

Value Chain Analysis for the Egyptian Herbs & Spices Sub-Sector: Modeling and Estimating Export Potential

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Abstract: This article studies the Egyptian Herbs and Spices (H&S) sub-sector in order to increase the Egyptian market position in both local and international markets specially the European market (the main market for the Egyptian H&S). A value chain analysis has been performed. The value chain analysis included production, processing, and consumption phases. Production phase concerned with the main problems related to quality in cultivation, harvest, and post-harvest operations, especially as related to drying and storage processes. Processing phase mainly investigates the processors' numbers, size, location, types of products dealt with and main problems and challenges facing them, especially those related to quality of the product that determine its entrance into international markets. Consumption phase deals with H&S target market, quantities and market share on national and international markets, plus problems and challenges related to market access. At last, gravity model estimation is performed in order to determine the trade potentials between Egypt and importing countries.

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1. Introduction:

Herbs and Spices (H&S) are common in most foods around the world today. Both are used to flavor foods and some for medicinal purposes. H&S have both been prominent throughout human history. In earlier times, H&S were considered luxuries and only available for the use of the wealthy. H&S were, also traded frequently between nations in medieval times. Many people do not know the difference between an herb and a spice. There are many similarities between the two, and some of the differences are very subtle, but they are still valid.

There are numerous H&S produced for many different markets all over the world. Each market has its own unique consumer requirements, as well as marketing and distribution channels. In most cases, meeting buyer needs and accessing the market can be recognized through studying the market.

The world production and processing of H&S is concentrated in Europe (France, Spain, Germany and Hungary), China, India, Indonesia and Korea. North American production of H&S is small compared to world production (Eurostat 2009).

India exports most of the H&S, taking the place of Indonesia, and the quantities of its exports to the European Union (EU) only 42,500 tons in 2009, followed by Indonesia and China, other countries are Germany, Brazil, Spain, Morocco, Turkey, Italy, Zimbabwe, Malaysia, South Africa and Vietnam (FAO 2010).

The US market is considered the largest importing market for H&S, followed by the EU market. The imported H&S to the US market reached 312,000 tons in 2009, out of the total quantity produced in developing countries which is 6.5 million tons also in 2009 (Eurostat). Due to the rapid change in the eating styles and reliance on fast foods and half-cooked foods, there is a large increase in the consumption of H&S worldwide.

Germany is the second importer of H&S worldwide, and the first at the level of European countries, with 28% at the level of the EU market, with imports 64,000 tons at a value of 176,000,000 Euro in 2009. Holland comes next, taking 22% of the EU market, then the France with 15%, UK at 11%, Italy at 5.5%, then Denmark, Belgium, and Austria which imports large quantities of H&S specially black pepper and chili pepper (Eurostat 2009).

Holland consumes large quantities of H&S for the purpose of local consumption and re-exporting after preparing and packaging. The consumption of H&S in Holland is rated at 19,000 tons valued at 28.7 million Euros; the re-exported of H&S is 33,800 tons. These figures reveal the importance of the Holland market especially to Egypt since it produces the H&S that are largely consumed there, and is actually expanding its production of these H&S.

In 2009, apparent consumption of H&S in the EU was estimated to be 177,660 tons with a value of €410 million. Germany is the largest H&S consumption market in Europe. In 2009, Germany

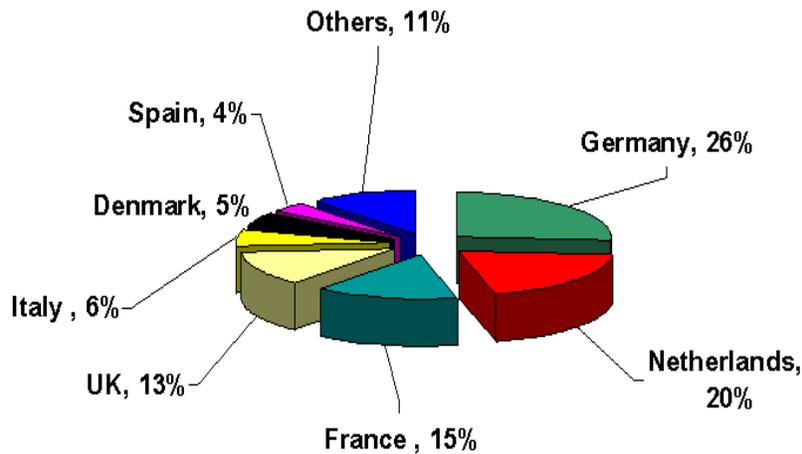
consumed 73,000 tons of H&S valued at €160 million. Average consumption and the popularity of H&S vary considerably from region to region in the EU.

In 2009, the total European industrial sector amounted to 57,900 tons with a value of € 511 million. Although it is a mature market, further growth is expected in the coming years. There are roughly 43 food ingredient manufacturers in just the

Netherlands. Different usages of H&S in EU are presented in figure 2.

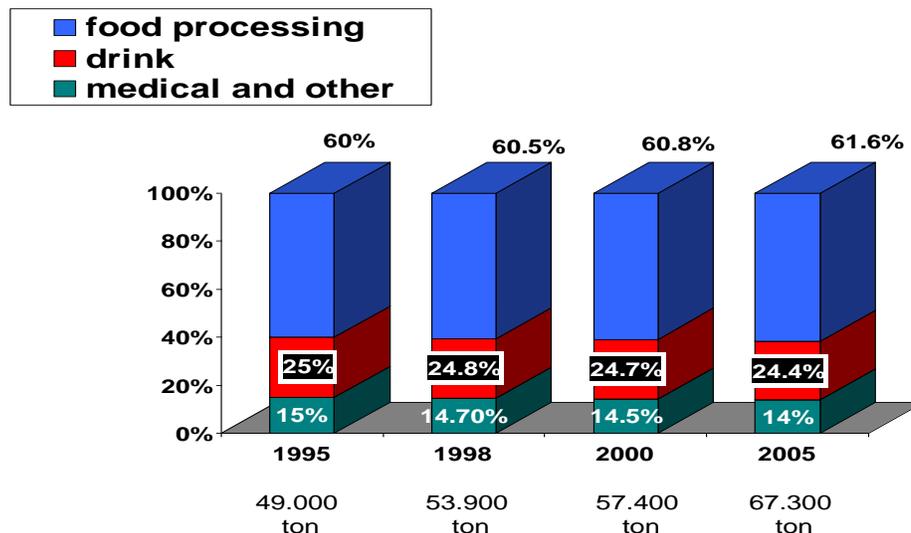
Consumption per capita is relatively low in Ireland and is much higher in Austria, Germany and the Netherlands. The Mediterranean regions of southern France, Spain and Italy have a very low consumption of dried herbs, but use a lot of fresh material out of gardens or wild produce harvested in the mountains. Per capita consumption of EU countries is expressed in figure 3.

Figure (1): The main European markets that import H&S, 2009

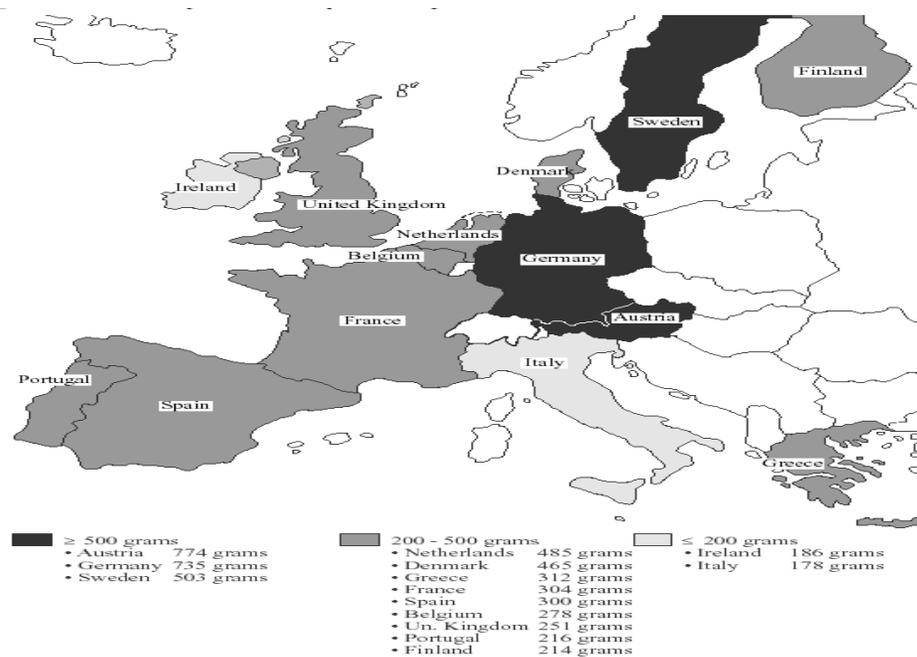


Source: Eurostat, 2009.

Figure 2: European consumption of H&S



Source: Eurostat, 2009

Figure 3: European per capita consumption of H&S, 2009

Source: Eurostat,2009.

Statement of the study problem:

Egyptian H&S constitutes one of the most important groups of economically valuable plants. This group of plants comes in the 5th place regarding Egyptian export profits, after cotton, potatoes, citrus fruits and rice. Despite the above, the cultivated area has not increased during the last 10 years, which causes a dilemma. The average cultivated area in Egypt was about 55,000 feddans in year 2000; representing 0.73 % of the total cultivated area and only reached 60,000 feddans in 2009. The reason behind this is the failure to open new markets for the Egyptian H&S in addition to the high competition within the current markets (CAPMAS 2011).

Study objectives:

The major objective of this study is to elaborate a detailed description of the challenges and potentials of the H&S sub-sector in order to improve the Egyptian market position in the international markets especially in the European market, which is the main international market for Egyptian H&S. In order to achieve this objective the study will shed light the value chain of the Egyptian H&S and the challenges facing them, the trade potentials for H&S will be estimated.

2. Methodology

The methodology used in this study is focusing on conducting a value chain analysis for the H&S

sub-sector and build up a Gravity Model to determine the most important factors in the trade flow between Egypt and the EU; the main partner of the Egyptian H&S exports and, accordingly, to calculate the trade potentials for Egypt. Data was collected in two different ways; primary data collected via interviews with representatives of H&S exporting companies in Egypt who are members of the Egyptian Spice and Herb Export Development Association ESHEDA and secondary data collected from Eurostat database, Ministry of Agriculture and Land Reclamation MALR, and the Union of Producers and Exporters of Horticultural Crops UPEHC.

Value Chain Analysis:

The Value Chain Concept:

A value chain is a chain of activities for a sub-sector or a specific industry. Products pass through all activities of the chain in order, and at each activity the product gains some value. The chain of activities gives the products more added value than the sum of added values of all activities. It is important not to mix the concept of the value chain with the costs occurring throughout the activities.

The value chain categorizes the generic value-adding activities of a sub-sector. The "primary activities" include: inbound logistics, operations (production), outbound logistics, marketing and sales (demand), and services. The "support activities"

include: administrative infrastructure management, human resource management, technology (R&D), and procurement. The costs and value drivers are identified for each value activity.

The value chain analysis is a powerful analysis tool for strategic planning in order to increase the competitiveness of this important sub-sector for the Egyptian economy .

Production:

H&S in Egypt are often miss-categorized as “vegetables” in trade statistic, leading to their underestimation. H&S are often not disaggregated to the larger variety of plants being grown and marketed. The demand for Egyptian H&S is generally increasing. The amount of H&S marketed reached L.E 55 million in 2009. H&S are traded locally and internationally but locally they are often lack freshness so are considered of low quality. The marketing channels are characterized by transport without refrigeration; hence, products have short shelf lives.

The most important produces being produced in Egypt are fennel, marjoram, basil, mint, chamomile, thyme, and geranium. H&S cultivation in Egypt is considered an exporting business in the first place, since a maximum of 20% of the produce is marketed in the Egyptian market, in supermarkets, pharmaceutical manufacturing, cosmetics and food processing. Noteworthy is that in the past two years, the percentage did not exceed 4%, however, with the increase of programs on satellite channels spreading awareness among people about the importance of alternative medicine centering around the use of H&S for cures, the consumption of H&S has leapt. The remaining 80% go to exporting purposes.

The cultivation of H&S in Egypt is centered in Upper Egypt, especially in four main governorates: Assiut, Minya, Beni Suef and Fayoum. In Assiut, only small amounts of basil and mint are being cultivated, in Minya the cultivation is centered on seeds like coriander and anise, in Fayoum leaves are being cultivated like basil, marjoram and mint. Moreover, in Fayoum and Beni Suef there are several factories for the distillation of essential oils from H&S and exporting them. These factories, however, are small with old technology and machinery (CAPMAS 2011).

As for cultivated areas, they are medium (not so small less than 2 feddans since the farmer prefers to cultivate wheat for family consumption and berseem for animal consumption, nor too large as to exceed 12 feddans). This has led exporters, processors or even pharmaceutical companies not to deal directly with farmers for the small areas of cultivation, but to deal with local traders who collect produce from many farmers. These local traders have set quality

standards on produce for exporters and take produce from farmers according to these standards. Noteworthy is that most farmers have no quality assurance certificates such as the Eurep GAP, BRC or IFS.

However, farmers have had a great deal of awareness on safe agriculture during the last years, in terms of use of chemicals and pesticides, due to the set of quality standards laid down by the exporters through which they would often refuse their produce of low quality. However, there are still some problems such as:

- 1) problems related to hygiene which has led to the increase of microbes in the produce, a problem which can be overcome by steam sterilization.
- 2) there are several agricultural practices that decrease the percentage of oil in the herbs, like ignorance about the ripeness of chamomile which leads to lower percentage of oil in it, and the fact that leaving aside the geranium after harvest increases the oil in it, in addition to ignorance of the fact that harvesting of basil and marjoram during the flowering phase and directly before seeding leads to a higher oil percentage. This is due to lack of experience in agriculture, and this is why farmers need a lot of training.
- 3) the last problem which is a big one is post-harvest techniques, especially as related to grading, packaging, storage and drying. Through interviews with processors, it was found out that the main problems of produce coming to them include that it is very poorly dried, since farmers use solar drying (leaving them in the sun, on a drying areas, in the crates or even on the ground) for long amounts of time which leads to exposure to dust, microbes and mechanical damage. Even drying places are insufficiently equipped.

As for storage rooms, it is open to factors like humidity and all kinds of weather, they are also with no fences which makes them open to animals, and affects the final product. This has been one of the main complaints of processors throughout the interviews. In the export market, however, quality comes first and must be established and maintained through production, harvesting, sorting, packing, and transportation. Exporters buying from small farmers through local traders as mentioned before are introducing changes in the system by selective buying and contractual arrangements including quality criteria.

Almost 80% of H&S cultivation in Egypt is conventional and only 20% is organic. This is due to the fact that the cost of registering an organic farm is very high, in addition to that organic farms yield less produce and require more elaborate skills not available in most parts of Egypt.

Lately, Farmer Associations (FAs) have started to appear, but until today, farmers do not recognize their importance and prefer individual work. FAs working in vegetables and fruits have a great role and importance, protecting farmers in their relationships with exporters, in contrary to FAs concerned with H&S which have yet to play an active role in the agricultural arena. However, it is expected that in the next few years, there will be a huge increase in the role of these FAs.

Processing:

Most of the processors in Egypt perform the following processing steps on the dried product coming from the producer:

1. Sieving: classifying into classes according to the requirements of clients, and removing wastage.
2. Blending: so as to make the product homogenous, and at the same time remove the long grasses and foreign objects.
3. Final Cleaning: through a vibrator to separate the powder.
4. Color Sorting: for some products like basil and fennel. This is a very primitive process in Egypt that is in need of much development.
5. Packaging: the product is packed in bulk form or in small quantities in plastic bags bearing the company's brand name, according to the needs of the client.

The main Egyptian foreign trade is for H&S, fresh, dried and in crude form, cleaned but not further processed. It is estimated that about 80% of the trade is in this form. The remainder is for crushed or ground spices, essential oils or oleoresins.

According to the Egyptian Spice and Herb Export Development Association ESHEDA; processors can be classified in the H&S sub-sector to three main categories according to size: large, medium and small, that is determined according to turn over and the scale of the investment. Large processors are ten located in Cairo and Alexandria, all working in exporting, including four which represent 50% of export in Egypt. Medium processors are twenty located in Cairo. Small processors are 100, 60% of those small processors work with dried herbs and spices and seeds in Cairo and Alexandria, while the remaining 40% work with essential oils, and they are spread in the areas of cultivation of H&S in Upper Egypt (Assiut, Minya, Beni Suef and Fayoum). Coming to the types of produce that processors deal with, the interviews were unable to determine certain kinds of products that companies deal in, instead they deal with all kinds of H&S produce, whether leaves or seeds. However, the most important products are: basil, marjoram, mint, chamomile, calendula, fennel, and seeds like coriander, anise, caraway and cumin. Some

of the large companies include an organic line of production. Some of the main organic products include: basil, marjoram, spearmint, peppermint, chamomile, calendula, lemongrass, fennel, and some seeds including coriander, caraway and nigella seeds.

Through the interviews, it was discovered that: processors increasingly move away from dealing with small growers, choosing instead to deal with whoever can give the quality, high volume, and consistent produce (local traders and may be FAs). In the last two years, processors have also started to deal with some associations, especially in Beni Suef and Fayoum, like Youssef Al-Seddik Association in Beni Suef. Processors deal with local traders through contractual or verbal agreements. Verbal agreements represent 60% of all agreements. The local traders are chosen based on trust and ones who do not measure up are left. The interviews have also revealed that these contractual agreements are not binding, and upon breaking them by either side, no civil action is taken.

As for the technology used, large and medium companies have modern equipment, trained labor to some extent, and several expansions and agreements with companies in Germany and Italy to develop the existing production lines is in progress. Units for steam sterilization have been established so that products are being sent to Germany and Turkey to be sterilized will be sterilized in Egypt, which will reduce the cost greatly. Small-size companies use old and depreciated equipment and machinery.

Talking about profitability, it is observed through the interviews that all processors (including medium and small-size) during the last five years increased their production for the purpose of exporting by no less than 40%. This shows that Egyptian H&S are on demand internationally.

The margins charged by different intermediaries in the H&S trade are influenced by many different factors. These include the type of H&S produce, the current and expected future harvest situation, the availability or number of sources for the particular H&S, the level of demand and the trend in prices. All these factors make it extremely difficult to provide information on typical margins in the trade. The interviews show that margins added to the prices that traders take from farmers are about 5-10%, and processors about 20-25%. Finally all the processors interviewed have quality certificates such as HACCP and ISO.

Consumption:

The EU market is considered the largest market for importing H&S from Egypt, especially Germany, Netherlands and France (especially essential oils of geranium) followed by the US market, in some products like basil and fennel where the US comes in

the first place. The EU market is characterized by its closeness to Egypt which means lower transportation costs. The emerging market of Eastern Europe countries like Poland and Hungary, is a market that observes quality standards like EurepGAP, it is not as strong as west Europe in this aspect. Following are

Egypt's exports of main H&S to world countries in 2009.

Obviously, EU is the main market for the most important Egyptian H&S followed by the USA in some cases and some other countries in other cases. Russia, also, is on of the main markets.

Table (1): Egyptian Monthly Chamomile Exports by Tons in 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
EU	61	196	761	896	757	347	299	201	132	275	1	89	4015
USA	20	31	58	38	46	38	34	57	12	28	8	38	408
Venezuela	-	10	221	-	10	17	3	23	13	23	19	26	365
Russia	-	9	31	99	17	7	30	30	11	-	-	-	234
KSA	14	8	109	11	7	-	-	-	-	-	-	-	149
Brazil	-	33	-	-	18	84	5	5	-	-	-	-	145
Total	190	376	1311	1119	915	519	384	343	176	336	34	176	5879

Source: UPEHC, 2009

Table (2): Egyptian Monthly Marjoram Exports by Tons in 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
EU	411	509	646	298	272	175	323	461	278	236	332	461	4402
Russia	3	1	580	1	15	-	11	8	7	5	10	2	643
USA	43	33	56	63	49	62	57	76	11	5	129	42	626
Turkey	10	13	12	5	4	17	31	10	5	17	28	10	162
Uruguay	-	38	22	12	23	-	-	-	12	15	6	24	152
Israel	-	13	44	-	1	-	-	-	-	-	-	7	65
Total	471	688	1415	413	404	260	446	627	331	282	522	574	6433

Source: UPEHC, 2009

Table (3): Egyptian Monthly Mint Exports by Tons in 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
EU	108	198	180	144	280	143	160	482	164	112	278	236	2485
Romania	-	1	1	808	-	1	8	1	10	2	11	-	843
USA	3	47	43	16	5	5	5	47	33	15	89	41	349
Argentina	-	-	37	13	24	-	-	16	4	-	-	-	94
Turkey	-	27	5	8	2	10	1	-	6	6	9	-	74
Total	124	278	295	993	347	189	191	571	239	167	409	365	4168

Source: UPEHC, 2009

Table (4): Egyptian Monthly Fennel Exports by Tons in 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
USA	250	163	334	175	108	146	274	261	199	346	447	396	3099
EU	101	189	57	128	108	61	129	194	97	64	206	294	1628
Seri Lanka	-	-	-	5	-	50	192	135	73	96	322	241	1114
Malaysia	25	48	65	-	-	-	25	79	118	54	125	322	861
Brazil	-	-	24	24	-	87	98	112	56	101	63	89	654
Total	385	467	548	433	402	487	1244	1621	823	749	1222	1864	10245

Source: UPEHC, 2009

Table (5): Egyptian Monthly Basil Exports by Tons in 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
USA	361	982	254	468	143	84	306	400	346	227	131	391	4093
EU	302	336	340	193	352	174	198	254	244	231	75	230	2929
Canada	17	41	15	33	39	51	31	8	10	10	43	28	326
Turkey	-	16	31	40	11	47	1	36	39	18	37	30	306
Brazil	5	5	35	10	24	6	14	12	4	12	117	17	261
Russia	16	1	1	2	15	-	27	24	81	29	36	23	255
Total	730	1434	770	779	609	376	612	882	737	554	440	737	8660

Source: UPEHC, 2009

The EU market for Egypt is considered one of the most important markets all over the world because:

- It is a huge market (EU 15 is 379 million people).
- It has wealthy consumers & tremendous purchasing power (GDP per capita = 23,200€).
- It has healthy life trends (anti-cholesterol trend, more fresh and processed fruits and vegetables including H&S).
- It has year round and increasing demand.
- It has limited raw materials and local production capabilities.
- The use of H&S by EU consumers is increasing as they appreciate them as natural, rather than artificial, additives.
- Apart from being directly used by the industrial and catering sectors as well as consumers, they are also the starting points for the production of many flavors for different industries in Europe.
- There is growing demand for organic H&S in the EU. Consumer sales of organic products now amount to about one and a half per cent of total EU sales of H&S.
- European Consumption of convenience and ethnic foods is expected to increase because more and more people are eager to try the new and varied taste of foreign foods.
- This implies that there is a growing market, although the retail market for H&S will be restrained by the growing popularity of wet and dry cooking sauces, which contain H&S.
- Also, the ready-to-use segment will take a larger share in the retail market. In some EU markets there may be opportunities for private brands but most opportunities should be sought in the industrial sector.
- The healthy food sector is a growing market, as industry and consumers focus more on healthy food and natural flavors as substitutes for sugar, salt and artificial products.
- Growing public concern over health and the increasing number of food scares have a positive

effect on the growth of the market in particular for fresh and dried herbs.

All these facts lead to:

- Tremendous opportunities for serious suppliers.
- A highly competitive quality market.

General analysis of the value chain:

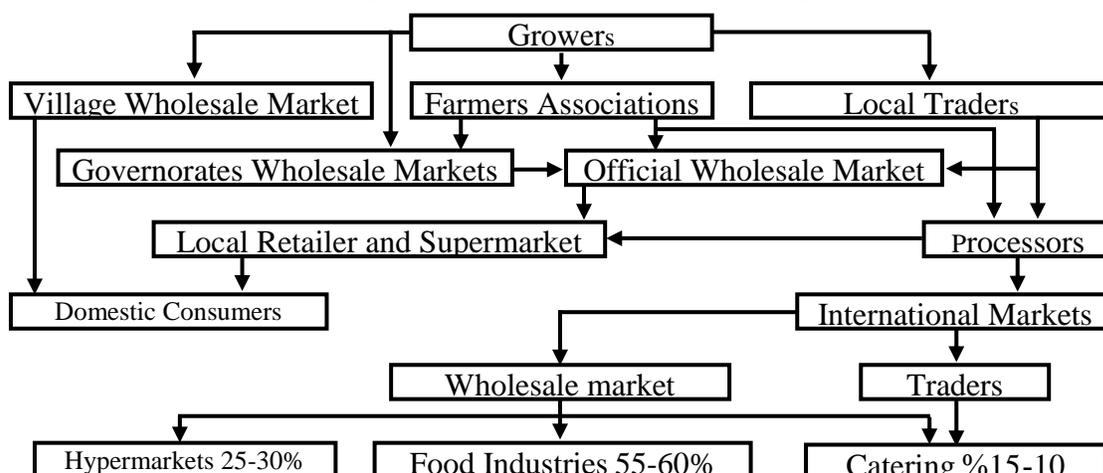
Generally, H&S crops including basil, chamomile, geranium, marjoram, and fennel, are grown primarily for the overseas market, difficult to differentiate as value-added produce, and normally sold as bulk. They are sold after harvest to local traders and wholesalers. Most small and medium size farmers secure production loans from these traders/wholesalers, and are obligated to sell them at least a part of their crop. While this system reduces the farmer's costs and risk, it also reduces his profit potential. After leaving the farm, the produce is sold to local markets (the village wholesale market, the Governorate wholesale market, or the official wholesale markets: four major wholesale markets serving the major cities: El Obour, Alexandria, Mansoura, and Assiut. From the major wholesale markets they make their way to retail markets and vendors in the major cities and throughout the country through various levels of wholesalers. As mentioned earlier, processors and exporters increasingly move away from dealing with small growers, choosing instead to deal with whoever can give the quality, high volume, and consistent produce, so exporters and processors purchase their requirements from farmers through the local traders and Farmers Associations (FAs). Figure (4) portray the value chains for H&S.

The market for H&S produce can be distinguished into domestic market (20%) and overseas markets (80%). The domestic market can be subdivided into retail, institutional and processing. The overseas markets can be subdivided into conventional and organic. Table (6) provides market size for the five H&S produce items under study, in 2009.

Table (6): Market size for selected H&S products in 2009

Market	Marjoram		Basil		Fennel		Chamomile		Mint	
	Mt	%	Mt	%	Mt	%	Mt	%	Mt	%
Egypt	2005	20	2139	19.8	2603	20.2	1422	19.4	942	18.4
Overseas	6397	80	8661	20.2	10247	79.8	5878	80.6	4168	81.6
Total	8000	100	10800	100	12850	100	7300	100	5110	100

Compiled and computed from: MALR and UPEHC.

Figure (4): the value chains for H&S crops

Source: Compiled from interviews, and, Sallam, W., Abo elwafa, M. 2005. Egypt's H&S Competitiveness Framework Benchmarking Exercise, Marketing study, AERI Project, MUCIA, USAID, Cairo.

An important trend among distributors of food products is across the entire EU, being developed by major multinational food companies and influencing competitive positioning of food produce by major supermarkets and hypermarkets in Europe and North America. With the trend that retailers are further consolidated into large chains, and the number of small retailers shrinks, Egyptian processors and exporter should place more emphasis on direct marketing to the large retailers.

Value chain framework conditions:

This part of the study will specify the problems and challenges related to the supply market (quality and/or quantity, infrastructure, etc.), processing and finally specify the problems and challenges related to market access and distribution (regulation, quality standards, market information).

Problems and challenges:

The value chain of the H&S is faced by many challenges at all phases.

Challenges of the production phase:

Producers of H&S are facing the following problems:

1. Lack of a stable long-term or short-term policy for the production, varieties improvement, and introduction of new kinds of H&S in Egypt. This has been revealed by thorough studies of the local and overseas markets and their needs.
2. Lack of agricultural and economical awareness in H&S farms, which make many producers fail in this area since H&S need of knowledge in cultivation, harvest and post-harvest procedures, especially drying and storage.
3. Difficulties related to storage in Egypt as revealed through the interviews with processors, most of whom have problems with storage which

exposes the produce to spoilage, dust, microbes, animals, insects, rodents, in addition to decrease of the amount of oil in the crop.

4. Another important point from the processors' point of view is lack of specialization in producing a certain kind of H&S so that each area or group of areas will specialize in a certain product, which eases transportation. This lack of specialization also leads to small amounts of experience in production of each kind of crop.
5. Farmers' fear of producing H&S due to the huge price fluctuations from one year to the next. This is due to production without having a marketing plan, lack of a database on H&S cultivated areas in Egypt which makes decisions hard to make, thus leading to fluctuations in production and so in prices too. For example, chamomile produce in 2004 was priced at 0.60 pt per kilo although the harvesting process alone cost the farmer 0.40 pt – 0.50 pt which led to lower amounts of cultivated chamomile in the next year, 2005, which led to an increase in the price of kilo to LE 3.20.
6. From the processors' point of view, many producers lack awareness of many important processes:
 - Optimal harvest time, since it is done either too early or too late which affects the amount of essential oils in the crop.
 - Transportation after harvest is performed in the wrong way since huge amounts of produce are transported onto the vehicle to save money, which leads to the escape of a high percentage of essential oils and changes the color of the final produce into black or

brown, and leads to rotting in the drying phase.

- A large problem faced by processors is related to drying which is currently done in places exposed to the sun, leading to burning on the top layer of the leaf and change of color into brown or black, in addition to losing a large amount of aromatic oils. Moreover, drying in open places exposes the produce to all kinds of contamination, including dust, bird waste, microbes, insects, etc. Also, crates are overloaded by produce which leads to higher humidity and a high degree of spoilage.
- Storage is done in an unsuitable setting, in open places, which affects the percentage of oil, humidity control, and leads to exposure to insects and rodents, etc.

Challenges of the Processing phase:

Processors of H&S are facing the following problems:

1. All processors do tests on the product (salmonella, e-coli, pesticides, etc.) in the Central Laboratory for Pesticides that is under the auspices of the Ministry of Agriculture. However, machinery in this laboratory is old and so inaccurate and produces wrong results, for example the importers abroad find different results of factors like pesticides in the produce that here were said to be absent, and so the produce is refused. This is because of limited detection in Egypt, while abroad the default is lower and thus can detect more accurately any problems with the produce. Processors overcome this problem by sending the produce to Germany for being tested, which raises the cost greatly.
2. As mentioned before in the problems faced by producers especially those related to hygiene, these problems are overcome by steam sterilization, but until today there is no steam sterilization unit in Egypt, which is why processors need to send the produce to be sterilized in Turkey or Germany, and then to export. This raises the cost greatly. Through the interview with Delta Spice, one of the major companies in the field of H&S, it was found that they are developing the first steam sterilization unit in Egypt in collaboration with an Italian company. However, Delta Spice will have the problem of training the workers on using the equipment, it is suggested that GTZ-FVP carry out this training. However, these are all personal endeavors; it is recommended that ESHIDA have a steam sterilization unit to serve all the processors.
3. Processors' lack of color sorting machines especially needed for fennel. This leads to the import of fennel which is not well sorted according to color, which often leads to refusal of the produce.
4. Absence of machinery that makes the produce homogenous in terms of size, especially needed for seed products like coriander and caraway.
5. Absence of trained labor aware of the use of machinery or hygiene concerns. It is recommended that FVP take over this training task.
6. Lack of knowledge of the main modern equipment in the field (like new distillation rooms) or where the best place to purchase them is.
7. Manufacturing machines are old and initially designed for wheat, but every factory re-adjusts them according to need. This leads to discrepancy in the way processors use them. This means that processors need an optimal model for all to use. FVP could also add German expertise to this area.
8. Absence of a database on companies that produce machinery used in herbs processing and seeds treatment.
9. Absence of a database on the areas cultivated in Egypt, kinds of crops cultivated, exports, and the field in general.
10. A high degree of randomness in sea freight, and huge price fluctuations in costs of sea freight. Prices could increase by up to 1000 dollars suddenly. A set price policy for sea freight should be laid to avoid this randomness.
11. Poor relationship between producer and processor, since the producer believes that the processor is robbing him of his money, and the processor sees that the producer has many problems that need to be solved, which leads to non-abiding by the rules in the contract between them. This especially happens with small size processors who sign long-term contracts with European importers, leading to distrust from the importer and disorganization in export activity. Large size companies overcome this problem by cultivating their own produce.
12. Much paperwork and procedures needed before export, in addition to that the governmental associations in charge of export procedures, do not give set deadlines for their completion and need the processor to move between several places in order to get the paperwork done. This leads to the loss of much time and effort, and unpunctuality in meeting deadlines with importers.
13. Transportation facilities: shortage of adequate transportation is an obstacle to the development of horticulture in general and to H&S exports in

particular. The existing transportation facilities are poor and the transportation system implies expensive costs for all agricultural products.

There have been some government efforts to improve transporting produce to export markets, including increased availability of airfreight space, reduction of airfreight costs, development of sea-shipment capability, reduced transit time to northern EU markets with sea truck transport using Italian Slovenian ports, increased refrigerated containers availability, and more efficient port procedures. Also, a new cold holding facility has recently been constructed at Cairo International Airport. However, much more should be done to increase efficiency of the transport system that reduce costs and maintain quality. Constraints exist for the two modes of transport –sea and air- are discussed below.

Transportation:

Air Transportation:

Air cargo space for H&S is not regularly available during peak exporting periods, and is more expensive compared to Egypt competitors. The lack of adequate inbound cargo discourages regular cargo scheduling and forces higher outbound rates.

Excessive cargo handling costs at Cairo Airport are another major deterrent to export expansion. Commercial rates for loading and unloading a cargo aircraft are about \$170 per ton, which is similar to rates charged at European airports, thus do not induce the low labor cost in Egypt. Only Egypt Air and Egyptian Aviation Services (EAS) are authorized to provide cargo handling services. Lack of competition in cargo handling is resulting an excessive fees and, notably, low efficiency. Airlines have limited equipment to service their own flights because of the low number of flights, and they are not allowed to share equipment or facilities.

Sea Transportation:

Port facilities for containers are poor. Lengthy inspection procedures on imported container food shipments result in demurrage charges, interest charges on money tied up in inventories, need for larger container inventory and port congestion. All food consignments must be inspected by four agencies, first for radiation, second for 6 food qualities, third for safety and quality, and the fourth for safety and quality of both fresh produce and fish and dairy products. With few exceptions (frozen products) inspections, and in all cases laboratory analyses, are done independently and sequentially rather than simultaneously.

Total capacity of Egypt's ports is 50 million ton. Alexandria port is the largest and equipped with storing capacity of 172000 square meters. Alexandria port receives about 70 percent of Egypt's trade. Damietta port is the second largest with storing

capacity of 150,000 ton and expandable to double of this amount.

Gravity Model:

Introduction

Numerous empirical studies, originating from Tinbergen (1962) and Linnemann (1966), showed that trade flows follow the physical principles of gravity: two opposite forces determine the volume of bilateral trade between countries or economic blocks or a country and an economic block - the level of their economic activity and income, and the extent of impediments to trade. The latter include in particular transportation costs, trade policies, uncertainty, cultural differences, geographical characteristics, limited overlap in consumer preference schemes, regulatory bottlenecks etc. National borders are among these impediments, even for industrialized countries (Anderson and van Wincoop, 2003).

While trade potential is the result of matched export capacities and import demands at the microeconomic level, on a more aggregated level of analysis, proximity in demand, in per capita income, in space, and in culture, are key macroeconomic determinants of export potentials. Thus various combinations of macroeconomic variables, such as gross domestic product and population with geographic distance, are powerful predictors of trade potentials. Hence, gravity equations have been used extensively in the empirical literature on international trade (Havrylyshin and Pritchett, 1991; Frankel and Wei, 1993; Bayoumi and Eichengreen, 1997; Evenett and Hutchinson, 2002).

Within this extensive literature, gravity equations share common features that can be customised for different purposes:

- First, a gravity equation is *bilateral*. It explains a trade-related dependent variable, by the combination of macroeconomic variables, such as country size, income, exchange rates, prices etc., for both countries. Moreover, indicators of transportation costs between the two countries and more general market access variables are commonly added.
- Second, gravity equations can be derived from various theoretical trade models (Deardorff, 1995). Independent from the underlying trade model chosen, they represent a conditional general equilibrium if multilateral (price) resistance terms are taken into account. Inference about determinants of trade flows can be drawn thanks to their property of “separability” (Anderson and van Wincoop, 2003). This means that trade flows across countries are separable from the allocation of production and consumption between

countries. Thus, gravity equations establish a link between trade and its determinants conditional on the observed production and consumption patterns, which draws inference on trade flows from the underlying general equilibrium structure determining production and consumption allocations. In addition, due to the separability property, the gravity equation is not affected by the presence of non-tradable sectors in the economy, as non-tradables do not affect the marginal productivity of tradable goods within a sector (Anderson and van Wincoop, 2003).

- Third, a gravity equation *may be used in order to estimate either determinants of the volume or determinants of the nature of trade flows in general or in sub-sectors*. In the latter case, the purpose is to use an index of intra-industry trade as the dependent variable.

The most common design is the following:

$$X_{ij} = a_0 Y_i^{a_1} Y_j^{a_2} L_i^{a_3} L_j^{a_4} D_{ij}^{a_5} P_{ij}^{a_6} e^{u_{ij}} \quad (1)$$

Where:

i = Egypt, J = EU countries

X_{ij} : the total exports from i to j

$Y_i Y_j$: the countries income

$L_i L_j$: the countries population

D_{ij} : the geographical distance between I and j

P_{ij} : a measure of market access from I to j

$e^{u_{ij}}$: the normal random error term

It is generally estimated in a log-linear form. This specification provides elasticities of bilateral trade to income, country size and distance.

$$\log X_{ij} = a_0^* + a_1^* \log Y_i + a_2^* \log Y_j + a_3^* \log L_i + a_4^* \log L_j + a_5 \log D_{ij} + a_6 \log P_{ij} + e^{u_{ij}} \quad (2)$$

$$a_0^* = \log a_0, P_{ij} = (0.1)$$

Models generally use nominal incomes at current exchange rates. However, the associated trade-to income elasticities may be biased when developing countries like Egypt are integrated in the model. Using PPPs also affect the trade-to-income elasticities. It is sometimes argued that PPPs would be much more appropriate to estimate trade potentials in the long run, an horizon in which all exchange rate adjustments towards equilibrium have taken place. In contrast, current income would be more appropriate to analyze short-term trade potentials. However, in our model, estimating trade equations using PPPs variables leads to unreliable and highly sensitive elasticities. Hence, the alternative solution adopted here is to estimate elasticities with current exchange

rates, but using Egypt's data trading with their entire partner the EU, industrialized block.

The H&S sub-sector has been used in this model. The integrated crops included are: basil, marjoram, mint, chamomile, calendula, fennel, coriander, anise, caraway and cumin. the fit for the total trade of the sub-sector $R^2 = 0.74$ with an R^2 ranging from 0.56 to 0.71.

Variables included in the model:

The 2007-2009 average is considered for all figures. Hence it is used a cross-sectional estimates as a basis for simulation. The source of trade data is COMTRADE, EUROSTAT, and CAPMAS. The model has been estimated on the basis of Egypt as an exporting country towards the EU (27 importing countries).

Table (7): R2 values for the crops integrated in the model

Crops	R2	Crops	R2
Basil	0.69	Fennel	0.71
Marjoram	0.66	Coriander	0.69
Mint	0.75	Anise	0.68
Chamomile	0.56	Caraway	0.79
Calendula	0.77	Cumin	0.77
Total	0.74		

Bilateral measure of market access:

Since the model is by construction bilateral (Egypt and the EU countries), a bilateral measure of market access that takes into account all preferential regimes. Most of these preferential regimes are related to quality and certificates like EurepGap, BRC and IFS. In this model the previous arrangements related to quality are captured using dummy variables.

GDP at current prices:

Data are in current billion US\$ converted using the World Bank data. It is considered the average GDP for 2008 and 2009 in US\$ taken from World Bank.

Cultural factors:

A common culture variable, ranging from 0 to 1 has been created. It takes into account common national languages (official or not) as well as links established during the colonial period. The languages were taken from *google search site on line wikipedia*. The following languages were considered: Arabic, Dutch, English, French, German, Irish, Greek, Hungarian, Italian, Mandarin, Portuguese, Spanish, and Swedish. Table (8) shows the intensity of the common cultures.

Table (8): Intensity of common culture

Cases	Value taken by the culture variable
The two countries share a common main language	1
Country <i>i</i> (or <i>j</i>) was a former colony of country <i>j</i> (or <i>i</i>)	1
The two countries, <i>i</i> and <i>j</i> , share a common language, that is a main language in one country (<i>i</i> or <i>j</i>) but a secondary language in the other (<i>j</i> or <i>i</i>)	0.5
The two countries share a common second main language	0.25

Transportation Costs:

Transport and transaction costs in this gravity models are captured by calculating the physical distance between two countries and the existence of a common border.

Literacy Rate:

The ability to read and write influences foreign trade. The literacy rate is strongly related to the level of development and GDP per capita, it is also related to the ability of farmers to change and cultivate high value crops, and their ability to analyze markets, prices, and make predictions about prices and market needs.

Per capita Foreign Direct Investment (FDI):

FDI flows are particularly relevant in explaining bilateral trade flows. FDI usually brings technology, know-how and international marketing and generally increases international competitiveness. Nevertheless, the impact of FDI on exports depends on the nature of the investment and the target market. Investments in the herbs and spices sub-sector in an export-oriented perspective are likely to have a stronger impact on national exports.

3. Results and Discussion:

The final model is the following:

$$\log X_{ij} = 15.34 + 1.33 \log Y_i + 0.99 \log Y_j + 0.56 \log FDI_i + 1.85 \log Literacy_i + 0.003 \log Langdiv_i - 2.01 \log D_{ij} + 0.9 \text{Border}_{ij} - 0.11 \text{Market Access}_{ij} + 0.98 \text{Culture}_{ij}^* + u_{ij} \quad (2)$$

$$R^2 = 0.74$$

Where:

i: Egypt

j: the importing EU country

X_{ij} : trade from Egypt to country *j*

Y_i : GDP of Egypt

Y_j : GDP of EU countries

FDI_i : Per capita FDI stock in Egypt

$Literacy_i$: literacy rate in Egypt

$Langdiv_i$: language diversity in Egypt

D_{ij} : distance between Egypt and *j*

Border_{ij} : *i* and *j* are neighboring countries (=1) or not (=0)

Culture_{ij} : bilateral measure of common culture

The estimated coefficients of the model have all the expected signs and most of them are statistically significantly different from 0 at the 1%

significance probability level. Culture -elasticities are not statistically significantly different from 0 at the 1% significance probability level. The market access on trade seems to have a limited but significant negative impact on trade, with a 5% significance probability.

There is a negative impact of distance on trade appears despite that it is over-estimated (-2.01). In most studies, it varies between -0.8 and -1.5. This result in general indicates that the European market is the main market for Egypt since it is near to it.

The result could be interpreted that there is a lack in the logistic infrastructure in Egypt regarding sea freights and aircraft freights. Shortage of adequate transportation is an obstacle to the development of horticulture in general and to H&S exports in particular. The existing transportation facilities are poor and the transportation system implies expensive costs for all agricultural products. Air cargo space for H&S is not regularly available during peak exporting periods, and is more expensive compared to Egypt competitors. The lack of adequate inbound cargo discourages regular cargo scheduling and forces higher outbound rates. Excessive cargo handling costs at Cairo Airport are another major deterrent to export expansion. Commercial rates for loading and unloading a cargo aircraft are very high.

Also port facilities for containers are poor. Lengthy inspection procedures on imported container food shipments result in demurrage charges, interest charges on money tied up in inventories, need for larger container inventory and port congestion. This makes it crucial to put forward a recommendation for improving the freight and shipment logistics.

One of the main factors influencing trade, according to the model, is literacy rates. Since there is a positive relationship between trade and farmer literacy, this result reveals that most of the Egyptian exports come from areas where the farmer are well-educated, like Salheya, Nubaria. Most of the farmers in Egypt, in conventional areas like Delta and Upper Egypt, illiteracy rates are very high; therefore they cultivate traditional crops like wheat and cotton, instead of cash crops that they know nothing about. Therefore, there must be huge efforts for spreading public awareness about cash crops through the Ministry of Agriculture through the Agricultural Extension Department services.

The model shows that an increase in Egyptian GDP, positively affects the trade between Egypt and EU countries, which means that Egypt must try to raise GDP and the economic growth rate to higher than 12% since this will lead to raising the trade with European countries. Bi-lateral measure of common culture also has a positive effect on trade, meaning Egypt's chance of trade with North Euro-Mediterranean countries, like France, Spain and Cyprus, is larger than its chance with the remaining European countries like Germany.

One of the main results of the model is the positive relationship between foreign direct investment and size of trade with EU countries. If Egypt wants to increase trade volume with EU countries, it has to encourage foreign direct investment which presents technology (needed in Egypt). As a recommendation, Egypt must fix some policies on the macro level, in order to encourage investment, especially foreign investment.

Conclusions & recommendations:

For Egypt to increase its exports in the H&S sub-sector due to the value chain analysis and gravity model, much attention needs to be paid to quality, consistency, punctuality in meeting deadlines, also solving the problems related to cultivation, harvesting, and especially post-harvesting which was revealed through the study to face many problems, especially as related to drying and storage and kinds of packaging. Moreover, it needs to develop its manufacturing labour force and make available steam sterilization units, besides modernizing the equipment at the Central Laboratory for Pesticides that falls under the auspices of the Ministry of Agriculture, so as to be able to perform accurate and correct tests on the H&S samples and avoid them being rejected for export. Also, problems related to quality control and hygiene in the factories, relationship problems between producer and processor, and paperwork deadline and procedures problems, must be solved.

If the food-processing industry has taught H&S Egyptian processors and exporters anything in the past years, it is that there is only enough room for a limited number of suppliers in Europe and, to succeed, one needs to be a technically knowledgeable partner. Although in Egypt, low priority is given to research programs on H&S, countries like Indonesia and India have undertaken several successful initiatives.

Competition in the food sector is strong and quality requirements are high. Most of the H&S are imported for industrial use and will be further processed and packaged in consumer or catering packs by the European food-processing industry.

Small and medium-sized Egyptian exporters should seek markets segments in which small amounts of the product can be traded and in which Egyptian exporters are more equipped to compete. In this sense, market opportunities in the EU for Egyptian exporters lie in the production of H&S which are hardly grown in Europe, and in the production of organically grown products.

The recommendations the search can give in order to be successful in the competitive European food market is:

- **Offer a 'concept'**

A general trend in the H&S sub-sector is that importers and food-processing manufacturers in the EU do not simply ask for a spice or herb as such, but for a concept. This means that a product should include complete product specifications, suggestions for application, instructions on how to store and to process, proposals for product presentation, information on quality assurance (e.g. HACCP) or even ISO certification (ISO 22000). An Egyptian exporter capable of meeting these requirements will have an improved competitive position in the EU market for H&S.

- **Go 'organic'**

Healthy, natural and organic products are occupying an increasingly stronger position in the EU. This applies to the consumer market as well as to the food-processing industry. Organic production is particularly attractive for growers in Egypt, since much of their food production is already organic or can easily be changed to organic. However, going organic is not a panacea. It is not only a question of obtaining the certificate, which involves a lot of personnel efforts and costs, but substantial follow-up efforts are also needed in order to maintain the certificate. Moreover, while margins are currently high, they will decrease if too many producers and exporters go organic.

- **Adopt HACCP**

Although Egyptian exporters to the EU are not obliged to apply an HACCP system and their system will not be subject to control by the food inspection service in the importing country, adopting an approved HACCP system, or working following a similar principle of quality control, will be a very positive argument in export business for Egyptian exporters, in this area FVP could offer training on correct quality control for Egyptian processors.

- **Adopt GAP**

Using Good Agricultural Practices can be used as a marketing instrument. The underlying theme of GAP is knowing, understanding, planning, measuring, recording, and of managing according to identified social, environmental and production goals. This requires a sound and comprehensive management

strategy and the capability for responsive tactical adjustments as circumstances change.

The main recommendations for this study are:

1. Building a good relationship between producer and processor through a win-win relationship, partnership, sustainability, honesty, clarity and transparency.
2. Forming funds and associations for the producers and processors to participate in so as to get to know each other better and build trust, besides insuring the crops and protection against fluctuation in prices.
3. Specialization in production is very important as it leads to maintaining clients and leads to better knowledge and expertise.
4. Paying attention to small details and new, updated information, and attending trade fairs.

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