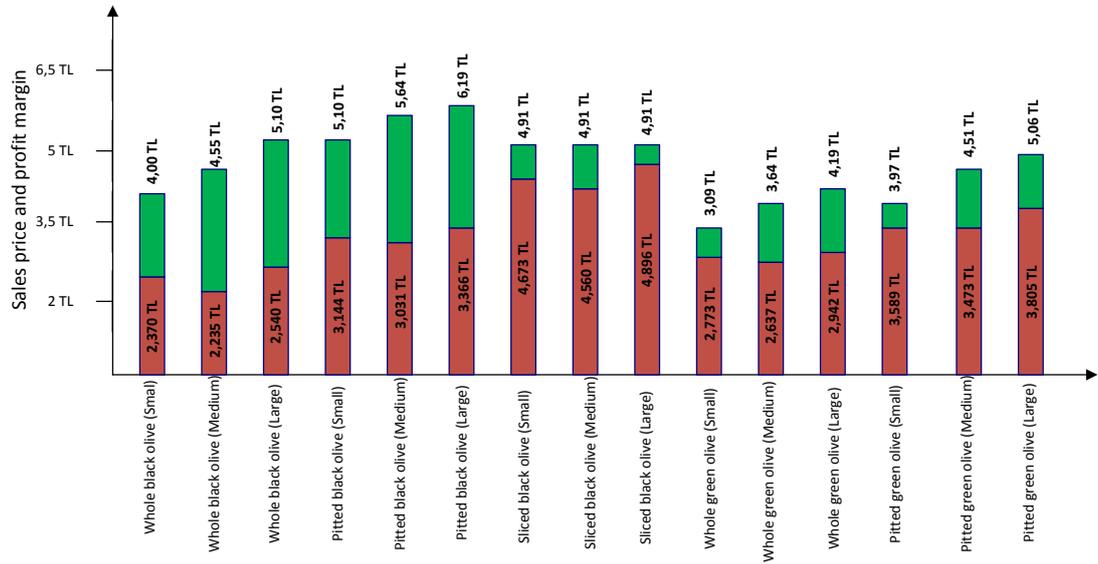


Figure 21. Sales prices and profit margins

When the products are placed by their costs and sales prices on the graph, it is easier to deduce the products that have good profit potential by comparing the sales prices with costs derived from the activity based costing model. The red parts in the graph represent the cost of the products and the green part is the profit of the product which is calculated by deducting the sales price from the cost of the product which is retrieved from the activity based costing model. The whole picture of the findings of profit potential and sales volume analysis can be found in Appendix 5.

5.3 PRODUCT PORTFOLIO STRATEGY

After the profit potential of all the products are gathered by comparing the accurate cost information from activity-based costing model and market prices, the products are placed on profit – volume graph to be able to understand the role of each product for the firm and create a product portfolio strategy depending on their position. This analysis will enable UGS Foods to define what can be done to improve the value that each product generates for the firm without increasing the prices which does not seem like a good possibility for the firm by taking the market position and the competition level in the market into consideration. The products on profit – volume graph are illustrated in more details in Figure 22 below.

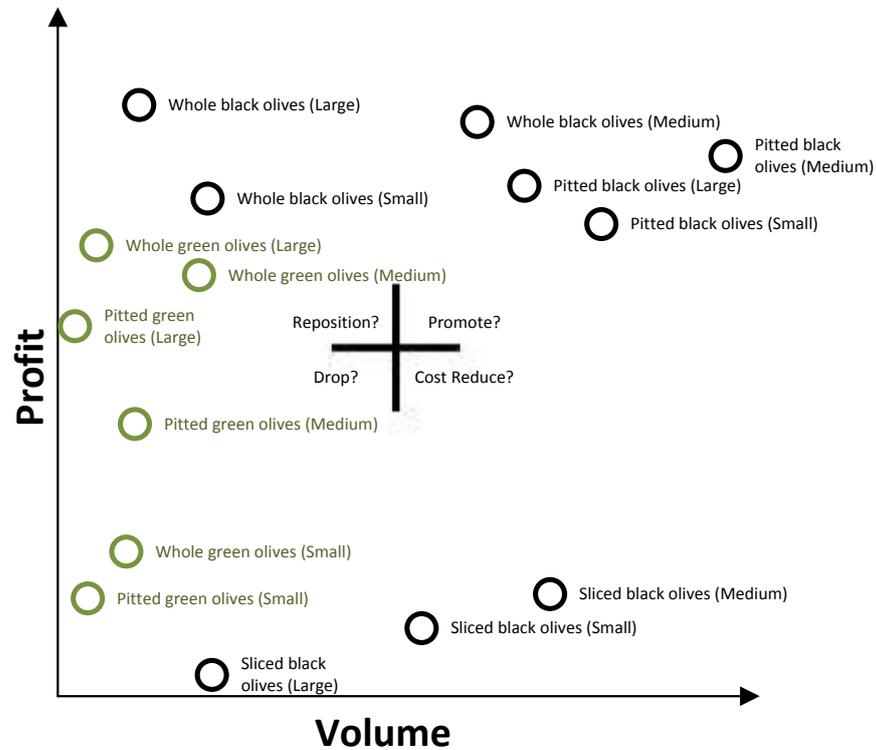


Figure 22. Profit and volume analysis

After placing the product on profit – volume graph depending on their profit potential and sales volume, it is easy to deduce the role of each product for the company. The next step is to create a strategy for promising products to retrieve the best out of them and use them in full potential, find an alternative approaches for the products that are not fulfilling the expectations of UGS Foods and drop the products that has no chance to be recovered without damaging the long term customer relations

5.3.1 Drop Strategy

The products in the drop group are the ones who have limited profit margin and low volume of sales in the product portfolio of UGS Foods. In the case of UGS Foods, dropping a product is a complex issue as the olives are purchased in batch amounts and it is complicated to control the color and size of olives that are being purchased. Moreover, not all the customers of UGS Foods are purchasing one type of olives. When the customers make an order of mixed products, it is important to consider the profitability of the mixture offered instead of focusing on individual products. In B2B world, the requirements and needs of the value chain defines the success so it is important for UGS Foods to offer products that are not very profitable in the mixture because the same product can be essential to one stakeholder in the value chain. Thus, the drop strategy should focus on utilizing the

product in hand in different perspective other than avoiding purchasing any olive in specific size or color and the long term customer relationship into consideration. The products in drop strategy portfolio are illustrated in Figure 23 below.

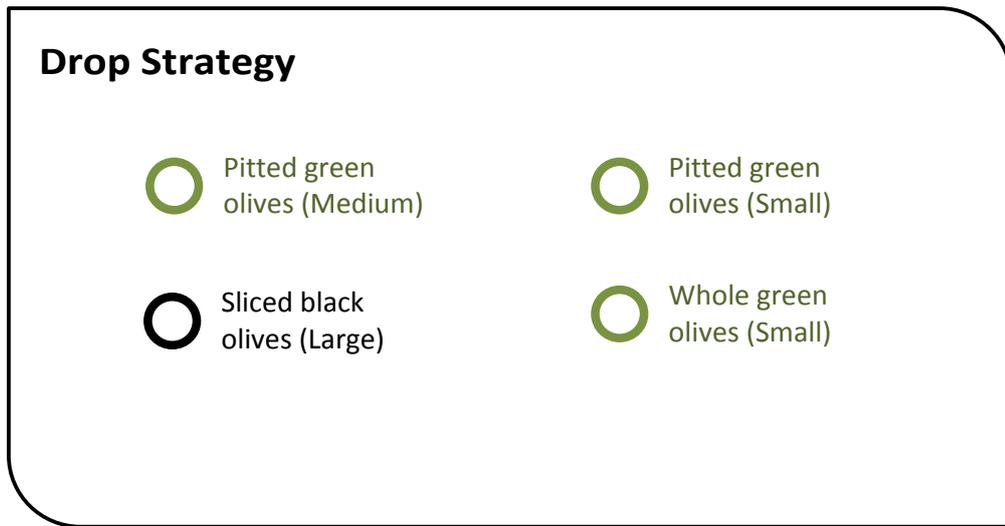


Figure 23. Drop strategy

Sliced Large black olives are one of the interesting products to analyze in the drop strategy portfolio. They generate less than 1% operating profit for the company and they have the sales volume of 24622 kilograms. By considering the extra costs generated after the operating level, sliced large black olives can be considered as generating loss for the company. However, black olives are really interesting product group for UGS Foods and because of the high level of sales potential and profitability in international markets which can also be seen as sliced large black olives are the only black olives in the drop strategy portfolio. The analysis shows that whole large black olives are the most profitable product for UGS Foods with 50.16% operating profit margin. Thus, UGS Foods should avoid slicing the large black olives and try to promote them as whole olives because slicing them diminish their profitability significantly and large black olives are more valuable when they are sold as a whole.

Whole small green olives are another product in drop portfolio strategy. They have sales volume of 9167 kilograms and their operation profit margin is only 10.39%. In the product portfolio of UGS Foods, Small sized green olives are problematic product group because of their low profitability and sales volume in general as well. As a precaution to this general issue, the sourcing department of UGS Foods should avoid purchasing the small sized green olives as much as possible so that the amount the company need to process can be decreased. As the sourcing is done in a short period of the season in a very competitive environment, it is complicated to reach 100% success but every positive move in this direction can create a competitive advantage for UGS Foods. To increase the profitability of the whole

small green olives in hand, it is possible to offer them as a mix with whole small black olives by using exotic spice flavors so that it can be perceived as a premium product in consumers mind and the profitability problem can be solved and the volume can be increased. An example product has been illustrated in the Figure 24 below.



Figure 24. Green black olive mix.

Another products that are in drop product portfolio group are pitted small and medium green olives which have sales volume of 7359 and 25756 kilograms respectively and their profit margins are 9.55% and 23.06%. Pitted medium green olives are the most interesting product in drop strategy product portfolio because they have higher profitability and sales volume compared to the other products in the same segment. These products have two alternative scenarios for further steps. One alternative is that UGS Foods can stop pitting the medium sized green olives and sell them as whole olives which have higher profit margin or they can be promoted with nut, garlic or cheese filling inside so the consumer can perceive them as a premium product so that the profitability of the product can be increased. An example filled pitted green olive is illustrated in Figure 25 below.



Figure 25. Green olives filled with cheese

5.3.2 Repositioning Strategy

The products in the reposition group are the ones who have interesting profit margin but their low sales volume keep them from being an important product for UGS Foods. However, they are the most critical products for the analysis because in the fast changing business environment and consumer preferences. If one of these products manages to reach the mainstream markets and increase its sales volume, it would make a significant impact of the profitability of UGS Foods in company level. The products in repositioning strategy portfolio are illustrated in Figure 26 below.

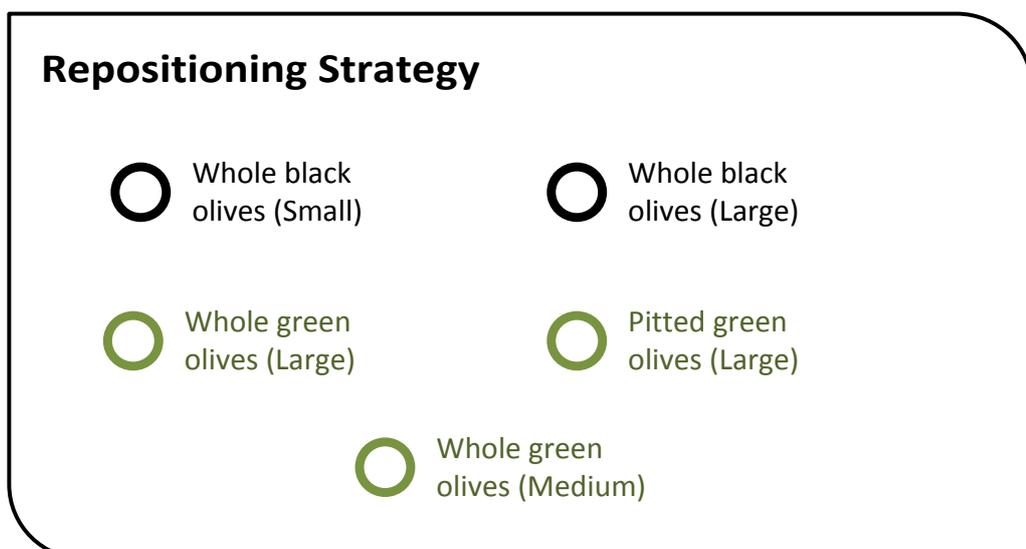


Figure 26. Repositioning strategy

Whole small black olives have 23191 kilograms sales volume and 40.80% operating profit margin. The repositioning strategy will be done by producing a green black olive mix by using small green olives which is also mentioned in the

previous chapter. By mixing a profitable product with a less profitable product will also solve the problem of small green olives profitability and the green black mix promotion is expected to increase the sales volume problem for the product.

Whole large black olives are key product to focus for UGS Foods because they have the highest amount of profitability in all products with 50.16%. Thus, the repositioning of this product is vital for the long term success of the firm. The repositioning should focus on making the product more attractive in consumer's eyes which can be done by herbal mixtures and premium packaging. It is also possible to lower the prices which will help company to boost the sales volume and profit from the product still above average level. Whole medium and large sized green olives have also similar problem like the whole black ones, they have a respectable amount of profit potential but lack the sales volume required to make an impact. Similar repositioning strategy can also be followed in the green ones as well so that the perception of the product can be changed in a positive way. Marinated green and black olives are shown in Figure 27 below.



Figure 27. Marinated green and black olives

Pitted large green olives are the most interesting pitted green olives for UGS Foods. They have profit margin of 24.80% and sales volume of 3679 kilograms. It is important for UGS Foods to keep this product alive so that it can be the carrier for pitted green olive market for UGS Foods. The repositioning will be done by offering volume discounts to long term customers and offer them in green black pitted mixtures as an alternative product.

5.3.3 Promotion Strategy

The products in the promotion product portfolio are the inevitable products for UGS Foods and they are the flagship of their success in international markets. They both have interesting profit margins and sales volumes so that they generate high amount of cash for the firm and keep it strong in long term vision. The products in promotion strategy portfolio are illustrated in Figure 28 below.

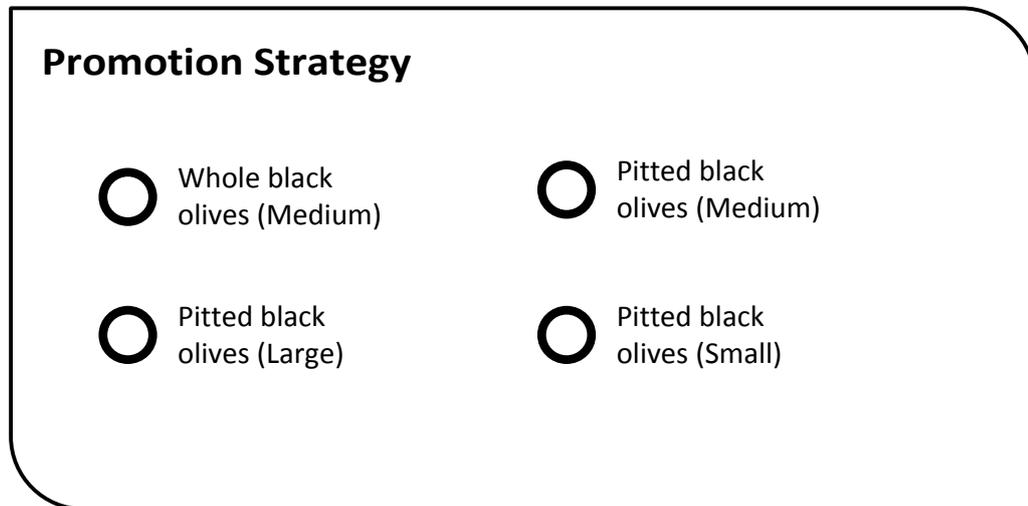


Figure 28. Promotion strategy

Whole medium black olives are the only whole olive in the promotion segment with a profit margin of 50.88% and 59670 kilograms of sales. This is an interesting product to have for UGS Foods and if they can manage to increase the sales volumes, it would turn up to be one of the leading products in company level. The company may try to expand to new customer groups and countries to increase the sales volume of the product in hand.

Pitted small, medium and large sized black olives are certainly the flagship products of the firms. They have 38.20%, 46.28% and 45.61% profit margin and 286731, 1003558 and 143365 kilograms sales volume respectively. The pitted black olives contribute at most to the success of the firm in foreign markets and it is important to keep these products interesting for the company to pursue long term success. It is also important to promote these offerings in other customer groups and different countries where there is potential to sell these offerings and increase the sales volumes which directly lead to improved profitability in company level via minimum effort.

5.3.4 Cost Reduction Strategy

The cost reduction strategy group is an important area to analyze for UGS Foods. These products have satisfactory sales volume and customer base but they lack at providing satisfactory profit margins. Thus, UGS Foods will focus on decreasing the cost of production for these products so that they become profitable. The products in cost reduction strategy portfolio are illustrated in Figure 29 below.

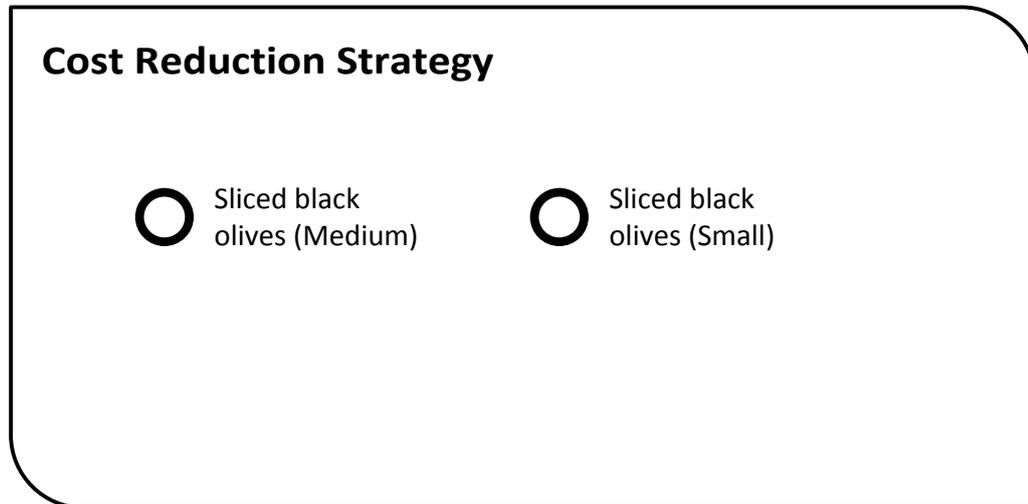


Figure 29. Cost reduction strategy

Sliced medium and small black olives are the products in the cost reduction portfolio. They have sales volume of 172353 and 49244 kilograms respectively and they generate 4.90% and 7.20% operating profit margin. To be considered strategic products for UGS Foods, their costs need to be decreased significantly so that they can create adequate amount of profit for the firm thanks to their sales volumes. One possible cost reduction method is possible by using the amount of water used in slicing zone. During the analysis phase, it is seen that there is running water next to slicing machine to get the olives sliced without destroying them. However, this water increases the amount of water being wasted as well. If the waste is taken under control in this zone, it would impact the cost of products as well. Another possibility to lower the production cost is to connect the slicing zone to the automated closing and labeling machines which are used for whole and pitted olives in the company. This will lead to lower labor cost and the company will utilize its resources more efficiently.

6 CONCLUSION

The most important target of every firm is to have return on their investment which can first ensure survival in competitive markets and then grow steadily. The competitive global market enforces companies lower their prices to be able to compete with global market leaders who pursue economies of scale as their business strategy. In olives industry, the Italian, Greek and Spanish companies dominate the competitive markets such as USA, South America and Western Europe and try to build an entry barrier with their lower prices against smaller firms from other countries such as Turkey, Egypt and Tunisia where olive cultivation has long tradition as well. This trend forced UGS Foods to follow the competitive pricing strategy that is implemented by the market leaders to be able to keep their business running in overseas which shrank the profitability of the firm.

Apart from large size olives which can be premium priced in some specific markets, it is impossible to increase the price of the products and the prices are usually calculated by following the trends in the market. As the price range is quite limited for UGS Foods, it is decided that it would be beneficial for the firm to control their costs effectively and obtain how much each type of product generates cost for the firm which will be possible by implementing an activity-based costing model. The accurate cost information is very essential for UGS Foods to use their products strategically against their competitors. The accurate cost data enables UGS Foods to understand the role of each product for the company and adapt these strategies with the long term strategy of the firm by creating a product portfolio strategy depending on the profit and sales volume each product group generates. This project will help UGS foods to follow data-driven management method by making concrete analysis on products and their market performance.

Olive production environment is an interesting area to analyze activity assignment because it has plenty of unique production methods that do not exist in most of other food production environments. Each type of olive pass through different steps in the production flow in UGS Foods which make an interesting research possibility for the researcher to analyze how much each activity generate cost on products of the firm. Thus, the production facilities have been observed and the employees that are responsible of olive production in the company have been interview to be able to understand the basics of olive production and increase industrial know-how. The knowledge gathered in the production zone has contributed to practical knowledge of activity-based costing implementation.

The objective of this study was to create a product portfolio strategy for UGS Foods so that they can position their major products more strategically in global

competitive markets. This strategy enabled UGS Foods to control its costs by analyzing their business activities and understand where they lose money as well as to change the market strategies for their existing products that increase their profitability without the need of making considerable amount of investment in product development.

To sum up, the outcome of the research study is that implementation of activity-based costing model that will be used as a tool to retrieve cost information of each product that the company produces so that the precise profitability data can be acquired. In the current business landscape, information that can be used in decision making and strategy creation is a step stone to success. Profitability information in hand gave the opportunity to place the products on profit-volume analysis framework and create a product portfolio strategy for each product group.

6.1 LIMITATIONS

Even though this research tried to focus more on the practicality of the work instead of academic overview, it is still hard to utilize an academic work 100% efficiently in business landscape. The findings of the research may require additional analysis in terms of competitive and risk analysis which might be undertaken by the experienced managers of the UGS Foods. Moreover, the data used in the analysis only focuses on 2012 fiscal year results and does not take the business activities done before 2012 and the ones that are planned in the new olives season.

The focus of the research was to take a snapshot of the running firm in a period and analyze the data in hand to show the right direction and way of thinking to build up the long term strategy in the international markets. The management should not use the cost data provided as an accurate number to price their products because the business structure of the firm is very flexible and dynamic which mean that it is open to immediate changes in short term. However, the activity based costs of the products are very useful to understand the big picture of the business operations of UGS Foods and which activities are costly for them and how much cost they add on product level. By keeping these restrictions in mind, the research findings provide infinite opportunities for UGS Foods to utilize and expand their operations in global perspective.

6.2 MANAGERIAL IMPLICATIONS

The biggest challenge that UGS Foods is facing now is the management of the planned expansion in product portfolio in competitive global markets. The company needs to stop slicing the large black olives and focus on selling them as a whole product because slicing diminishes the value generation drastically. In addition, they should also start offering green and black olive mixtures to create extra value and increase profitability since the green olives are less profitable than black ones in the current setup.

It is also important to gain focus on the flagship pitted black olives which generate the most of the profit for the firm. It would be a big mistake to ignore this group just because they are already profitable and have high sales volumes. The big markets are changing fast in current business world and the emerging markets are starting to gain attention of the world class firms. Thus, it is important to analyze the strategic position of the above mentioned products and use them to chase success in new markets and possible new customer deals. If UGS Foods manage to keep the profitability stable and increase the sales volumes for pitted black olives, they would guarantee success in long term and use the money generated in strategic investment decisions.

The drop strategy portfolio covers small and medium sized pitted green olives, small whole green olives and large sliced black olives. The main focus of this product group is to analyze how the strength of the product in hand can be utilized in different channels. The reason behind this approach is that it is impossible to drop a product in UGS Foods because the purchase is made in batch level so it is important to be able to utilize and benefit from it the best way possible to be able to succeed.

The repositioning strategy portfolio includes small and large whole black olives, medium and large whole green olives and large pitted green olives. The main focus of this group is to reposition the products in the market so that the customer can perceive the products differently which will have impact on the sales volumes of the products. The above mentioned products already have adequate profit margins so when the sales volumes expand, the strategic value of them will increase exponentially.

The promotion strategy product portfolio has small, medium and large pitted black olives and medium whole black olives. These are the flagship products of UGS Foods in international markets because they both have high profit margin and sales volume. These products are important for UGS Foods so they need to pay good attention to this product group and try to increase their sales volume by following

correct promotion strategies so that the profitability can be expanded in company level.

The cost reduction portfolio group is the final segment and it consists of small and medium sliced black olives. These products have good amount of sales volume but they lack in profitability. The cost reduction strategy will enable UGS Foods to increase the profit margin of the following products so that they can create good amount of profit thanks to their high amount of sales volume.

6.3 FURTHER RESEARCH

The complexity and the industry specific dynamics of olive production has enabled an interesting research opportunity for the researcher to conduct an activity based costing study to understand how much each product costs for the company and then use this data to analyze profitability and create product portfolio strategy that will enable the firm to benefit from their wide range of olive products more effectively. Before the project has started, it was planned to have long term collaboration between the researcher and the case company UGS Foods to improve the costing approach that is being used in the company and analyze how much each product and customer create value for the firm to be able to obtain a strong position in competitive markets.

After the research in hand is complete, it is scheduled to continue activity-based costing model research by spreading the scope of the research into customer profitability analysis which will be done by involving the white collar workers activities into the analysis. This approach will enable the company understand the profitability of individual customers by comparing the marketing and sales resources consumed. This data will be used to create interesting opportunity for the researcher to analyze and develop a customer portfolio strategy framework for UGS Foods in long term.

6.4 CONTRIBUTION TO THEORY

Apart from the practical benefits, the research also contributes to business literature and creates an opportunity to investigate the activity-based view in complex production environments where the standard methods cannot be applied directly and require some modifications in the concept and how accurate cost data can be used to improve the market positioning and strength of a product. The study in hand leaves an open door to discussions on how data-driven management can improve business performance and it is an interesting field for further research

especially in current business environment where data-driven decision making is perceived as key to pursue success and create a world class company.

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LIST OF INTERVIEWS

The following people are the stakeholders of ABC project in UGS Foods and they have been interviewed during the process:

Person	Position	Time	Duration /h
Erol Bozkurt	CEO	10.12.2013	10.0
Emre Bozkurt	COO	10.12.2013	18.0
Mustafa Gök	Operations Manager	11.12.2013	10.0
Raziye Yılmaz	Financial Accountant	13.12.2013	12.0
Pelin Polat	Junior Food Engineer	14.12.2013	10.0

APPENDICES

Appendix 1: Resource Centers and Resource Drivers

Appendix 2: Distribution of Resource Costs on Activities

Appendix 3: Activity Drivers

Appendix 4: Cost of Activities on Products

Appendix 5: Total Costs and Profit Margins

Appendix 1: Resource Centers and Resource Driver

	Color Seperation	Calibration	Pitting	Ventilation Tanks	Density Seperator & Vibrator	Seedless Calibration	Slicing	Final Selection	Filling	Closing	Labeling	Packing	Total activity
Working hours (h)	96	96	384	32	192	96	64	224	208	32	64	192	1680
Area covered (m2)	20	60	200	100	160	40	70	160	40	50	40	60	1000
Machine costs (TL)	88000	20000	111350	10000	17000	6000	64000	8000	6000	2000	39000	40000	411.350 TL
O&M costs (TL)	440000	130000	660760	111000	190000	39000	195000	48000	168000	40000	170000	290000	2.481.760 TL
Energy consumed (TL)	53750	32020	71700	0	23240	4800	11250	6810	3405	6810	9810	3405	227.000 TL
Water consumed (tonnes)	500	300	3500	4100	2100	1000	1000	500	2000	0	0	0	15000

	Color Seperation	Calibration	Pitting	Ventilation Tanks	Density Seperator & Vibrator	Seedless Calibration	Slicing	Final Selection	Filling	Closing	Labeling	Packing	Total activity
Working hours	6%	6%	23%	2%	11%	6%	4%	13%	12%	2%	4%	11%	100%
Area covered	2%	6%	20%	10%	16%	4%	7%	16%	4%	5%	4%	6%	100%
Machine costs	21%	5%	27%	2%	4%	1%	16%	2%	1%	0%	9%	10%	100%
Maintenance costs	18%	5%	27%	4%	8%	2%	8%	2%	7%	2%	7%	12%	100%
Electricity consumed	24%	14%	32%	0%	10%	2%	5%	3%	2%	3%	4%	2%	100%
Water consumed	3%	2%	23%	27%	14%	7%	7%	3%	13%	0%	0%	0%	100%

Appendix 2: Distribution of Resource Costs on Activities

	Color Seperation	Calibration	Pitting	Ventilation Tanks	Density Seperator & Vibrator	Seedless Calibration	Slicing	Final Selection	Filling	Closing	Labeling	Packing	Total cost
Direct Labor	65.138 TL	65.138 TL	260.551 TL	21.713 TL	130.275 TL	65.138 TL	43.425 TL	151.988 TL	141.132 TL	21.713 TL	43.425 TL	130.275 TL	1.139.909 TL
Facilities													
Amortization	3.889 TL	11.666 TL	38.888 TL	19.444 TL	31.110 TL	7.778 TL	13.611 TL	31.110 TL	7.778 TL	9.722 TL	7.778 TL	11.666 TL	194.438 TL
Machine													
Amortization	88.000 TL	20.000 TL	111.350 TL	10.000 TL	17.000 TL	6.000 TL	64.000 TL	8.000 TL	6.000 TL	2.000 TL	39.000 TL	40.000 TL	411.350 TL
O & M	440.000 TL	130.000 TL	660.760 TL	111.000 TL	190.000 TL	39.000 TL	195.000 TL	48.000 TL	168.000 TL	40.000 TL	170.000 TL	290.000 TL	2.481.760 TL
Electricity	53.920 TL	32.121 TL	71.927 TL	0 TL	23.314 TL	4.815 TL	11.286 TL	6.832 TL	3.416 TL	6.832 TL	9.841 TL	3.416 TL	227.718 TL
Water	7.075 TL	4.245 TL	49.522 TL	58.012 TL	29.713 TL	14.149 TL	14.149 TL	7.075 TL	28.298 TL	0 TL	0 TL	0 TL	212.238 TL
Total activity cost	658.021 TL	263.170 TL	1.192.997 TL	220.168 TL	421.412 TL	136.880 TL	341.471 TL	253.004 TL	354.623 TL	80.266 TL	270.044 TL	475.357 TL	4.667.414 TL

Appendix 3: Activity Drivers

	Black Whole Small	Black Whole Medium	Black Whole Large	Black Pitted Small	Black Pitted Medium	Black Pitted Large	Black Sliced Small	Black Sliced Medium	Black Sliced Large	Green Whole Small	Green Whole Medium	Green Whole Large	Green Pitted Small	Green Pitted Medium	Green Pitted Large	Total
Color Separation	0,0107	0,0374	0,0053	0,1607	0,5780	0,0859	0,0238	0,0855	0,0127	0,1720	0,6021	0,0860	0,0273	0,0981	0,0145	2
Calibration	0,0415	0,0407	0,0395	0,6253	0,6295	0,6354	0,0925	0,0932	0,0941	0,2077	0,2035	0,1976	0,0330	0,0332	0,0334	3
Pitting	0	0	0	292000	1050000	156000	43200	155400	23100	0	0	0	15400	55300	8200	1.798.600
Ventilation Tanks	19400	67900	9700	292000	1050000	156000	43200	155400	23100	97000	339500	48500	15400	55300	8200	2.380.600
Density Separator & Vibrator	0	0	0	292000	1050000	156000	43200	155400	23100	0	0	0	15400	55300	8200	1.798.600
Seedless Calibration	0	0	0	292000	1050000	156000	43200	155400	23100	0	0	0	15400	55300	8200	1.798.600
Slicing	0	0	0	0	0	0	43200	155400	23100	0	0	0	0	0	0	221.700
Final Selection	19400	67900	9700	292000	1050000	156000	43200	155400	23100	97000	339500	48500	15400	55300	8200	2.380.600
Filling	19400	67900	9700	292000	1050000	156000	43200	155400	23100	97000	339500	48500	15400	55300	8200	2.380.600
Closing	19400	67900	9700	292000	1050000	156000	43200	155400	23100	97000	339500	48500	15400	55300	8200	2.380.600
Labeling	19400	67900	9700	292000	1050000	156000	43200	155400	23100	97000	339500	48500	15400	55300	8200	2.380.600
Packing	19400	67900	9700	292000	1050000	156000	43200	155400	23100	97000	339500	48500	15400	55300	8200	2.380.600

	Black Whole Small	Black Whole Medium	Black Whole Large	Black Pitted Small	Black Pitted Medium	Black Pitted Large	Black Sliced Small	Black Sliced Medium	Black Sliced Large	Green Whole Small	Green Whole Medium	Green Whole Large	Green Pitted Small	Green Pitted Medium	Green Pitted Large	Total Percentage
Color Separation	0,53%	1,87%	0,27%	8,04%	28,90%	4,29%	1,19%	4,28%	0,64%	8,60%	30,10%	4,30%	1,37%	4,90%	0,73%	100,00%
Calibration	1,38%	1,36%	1,32%	20,84%	20,98%	21,18%	3,08%	3,11%	3,14%	6,92%	6,78%	6,59%	1,10%	1,11%	1,11%	100,00%
Pitting	0,00%	0,00%	0,00%	16,23%	58,38%	8,67%	2,40%	8,64%	1,28%	0,00%	0,00%	0,00%	0,86%	3,07%	0,46%	100,00%
Ventilation Tanks	0,81%	2,85%	0,41%	12,27%	44,11%	6,55%	1,81%	6,53%	0,97%	4,07%	14,26%	2,04%	0,65%	2,32%	0,34%	100,00%
Density Separator & Vibrator	0,00%	0,00%	0,00%	16,23%	58,38%	8,67%	2,40%	8,64%	1,28%	0,00%	0,00%	0,00%	0,86%	3,07%	0,46%	100,00%
Seedless Calibration	0,00%	0,00%	0,00%	16,23%	58,38%	8,67%	2,40%	8,64%	1,28%	0,00%	0,00%	0,00%	0,86%	3,07%	0,46%	100,00%
Slicing	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	19,49%	70,09%	10,42%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%
Final Selection	0,81%	2,85%	0,41%	12,27%	44,11%	6,55%	1,81%	6,53%	0,97%	4,07%	14,26%	2,04%	0,65%	2,32%	0,34%	100,00%
Filling	0,81%	2,85%	0,41%	12,27%	44,11%	6,55%	1,81%	6,53%	0,97%	4,07%	14,26%	2,04%	0,65%	2,32%	0,34%	100,00%
Closing	0,81%	2,85%	0,41%	12,27%	44,11%	6,55%	1,81%	6,53%	0,97%	4,07%	14,26%	2,04%	0,65%	2,32%	0,34%	100,00%
Labeling	0,81%	2,85%	0,41%	12,27%	44,11%	6,55%	1,81%	6,53%	0,97%	4,07%	14,26%	2,04%	0,65%	2,32%	0,34%	100,00%
Packing	0,81%	2,85%	0,41%	12,27%	44,11%	6,55%	1,81%	6,53%	0,97%	4,07%	14,26%	2,04%	0,65%	2,32%	0,34%	100,00%

Appendix 4: Cost of Activities on Products

	Black Whole Small	Black Whole Medium	Black Whole Large	Black Pitted Small	Black Pitted Medium	Black Pitted Large	Black Sliced Small	Black Sliced Medium	Black Sliced Large	Green Whole Small	Green Whole Medium	Green Whole Large	Green Pitted Small	Green Pitted Medium	Green Pitted Large	Total
Color Separation	3.513,41 TL	12.296,92 TL	1.756,70 TL	52.882,20 TL	190.158,60 TL	28.252,14 TL	7.823,67 TL	28.143,47 TL	4.183,49 TL	56.595,19 TL	198.083,17 TL	28.297,60 TL	8.985,22 TL	32.265,09 TL	4.784,34 TL	658.021,20 TL
Calibration	3.644,18 TL	3.570,78 TL	3.466,05 TL	54.850,57 TL	55.218,22 TL	55.742,74 TL	8.114,88 TL	8.172,30 TL	8.254,21 TL	18.220,91 TL	17.853,89 TL	17.330,27 TL	2.892,80 TL	2.908,16 TL	2.930,07 TL	263.170,04 TL
Pitting	0,00 TL	0,00 TL	0,00 TL	193.681,33 TL	696.456,85 TL	103.473,59 TL	28.654,22 TL	103.075,61 TL	15.322,05 TL	0,00 TL	0,00 TL	0,00 TL	10.214,70 TL	36.680,06 TL	5.439,00 TL	1.192.997,42 TL
Ventilation Tanks	1.794,20 TL	6.279,68 TL	897,10 TL	27.005,41 TL	97.108,51 TL	14.427,55 TL	3.995,32 TL	14.372,06 TL	2.136,39 TL	8.970,98 TL	31.398,42 TL	4.485,49 TL	1.424,26 TL	5.114,38 TL	758,37 TL	220.168,11 TL
Density Separator & Vibrator	0,00 TL	0,00 TL	0,00 TL	68.415,65 TL	246.015,16 TL	36.550,82 TL	10.121,77 TL	36.410,24 TL	5.412,33 TL	0,00 TL	0,00 TL	0,00 TL	3.608,22 TL	12.956,80 TL	1.921,26 TL	421.412,26 TL
Seedless																
Calibration	0,00 TL	0,00 TL	0,00 TL	22.222,19 TL	79.908,57 TL	11.872,13 TL	3.287,67 TL	11.826,47 TL	1.757,99 TL	0,00 TL	0,00 TL	0,00 TL	1.171,99 TL	4.208,52 TL	624,05 TL	136.879,57 TL
Slicing	0,00 TL	0,00 TL	0,00 TL	0,00 TL	0,00 TL	0,00 TL	66.538,25 TL	239.352,88 TL	35.579,48 TL	0,00 TL	0,00 TL	0,00 TL	0,00 TL	0,00 TL	0,00 TL	341.470,62 TL
Final Selection	2.061,78 TL	7.216,24 TL	1.030,89 TL	31.033,01 TL	111.591,31 TL	16.579,28 TL	4.591,19 TL	16.515,51 TL	2.455,01 TL	10.308,91 TL	36.081,19 TL	5.154,46 TL	1.636,67 TL	5.877,14 TL	871,47 TL	253.004,07 TL
Filling	2.889,90 TL	10.114,64 TL	1.444,95 TL	43.497,44 TL	156.412,02 TL	23.238,36 TL	6.435,24 TL	23.148,98 TL	3.441,06 TL	14.449,49 TL	50.573,22 TL	7.224,75 TL	2.294,04 TL	8.237,70 TL	1.221,50 TL	354.623,30 TL
Closing	654,10 TL	2.289,36 TL	327,05 TL	9.845,28 TL	35.402,54 TL	5.259,81 TL	1.456,56 TL	5.239,58 TL	778,86 TL	3.270,52 TL	11.446,82 TL	1.635,26 TL	519,24 TL	1.864,53 TL	276,48 TL	80.265,99 TL
Labeling	2.200,64 TL	7.702,25 TL	1.100,32 TL	33.123,06 TL	119.106,90 TL	17.695,88 TL	4.900,40 TL	17.627,82 TL	2.620,35 TL	11.003,21 TL	38.511,23 TL	5.501,60 TL	1.746,90 TL	6.272,96 TL	930,17 TL	270.043,69 TL
Packing	3.873,79 TL	13.558,25 TL	1.936,89 TL	58.306,46 TL	209.663,64 TL	31.150,03 TL	8.626,16 TL	31.030,22 TL	4.612,60 TL	19.368,93 TL	67.791,24 TL	9.684,46 TL	3.075,07 TL	11.042,28 TL	1.637,37 TL	475.357,38 TL
Total cost	20.632,00 TL	63.028,13 TL	11.959,96 TL	594.862,61 TL	1.997.042,32 TL	344.242,32 TL	154.545,32 TL	534.915,15 TL	86.553,83 TL	142.188,14 TL	451.739,18 TL	79.313,89 TL	37.569,11 TL	127.427,64 TL	21.394,08 TL	
Total volume	19400	67900	9700	292000	1050000	156000	43200	155400	23100	97000	339500	48500	15400	55300	8200	
Cost per kilo	1,06 TL	0,93 TL	1,23 TL	2,04 TL	1,90 TL	2,21 TL	3,58 TL	3,44 TL	3,75 TL	1,47 TL	1,33 TL	1,64 TL	2,44 TL	2,30 TL	2,61 TL	
Purchase price	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	1,325 TL	
Cost of production	1,06 TL	0,93 TL	1,23 TL	2,04 TL	1,90 TL	2,21 TL	3,58 TL	3,44 TL	3,75 TL	1,47 TL	1,33 TL	1,64 TL	2,44 TL	2,30 TL	2,61 TL	
Defect sale	0,02 TL	0,02 TL	0,02 TL	0,22 TL	0,20 TL	0,17 TL	0,23 TL	0,21 TL	0,18 TL	0,02 TL	0,02 TL	0,02 TL	0,18 TL	0,16 TL	0,13 TL	
Total cost	2,370 TL	2,235 TL	2,540 TL	3,144 TL	3,031 TL	3,366 TL	4,673 TL	4,560 TL	4,896 TL	2,773 TL	2,637 TL	2,942 TL	3,589 TL	3,473 TL	3,805 TL	

Appendix 5: Total Costs and Profit Margins

Product name	Sales volume (kg)	Price per ton (\$)	Sales price in kilos (TL)	Total cost	Profit	Profit margin
Black Whole Small	23.191	\$2.200	4,00 TL	2,370 TL	1,63 TL	40,80%
Black Whole Medium	59.670	\$2.500	4,55 TL	2,235 TL	2,31 TL	50,88%
Black Whole Large	8.524	\$2.800	5,10 TL	2,540 TL	2,56 TL	50,16%
Black Pitted Small	286.731	\$2.800	5,10 TL	3,144 TL	1,95 TL	38,30%
Black Pitted Medium	1.003.558	\$3.100	5,64 TL	3,031 TL	2,61 TL	46,28%
Black Pitted Large	143.365	\$3.400	6,19 TL	3,366 TL	2,82 TL	45,61%
Black Sliced Small	49.244	\$2.700	4,91 TL	4,673 TL	0,24 TL	4,90%
Black Sliced Medium	172.353	\$2.700	4,91 TL	4,560 TL	0,35 TL	7,20%
Black Sliced Large	24.622	\$2.700	4,91 TL	4,896 TL	0,02 TL	0,37%
Green Whole Small	9.167	\$1.700	3,09 TL	2,773 TL	0,32 TL	10,39%
Green Whole Medium	32.083	\$2.000	3,64 TL	2,637 TL	1,00 TL	27,54%
Green Whole Large	4.583	\$2.300	4,19 TL	2,942 TL	1,24 TL	29,72%
Green Pitted Small	7.359	\$2.180	3,97 TL	3,589 TL	0,38 TL	9,55%
Green Pitted Medium	25.756	\$2.480	4,51 TL	3,473 TL	1,04 TL	23,06%
Green Pitted Large	3.679	\$2.780	5,06 TL	3,805 TL	1,25 TL	24,80%