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'Tenderstem' Broccoli for Export Markets: an Analysis Study on the AgroFood Company

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Abstract

The AgroFood Company desires to produce exportable 'Tenderstem' broccoli in Egypt using unique production practices. Production and distribution of a new specialty vegetable crop presents specific challenges to farm managers. An analysis of the company, competition, consumer, market channel, and conditions, provides insight into possible solutions to the challenges faced by the farm management. Designed for undergraduate classroom use, this case encourages students to think outside of traditional production techniques to arrive at solutions that are viable from both crop culture and financial standpoints.

Keywords: Decision case, horticulture, agriculture economics, broccoli production, protected vegetable production

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IAMA Agribusiness Case 13.2

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Introduction

In Egypt at the corporate headquarters of AgroFood Company, a discussion is taking place between two of the company owners, Mr. Salah Hegazy and Mr. Ahmed Farrag. The discussion is about a recent opportunity to supply a novel type of broccoli, 'Tenderstem' broccoli, presented to them by a client from the European Union (EU). The client was seeking an Egyptian partner to supply 'Tenderstem' broccoli when the product is unavailable from other international producers.

"The opportunity would allow us to expand into a new area internationally as we have not provided this product in the past. Compared to our current broccoli product, the contract for 'Tenderstem' broccoli appears to be very attractive. What do you think about the opportunity?" said Salah.

"I agree that the terms of the contract look promising, but I'm a little concerned about growing this new crop at our specialty crop farm site. We have some difficulties during winter production of broccoli at this location due to the cool winter temperatures. If the client becomes interested in a year-round supply from us, we will need to consider some novel production schemes for 'Tenderstem' broccoli. I'm not sure what the costs or benefits might be when we alter our production practices." said Ahmed.

"Let's discuss this with Nada because she likely will have some insights into current market trends for broccoli in Europe. I wonder how stable the prices are for 'Tenderstem' broccoli and if producers in other countries are aware of the supply gap. If the contract price is lowered significantly or if the supply gap is filled, this opportunity may become a liability. We need to analyze the situation a bit more before we commit to the contract. When the three of us get together, I think we will be able to determine if this opportunity is logistically possible and financially beneficial to AgroFoods Company." said Salah.

After this conversation, the management of AgroFood Company embarked upon a fact finding expedition to determine if the opportunity presented was in the company's best interest.

The Case

Company Background

The AgroFood Company was established in 1992 by three partners, two Egyptians, Mr. Salah Hegazy and Mr. Ahmed Farrag, and one Italian, Mr. M. Simaria, with each partner taking responsibility for a different operation within the company. Mr. Hegazy oversaw general affairs and communications with import companies, Mr. Farrag was responsible for the production of fruit and vegetables, and Mr. Simaria took care of marketing. Upon the death of Mr. Simaria in 2004, his wife, Mrs. Nada Polis, acquired her husband's portion of the AgroFood Company and maintains an active role in company management.

In the beginning, the firm exported only fava beans, but it quickly expanded its operations to include the exportation of potatoes to Turkey. The owners then discovered that potato

exportation to the European Union (EU) market was profitable and expanded their potato cultivation accordingly. The company has altered its product mix over several years to meet market requirements and fill market niches. Because of this, the AgroFood Company is now one of the leading Egyptian agricultural firms exporting potatoes and onions to the EU market.

The AgroFood Company believes that the EU market is a key to future success of the company. With a population of more than 491 million people, the EU market is considered the largest market to which products may be exported from the AgroFood Company. The EU market is geographically close to Egypt and has limited raw materials and production capacity (EuroStat, 2008). Consumers in the EU market have tremendous purchasing power (GDP per capital = 23,500 €), healthy lifestyles, and enjoy convenient ready-to-use products. Dolan and Humphrey (2000) state that retail supermarkets have emphasized fresh, healthy food, ease of preparation and innovation to attract consumers. Fresh produce has become a 'destination' category in supermarkets resulting in a doubling of the shelf area allocated to vegetables (Fearne and Hughes 1999). For some products, such as organically produced vegetables, the market demand remains unmet (Dolan and Humphrey, 2000). One goal of the AgroFood Company, as defined by company owners and managers, is to provide high quality, organic products to the EU market, especially England, Italy and Germany, and to improve their EU market share.

The AgroFood Company owners have witnessed the dramatic change in marketing channels that has occurred recently within the EU market. The development of tightly knit supply chains where EU retail outlets, such as supermarkets, drive production in and exportation from African countries has resulted in major multinational food companies gaining a larger percentage of the market, while smaller retailers are forced out of the market (Dolan and Humphrey, 2000; 2004). Large retailers are increasingly specifying the parameters that must be followed along the value chain including how products are grown, harvested, processed, transported, and stored (Dolan and Humphrey 2004). As a result, working directly with and meeting expectations of large EU clients is becoming essential for success. Smaller producers and exporters are sidelined in the channel as they are increasingly unable to meet large retailer expectations. This has resulted in large producers supplying an increasingly greater percentage of vegetables exported to the EU (Dolan and Humphrey, 2000; 2004).

Companies wanting to increase their market share in the EU need to be more than growers or traders. They must develop detailed production guidelines, invest in cold storage, processing facilities, and rapid transportation routes (Dolan and Humphrey, 2004). Success in the current EU market requires a significant paradigm shift for many specialty crop producers towards large-scale production.

The exception in the tendency toward tightly knit supply chains and concentration is in organic produce. For organic specialty vegetable crops, the EU supply base is fragmented which allows smaller companies, including Egyptian companies, an opportunity to fill the unmet market demand (Dolan and Humphrey 2000). With sales near 10.5 million Egyptian Pounds (L.E.)[1], the AgroFood Company is considered a small vegetable processing company by the Union of

[1]One (1) L.E. = 0.174 USD in November 2006 when information was collected for case.

Producers and Exporters of Horticultural Crops[2] (UPEHC 2007). As such, the AgroFood Company is poised to fill some of the unmet market demand.

The AgroFood Company has developed an excellent reputation with EU importers by meeting EU clients' "higher bar" requirements in terms of product and production standards and safety, as well cultivating new crops upon request. Recently, the AgroFood Company started producing high value specialty crops, such as peas, colored peppers, green peppers, green beans, broccoli, and cucumbers, due to changing market demands. The firm is willing to accept some of the risks associated with these new crops for the sake of clients' satisfaction.

When asked to describe their reasoning for shifting production towards specialty vegetable crops, the company owners identified the following points:

1. Brown rot, a fungal disease, exists in some Egyptian potatoes and is unacceptable in the EU. When detected, this disease can significantly reduce the quantity of potatoes imported by the EU making the market unstable for Egyptian potatoes.

2. Commodity products, such as potatoes and onions, are subject to large price fluctuations based on supply and demand.

3. EU supermarkets are demanding more specialty crops, including organically produced products.

4. EU supermarkets desire to have an uninterrupted supply of specialty vegetable crops.

5. Consolidation in the EU market has necessitated the development of partnerships and contracts with exclusivity clauses for some high value specialty vegetables.

6. The AgroFood Company has facilities to evaluate specialty crops under Egyptian conditions and is willing to accept some of the risks associated with these evaluations to ensure continued clients' satisfaction and partnerships.

Company Strengths

In light of the stated goals and justifications for shifting production towards specialty vegetable crops, the owners of the firm were asked "*What are specific strategies or strengths currently within the company that will assist you in achieving your stated goals?"* In response, the owners and managers indicated that the AgroFood Company has adopted several strategies to maintain its position as a leading producer and exporter of Egyptian vegetable products. First, the firm has adopted organic cultivation methods as prices of organic products are about 25% higher than products produced using non-organic methods. Overall, the trend of prices for organic products is decreasing due to an increased supply of organic products. However, in many EU markets, consumer demand for organic products remains high.

[2] UPEHC categories of large, medium, and small processors are based upon sales and capital expenditures of ≥ 50 million L.E., 15 to 49 million L.E., and < 15 million L.E., respectively.

Second, the AgroFood Company is committed to supplying clients with products on a year-round basis in an effort to foster a more positive trade relationship. To this end, the firm has begun expanding its product offerings to include processed vegetables. Processing is seen as a future opportunity by the company owners, who have invested significant resources into establishing a cold supply chain that meets organic certification requirements for the EU market. Company owned refrigerated trucks pick up pre-cooled field packed vegetables and deliver them to a modern processing and packinghouse that only handles organically produced crops. This AgroFood Company owned post-harvest processing and cold storage capacity facility ensures that products destined for exportation are handled in a hygienically and temperature-controlled manner meeting organic certification standards. Products, after being custom packed to meet EU client requirements, are delivered by airfreight to maximize product quality, aesthetics, and freshness. The company will continue to export the highest quality (first grade) products, but the lower quality (second grade) products will be processed, frozen, packaged, and exported. Currently, the company is conducting small scale processing trials with lower quality green beans and hot peppers to satisfy client requests, open new markets, and provide an alternative market for the lower grade products.

Third, the firm has three production locations northwest of Cairo along the Cairo-Alexandria Desert Road. The first is primarily a potato production site; the second is devoted to onion cultivation; and the third location is for specialty crops. The AgroFood Company specialty crops production site is a 95 feddan[3] production facility with 75 feddan of greenhouses and 25 feddan of open fields. Cultivation of seedlings and mature plants occurs in plastic covered greenhouses which allows for protected winter production by increasing the daytime air temperature (El-Sayed 2006a and 2006b). The use of greenhouses extends the fruiting season from two months up to nine months, thereby increasing crop yields, compared with open field production (Exhibit 1). Open field cultivation is devoted to evaluating specialty crops under Egyptian conditions when these products are unavailable elsewhere. In addition to these three production sites, the firm has pursued long-term relationships with farmers in the local area by offering them high prices for contract grown products that meet EU importer standards and by offering free technical assistance. These relationships have expanded the AgroFood Company's production potential.

Finally, the AgroFood Company has developed partnerships which provide increased market exposure and ensure certification requirements are met. The company is a member of Expo Link that helps the AgroFood Company in exhibitions and international trade fairs. The company partners with the Industrial Modernization Center (IMC) which implements Hazard Analysis and Critical Control Points (HACCP) and gap analysis for Egyptian companies. The AgroFood Company is also a member of the Chamber of Food Industries (CFI) and Horticultural Export Improvement Association (HEIA) that carries out different training programs.

The company investments described above along with the domestic and international partnerships listed enable the AgroFood Company to provide high quality, organic products to

[3] Feddan is a local measure of land equal to 4,200 square meters or 1.038 acres

the EU market. The owners of the AgroFood Company wish to expand their market share of exported vegetables, and are constantly seeking new opportunities for specialty products.

The Opportunity

As evidence of how past activities and preparation are beginning to be fruitful, the firm owners and management described a recent opportunity that was presented to them by an EU client. The client was seeking an Egyptian partner to supply a novel type of broccoli, 'Tenderstem' broccoli, in which the plant stems are harvested, as opposed to the immature plant flower (crown) with traditional broccoli[4]. The client has requested 1.5 metric tons (1,000 kg) of 'Tenderstem' broccoli per week from November to June (6 months), in 200 gram packages, containing stems of 16 to 22 cm in length. The client is willing to pay 35,000 L.E. per metric ton for 'Tenderstem' broccoli meeting these parameters. If the AgroFood Company successfully delivers high quality 'Tenderstem' broccoli to the EU client, the client has expressed interest in partnering with AgroFood Company to provide 'Tenderstem' broccoli year-round. This appears to be an opportunity that will benefit the AgroFood Company but is not without risks.

The challenge identified immediately by farm management is that 'Tenderstem' broccoli has never been produced in Egypt so cultural guidelines for this crop under Egyptian conditions are nonexistent. While commercial companies have developed guides to assist producers in other countries (O'Keefe 2009), no one is certain if 'Tenderstem' broccoli production is possible in Egypt or if the stems produced will meet EU client specified standards. Thus, one of the first questions that must be addressed by the AgroFood Company is "*Should 'Tenderstem' broccoli be grown in Egypt?*"

The AgroFood Company has positioned itself to be able to answer this question and is willing to accept some of the risks associated with evaluating new crops under Egyptian conditions. Cultivation trials at the specialty crop farm near Cairo are used to determine if proposed crops are technically feasible and financially viable. The AgroFood Company provides land and labor, while clients provide seed, technical assistance, and labor training for crop cultivation and processing. The 'Tenderstem' broccoli opportunity is a good example of how the AgroFood Company must evaluate potential export crops from both crop culture and financial standpoints.

Current Situation and Challenges

As a starting point for discussion, the firm owners and management were asked "*What are the main challenge(s) faced by the AgroFood Company related to 'Tenderstem' broccoli?"* The firm identified three main questions that needed to be addressed before 'Tenderstem' broccoli was added to their product mix:

1. Can current cultural practices for broccoli be modified using existing infrastructure, such as greenhouses, to develop a set of guidelines for 'Tenderstem' broccoli production in Egypt that meet client standards for packaged stems on a seasonal and/or year-round basis?

[4]Traditional broccoli will be referred to as "broccoli" in this manuscript. 'Tenderstem' broccoli will carry the 'Tenderstem' designation.

2. What are the financial costs and benefits for each of the possible production scenarios?

3. At what price will 'Tenderstem' broccoli be profitable for the AgroFood Company?

The AgroFood Company team began by investigating broccoli production and exportation in Egypt. Broccoli is a crop exported to the EU by Egyptian producers; however, high temperatures limit field production of exportable broccoli crowns during late summer and early winter. Broccoli flower formation is disrupted when temperatures exceed 30 ºC (Björkman and Pearson, 1998) resulting in broccoli crowns that are not marketable. The average yield for cauliflower and broccoli[5] produced in Egypt during 2006 was about 10.5 metric tons per feddan with a farm gate value of 504 L.E. per metric ton (FOASTAT, 2009). Processing broccoli adds tremendous value to exportable products as evidenced by the January 2007 to July 2007 average price of 27, 920 L.E. per metric ton for processed broccoli exported from Egypt to the EU (AMAL, 2009). In the Cairo-Alexandria region of Egypt, broccoli cultivars have a tendency to flower after winter transplanting (November 15 through January 15) which leads to unmarketable small crowns and reduced yields. Cool temperatures promote flowering of broccoli, so shifting crop production to warmer regions of Egypt during winter months is common. Unfortunately, Upper Egypt production sites are greater distances from major airports and ports. This creates added production and/or transportation challenges including increased shipping expenses and product losses. The production of broccoli in Egyptian greenhouses is undocumented but likely possible.

To determine if 'Tenderstem' broccoli meeting client expectations could be produced, the AgroFood Company initiated trials to identify crop performance under Egyptian conditions. AgroFood Company management modified existing broccoli production guidelines to meet 'Tenderstem' broccoli needs. 'Tenderstem' broccoli seedlings are produced in isolated greenhouses for six to eight weeks then transplanted to open fields. Cultivation of the 'Tenderstem' broccoli requires the removal of the apical meristem (small broccoli crown) about eight to nine weeks after transplanting to encourage stem formation. Beginning ten to eleven weeks after transplanting, stems are harvested weekly for six weeks. Total crop time after transplanting is sixteen to eighteen weeks depending on climate. Field trials indicated that each feddan yields an average of 1.5 metric tons of stems over a six week period with about 70% of the harvested stems meeting export standards.

After the initial trials were completed, the owners of AgroFood Company had identified several challenges that needed to be addressed before the company could meet client expectations for a six month contract or a non-interrupted supply of 'Tenderstem' broccoli. The owners expressed the following concerns:

1. Based upon the field trial, approximately six feddan of 'Tenderstem' broccoli transplanted each month beginning in early July for six months would supply about 9.0 metric tons of ungraded stems per month of which 6.3 metric tons (approximately 1.5 metric tons per week) should meet client standards. However, open field space at the specialty crop farm site is limited.

[5] Cauliflower and broccoli are closely related vegetable crops whose production and market value data are often combined in public databases. This is the case for Egyptian broccoli in the FAOSTAT database.

2. High temperatures in Egypt limit field production of exportable broccoli during late summer and early winter. The owners expect 'Tenderstem' broccoli to have similar production limits if requested to provide a year-round supply of product.

3. Broccoli must be grown in a warmer climate during the winter (in greenhouses or in Upper Egypt fields) to minimize flowering. The 'Tenderstem' cultivar is relatively tolerant to winter flowering; however, some flowering was noted for winter produced 'Tenderstem' broccoli at the AgroFood Company farm. This will reduce marketable yields during late spring unless alternative sites or protected cultivation systems are used.

4. The removal of the apical meristem (small broccoli crown) is done to promote stem development. Because a local market does not exist, the small crowns (about 500 kg/feddan) are discarded or given to farm employees for personal use.

5. Only 40% of the stems harvested late in the production cycle (week five to week six of harvest) meet the 16 to 22 cm (Grade 1) or 11 to 15 cm (Grade 2) stem length standards for the European market. These last two harvests increase the total percentage of unmarketable stems to about 30% for the six week yield.

In addition to cultural limits, the owners cited limited knowledge about competitors and production costs for 'Tenderstem' broccoli as other challenges that must be answered before production begins. Identifying Egyptian companies that are in direct competition with the AgroFood Company is difficult; however, other producers and processors are located in the same geographic area as the AgroFood Company and may be considered competitors for resources and market share. International competitors for the 'Tenderstem' market exist, as evidenced by O'Keefe (2009), but reliable data for the 'Tenderstem' broccoli market size and competition does not appear to exist in public databases. As value chain consolidations continue, competition is expected to increase, even for organically produced products. When tied to the fact that AgroFood Company currently has a single client interested in 'Tenderstem' broccoli, future demands for the product are unknown. There are no clear answers to the issues of competition from other suppliers of 'Tenderstem' broccoli or what market trends are likely to emerge for 'Tenderstem' broccoli. However, the overall trend for trade of specialty vegetable crops between Africa and EU is increasing (Dolan and Humphrey, 2000; 2004). The AgroFood Company owners believe demand for 'Tenderstem' broccoli will increase as well.

While the expected costs for producing 'Tenderstem' broccoli in Egypt do not exist, the AgroFood Company has generated an estimate near 11,000 L.E. per feddan to produce one metric ton of broccoli in open fields, process the harvest at their facilities, and deliver processed products to EU clients (Exhibit 2). Similar costs are expected for the 'Tenderstem' broccoli crop once production guidelines are firmly established for the company. The management of the AgroFood Company believes there are several options that can be pursued to provide a high quality year-round supply of 'Tenderstem' broccoli. These solutions may include:

〉 growing 'Tenderstem' broccoli plants in plastic covered greenhouses during the winter season, especially when transplanting takes place from mid-November to mid-January,

- using multiple locations (Upper and Lower Egypt) to provide a year-round supply of 'Tenderstem' broccoli, or

- planting 'Tenderstem' broccoli every three weeks, as opposed to monthly plantings, to minimize declines in quality of the late harvests.

The management of the AgroFood Company is seeking assistance in identifying which options have the most potential to increase their share of the 'Tenderstem' broccoli export market and provides significant financial gain for the company. When asked "*How would you assess the costs and benefits of producing 'Tenderstem' broccoli in open field or under covered greenhouses*", the owners indicated that an economic analysis of the three proposed solutions was needed. With the information above and other available resources, such as information on Egyptian agriculture from the Horticultural Export Improvement Association (HEIA) (http://www.manarasoft.com/heia/), the Union of Producers and Exporters of Horticultural Commodities (UPEHC) (http://www.upehc.org/), or the Horticulture Research Institute (http://www.hortinst.com/index.php?lang=english), financial statements can be generated for each production option. Choosing among these options, or other undefined options, can be a daunting task. The AgroFood Company believes that careful consideration of a) resource availability, b) the level of on-site expertise and experiences, and c) the total cost versus anticipated gains generated from each solution should be included when making decisions.

In order to calculate financial statements, assumptions must be made. Several of these assumptions may be based on the trial data generated on the AgroFood Company farm while others must be best estimates based on market information. The AgroFood Company management made the following assumptions for each production option.

1. 'Tenderstem' broccoli will have an open field yield about 1.5 metric tons per feddan of which 70% is exportable. This will remain constant across seasons for open field production.

2. Given yield increases of other crops produced in greenhouses (Exhibit 1), a conservative yield increase of 200% for 'Tenderstem' broccoli under protected cultivation (3.0 metric tons per feddan) is reasonable if greenhouse space is available and unlimited; however, greenhouses must be covered with plastic each year at a cost of 40,000 L.E. per feddan.

3. Because a local alternate market (local or processed) for the 2nd grade 'Tenderstem' broccoli and small crowns does not exist, about 30% of open field harvest is considered shrinkage.

4. Because the greatest percentage of non-exportable stems was harvested late in the production cycle, one can assume that exportable stem percentages will be increased if the late harvests are eliminated. For analysis, the AgroFood Company owners estimated that removing the last two weekly harvests from each cycle would increase the average percentage of exportable stems from 70 to 82%.

5. For production at alternate locations (Upper Egypt), the AgroFood Company owners assumed that land is readily available, suitable, and not limited during the winter.

6. 'Tenderstem' broccoli produced in Upper Egypt can be field sorted into exportable and non-exportable stems before shipping to reduce transportation costs; however, transporting the sorted product will result in additional losses. The owners will use 20% as an estimate for additional losses during transit from Upper to Lower Egypt.

7. Because AgroFood Company trucks are limited and required for transportation in Lower Egypt, an outside company must be hired to ship products from Upper to Lower Egypt. Ground transportation costs are assumed to be doubled due to distance and outside company involvement.

8. Consolidation of the EU market channel will continue. Organically produced products will be supplied by international partners able to meet client expectations for quality and quantity. AgroFood Company will meet client expectations for 'Tenderstem' broccoli.

There are production and time factors (i.e., anticipated crop yield, crop quality, and additional costs and benefits) that need to be determined for each of the proposed systems. For instance, altering cultural practices and farm production schedule to utilize existing greenhouse structures will be of benefit to the company. However, the use of existing greenhouses for 'Tenderstem' broccoli production means that these houses are no longer available for other profitable crops, such as hot peppers. The potential impacts of these factors are not being estimated currently by AgroFood Company management.

For each of the options identified above, the AgroFood Company has identified several changes in resource allocation (land, labor, equipment, etc …) that would need to occur in order for the company to meet client expectations of packaged 'Tenderstem' broccoli. Based upon the field trial, six feddan of land would need to be planted monthly to yield the 9.0 metric tons of ungraded product required each month. Thus, a total of 12 plantings would occur yearly and use 72 feddan of open field space. Harvests would occur over a six week period. This is considered the current production model to which all other options will be compared.

To produce 'Tenderstem' broccoli in greenhouses during a six month period, three feddan of land would need to be planted monthly. Thus, a total of 18 feddan of greenhouse space would be utilized during the winter by six monthly plantings. Harvests would occur over a six week period. When combined with open field plantings, a year-round supply of 'Tenderstem' broccoli is anticipated.

Production in Upper Egypt during the winter is another option under consideration. Due to increased shrinkage of product during transport to Lower Egypt, the monthly yield of ungraded stems must be near 11.25 metric tons. To meet this increase, the area of land planted per month must be increased to 7.5 feddan. Thus, a total of six monthly plantings would use 45 feddan of land. Harvests would occur over a six week period. When combined with plantings in Lower Egypt, a year-round supply of 'Tenderstem' broccoli is anticipated.

The final option discussed is to reduce the time between plantings from four weeks (monthly) to three weeks in an effort to maximize the percentage of marketable stems to 82%. With the increased percentage of marketable stems, just over five feddan would need to be planted each time. Thus, a total of 18 plantings would occur annually and use about 92 feddan of space. Harvests would occur over a four week period. This production scheme could be used throughout Egypt in open field and/or protected cultivation systems to provide a year-round supply of 'Tenderstem' broccoli.

An initial analysis of the viability of 'Tenderstem' broccoli was conducted by calculating the costs to produce an exportable yield of 6.3 metric tons per month for each of the systems (Exhibit 2). This makes it possible to calculate profitability thresholds defined according to the production system(s) used. Thus, if, within the said system(s), one considers the so-called opportunity costs of the owner (income from land, interest on invested capital, etc.), this threshold will be the price above which the owner covers all his production costs and can earn a profit (Fco et al., 2002). The AgroFood Company management has decided to estimate the profitability of 'Tenderstem' broccoli by using break-even cost per feddan and gross and economic margins for each of the production options previously identified. Break-even cost compares the expected market price (35,000 L.E.) with the unit cost of production. Gross return is what is often referred to as profit if there is no debt on the farming operation. This approximates the returns to management and investment. The analysis for each production system is summarized in Exhibit 2.

Key Questions

Given the information presented in this case, the AgroFood Company has an excellent idea of their future direction. They would like to obtain your thoughts on the following:

1. What do you see as the main strengths, weaknesses, opportunities, and threats (current and future) of their proposal to produce 'Tenderstem' broccoli?

2. What options do the decision makers have in resolving dilemmas so that the future success of the farm is ensured?

3. Given the production scenarios outlined, which do you consider the "best option" for the future success of the AgroFood Company?

4. Because a local market does not exist for second grade 'Tenderstem' broccoli, what are the possible alternative markets for this product?

5. Given that specialty vegetable crops are subject to price fluctuations based on supply and demand, what impact would a large short-term or long-term price fluctuation have on your recommendation to the AgroFood Company?

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Appendix

Exhibit 1. Annual yield of selected vegetable crops produced in Egypt in open fields during 2006 or unheated plastic covered greenhouses.

Vegetable Crop	2006 Open Field Yield (metric ton/feddan)	Greenhouse Yield (metric ton/feddan)	Yield Increase in Greenhouses (%)
Tomatoes	16.4	100	609.8
Sweet Peppers	11.7	50	426.3
Hot Peppers	6.8	33	488.2
Cucumbers	9.0	25	277.8
Snap Beans	4.2	16	377.4
Cauliflower/broccoli	10.5	N/A	

Source: FAOSTAT (2000) for field grown tomatoes, cucumber, snap beans and cauliflower/broccoli 92006 data), AMAL (2009) for field grown sweet peppers, and hot peppers (2006 data), El Sayed (2006b) for greenhouse grown crops except cucumber, El Aidy and El Sheikh (1990) for greenhouse grown cucumber.

Exhibit 2.

Income statement for the AgroFood Company for the production of 'Tenderstem' broccoli in five production scenarios; 1) open field (current production model), 2) protected cultivation (greenhouse), 3) open field in Upper Egypt, 4) open field in Lower Egypt with three week plantings cycles or 5) open field in Upper Egypt with three week planting cycles. Production scenarios 1, 2, and 3 require monthly plantings with six harvest dates per planting. Production scenarios 4 and 5 require plantings on a three week cycle with four harvest dates per planting. Expense estimates were used to calculate variable and fixed costs associated with production of 6.3 metric tons (MT) of exportable product per month. This monthly production is required to meet the proposed contract of 1.5 metric tons of exportable 'Tenderstem' broccoli per week. Assumptions for each of the production scenarios are presented in the case narrative. Revenue based on suggested contract price of 35,000 L.E. per metric ton of exportable product.

	Current Model - Open Field		**Greenhouse**		**Open Field Upper Egypt**		**Open Field Lower Egypt 3 Week Cycle**		**Open Field Upper Egypt 3 Week Cycle**	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	(MT)	(L.E.)	(MT)	(L.E.)	(MT)	(L.E.)	(MT)	(L.E.)	(MT)	(L.E.)
Revenue										
'Tenderstem' Broccoli Exports	**6.30**	220,500	**6.30**	220,500	**6.30**	220,500	**6.30**	220,500	**6.30**	220,500
Non-Exportable 'Tenderstem' Broccoli	2.70	0	2.70	0	1.58	0	1.38	0	1.58	0
Waste 'Tenderstem' Broccoli Sales	0	0	0	0	3.38	0	0	0	1.73	0
Total		**220,500**		**220,500**		**220,500**		**220,500**		**220,500**
Variable Costs										
Expenses for Production[1]	(feddan)		(feddan)		(feddan)		(feddan)		(feddan)	
Soil - Tilling and Compost	6.00	1,200	3.00	600	7.50	1,500	5.12	1,024	6.40	1,280
Fertilizers	6.00	3,600	3.00	1,800	7.50	4,500	5.12	3,073	6.40	3,841
Seedlings/Plants[2]	6.00	13,320	3.00	6,660	7.50	16,650	5.12	11,371	6.40	14,213
Irrigation Water	6.00	2,400	3.00	1,200	7.50	3,000	5.12	2,049	6.40	2,561
Labor for Production	6.00	3,060	3.00	1,530	7.50	3,825	5.12	2,612	6.40	3,265
Land Rent	6.00	3,600	3.00	1,800	7.50	4,500	5.12	3,073	6.40	3,841
Plastic Covering (greenhouse)	0	0	3.00	120,000	0	0	0	0	0	0
Total Cost for Production		*27,180*		*133,590*		*33,975*		*23,202*		*29,003*

Expenses for Processing, Packaging, and Shipping	(MT)		(MT)		(MT)		(MT)		(MT)	
Transportation to Processing Station (Lower Egypt)[3]	9.00	1,620	9.00	1,620	0.00	0	7.68	1,383	0	0
Processing and Packaging in Field (Non-exportable)	0	0	0	0	3.38	1,688	0	0	1.73	864
Transportation of Waste (Upper Egypt)	0	0	0	0	3.38	1,215	0	0	1.73	622
Transportation to Processing Station (Upper to Lower Egypt)[4]	0	0	0	0	7.88	2,835	0	0	7.88	2,835
Processing and Packaging (Export)	6.30	14,396	6.30	14,396	6.30	14,396	6.30	14,395	6.30	14,396
Transportation to Airport (Export)	6.30	1,134	6.30	1,134	6.30	1,134	6.30	1,134	6.30	1,134
Air Freight to Europe (Export)[5]	6.30	22,050	6.30	22,050	6.30	22,050	6.30	22,050	6.30	22,050
Processing and Packaging (non-export)	2.70	1,350	2.70	1,350	1.58	788	1.38	691	1.58	788
Transportation of Waste (non-export)	2.70	486	2.70	486	1.58	284	1.38	249	1.58	284
Total Cost for Production		*41,036*		*41,036*		*44,388*		*39,903*		*42,972*
Total Variable Costs		**68,216**		**174,626**		**78,363**		**63,105**		**71,975**
Fixed Costs	(month)		(month)		(month)		(month)		(month)	
Administrative	1	667	1	667	1	667	1	667	1	667
Utilities - Telephone, Electricity	1	800	1	800	1	800	1	800	1	800
Postage	1	240	1	240	1	240	1	240	1	240
Other	1	150	1	150	1	150	1	150	1	150
Total Fixed Cost		**1,857**		**1,857**		**1,857**		**1,857**		**1,857**
Total Expenses		**70,073**		**176,483**		**80,220**		**64,962**		**73,832**
Net Cash Flow per Planting		150,428		44,018		140,280		155,538		146,668
Net Cash Flow per 6 Months		902,565		264,105		841,680		1,399,839		1,320,013
Net Cash Flow per 12 Months		1,805,130		528,210		1,683,360		2,799,679		2,640,025

[1]One Egyptian Pound (L.E.) = 0.174 USD in November 2006 when AgroFood Company management provided cost estimates.

[2]Broccoli cannot be direct seeded into the field in Egypt. Small transplants are produced in a greenhouse. This expense represents the costs associated with producing enough seedlings for a one feddan (4,200 m^2) field.
[3]Local ground transportation provided by AgroFood Company owned 1.5 metric ton refrigerated trucks.
[4]Contracted refrigerated trucks are required as AgroFood Company trucks are unavailable for long distance transport.
[5]Based on Swanson et al. (2004)