Ghana
Sustainable horticultural export chain

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Foreword

This report has been written within the framework of the project entitled 'Ghana Sustainable Horticulture Export Chain,' commissioned by AHOLD, Albert Heijn, Bakker Barendrecht, the Agro Chain Science Foundation (AKK) and KLM and carried out by the Agricultural Economics Research Institute (LEI) and Michigan State University (MSU).

It is intended as a supporting tool for the 'AHOLD Africa Sustainable Assistance Project,' through which help is offered to Africa by means of corporate activities, without the aim of making a profit. The goal of these activities is to combat poverty by stimulating the local economy and to fight starvation by improving food production as well as the distribution of that food.

The report provides insight into the problem areas confronted by the Ghanaian horticultural sector. The focus is on one particularly important export product: pineapples. In order to gain this insight, we examine the entire pineapple chain.

A model will also be developed that is to act as a 'pre-selection tool.' This model enables European supermarkets to identify suitable farmers quickly and ultimately to enter into supply agreements with them.

In addition, the most important improvement scenarios for the pineapple sector are calculated by means of a simulation model. This produces results that can be used as concrete measures for improvement, not only in terms of improving matters in the problem areas but also in terms of sustainable corporate responsibility.

Our thanks go to all the parties involved in this project, particularly Roland Waardenburg at AHOLD, Gé Happe and Jelger de Vriend at Albert Heijn, Irénke Meekma at Bakker Barendrecht, Bastiaan Hoogendoorn at KLM and Sabine Willems and Sietske Boschma at the AKK. We also thank the people within the Ghanaian and Costa Rican organizations and farms/holdings who allowed us to interview them. Last but not least, we would like to thank Dave Boselie, who - before moving to Agrofair - made a considerable contribution to this project through his great knowledge of the sector, and also the other researchers who participated in this project.[1]

[1] At the Michigan State University: Peter Achuonjei, John Allen, Diana Twede, William Somerville, Deirdre Holcroft, Cesar Retamal and Vincent Hegarty. At Agrotechnology & Food Innovation (part of Wageningen UR): Henry Boerrigter and Seth Tromp.

1. Introduction

1.1 Motivation

The Ghana Sustainable Horticulture Export Chain project is an initiative by Cees van der Hoeven, former chairman of the board at AHOLD. During the Global Forum Meeting in Davos (2000), Cees van der Hoeven was asked the pointed question of why the world's largest supermarket chains (active in four continents at that moment in time) did not have any business operations in Africa. In response to this, AHOLD launched the 'AHOLD Africa Sustainable Assistance Project,' which aims to offer assistance by means of corporate activities, without the aim of making a profit. The goal of these activities is to combat poverty by stimulating the local economy and to fight starvation by improving food production as well as the distribution of that food.

In October 2002, the 'Ghana Sustainable Horticulture Export Chain' was submitted and approved to the Sustainable Agro-Food Chains programme, run by the AKK, as a supporting tool. This project examines the question of the extent to which the Ghanaian horticultural sector can occupy a prominent position on the European market. The Ghanaian pineapple (both whole and sliced as a fruit salad ingredient) has been used as an example. In addition to the development objectives, the potential transportation savings also occupy a central position in this project. For example, transport by sea could bring about a saving of almost 25% on the number of transport kilometres. The distances travelled by pineapples from Ghana and Costa Rica are presented in table 1.1.

Table 1.1: 'Distance information for Ghana and Costa Rica'

Route	Distance in kilometres
Amsterdam-Accra (aeroplane)	5214
Amsterdam-San Jose (aeroplane)	9252
Antwerp-Ghana (boat)	7210
Antwerp-Costa Rica (boat)	9400
Average distance by road in Ghana	400
Average distance by road in Costa Rica	100

Alongside AHOLD, the following parties are also involved in this project (see table 1.2).

Table 1.2: 'List of participants in project and reasons for participation'

Participant	**Company profile**	**Role in chain**	**Reason for participation**
Royal AHOLD	Holding of supermarket chains in four continents	Liaison	Project requester. Stimulation of Ghanaian economy as part of AHOLD Africa Sustainable Assistance Project
Albert Heijn	Supermarket	Retailer	New emphasis on sourcing within the framework of sustainability objective
Bakker Barendrecht	Logistical service provider	Stock keeping, packing, distribution of product	Problem formulation relates to 'core business'
Royal Dutch Airlines (KLM)	Air freight transporter	Transporter	Problem formulation relates to 'core business'
Horticultural Association Ghana (HAG)	Horticultural organization in Ghana	Supporting role	Problem formulation relates to 'core business'
Seafreight Pineapple Exporters Association Ghana (SPEG)	Sea freight organization in Ghana	Supporting role	Problem formulation relates to 'core business'
Exotic Fruit Exporters Association Ghana (EFEG)	Fruit exporting organization	Supporting role	Problem formulation relates to 'core business'
Agricultural Economics Research Institute (LEI: Landbouw Economisch Instituut)	Knowledge institute	Project coordinator	Knowledge development
Michigan State University (MSU)	Knowledge institute	Knowledge provider	Knowledge development
University of Ghana (UG)	Knowledge institute	Knowledge provider	Knowledge development

The project group consists of seven private parties and three knowledge institutes. The private parties all occupy a position within the chain, through which they provide a certain added value in various areas to the pineapple product that is ultimately consumed in Europe. This is presented in the form of a diagram in figure 1.1.

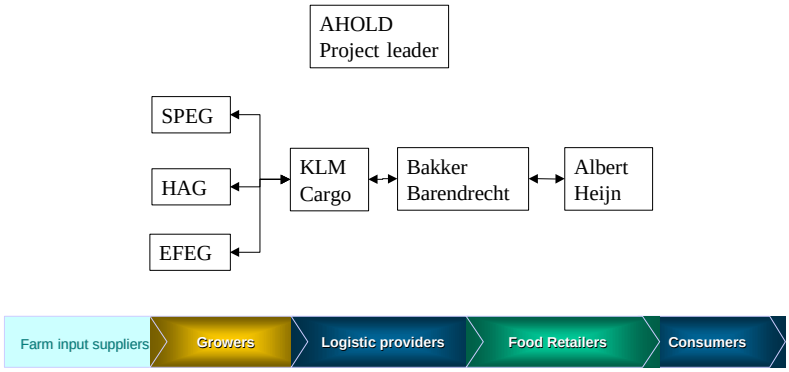


Figure 1.1: 'The place of the private parties in the Ghanaian (sliced) pineapple chain'

1.2 Project objective

The project has four main objectives:

- The reinforcement of the international competitiveness of Dutch retail and wholesale through the expansion of the global sourcing programme to Ghana;
- The reinforcement of the Dutch steering role and logistical service provision through the broadening of international trade flows of fresh fruit to the Netherlands;
- Supporting Ghanaian fruit exports by providing insight into problem areas for the purpose of setting up a sustainable, competitive, integrated export chain for whole and sliced pineapples (sliced pineapple salad);
- The development of an instrument for Dutch industry (benchmark model), to support export chains (in Africa).

Although exports currently take place from Ghana to Europe, for the time being only the b-segments of the tropical fruit market are served, and it is difficult to penetrate the supermarket segment (a-segment). There are various possible causes for this, including: production takes place on a small scale; the sector has a limited degree of organization resulting in the lack of a joint plan; and there is insufficient knowledge of the wishes of consumers and European market demands. The Ghanaian pineapple sector will have to professionalize in these respects. Furthermore, very little account is taken of sustainability criteria with respect to cultivation, processing and transportation. At the same time, there is a growing European consumer demand for high quality and safe exotic fresh products. This presents great opportunities for Africa.

1.3 Structure of the report

In the following chapter, attention will be devoted to the activities carried out and the methodology employed. Chapter 3 will cover the results of the chain analysis. The next chapter presents the 'Supplier Pre-Selection Tool.' Lastly, the results of the chain simulation will be discussed.

The research results contained in this report can be divided into two distinct sections. The chain analysis examines the problem areas in the Ghanaian pineapple sector that came to light in the process of the chain analysis. These problem areas were observed by a large group of experts during field research, in various sections of the chain, namely marketing, logistics, cultivation and post-harvest treatment, and packaging. As far as possible, a comparison is made with two competing countries, namely Costa Rica and the Ivory Coast. Points for improvement are also put forward.

In the second section, the chain simulation (executed by Agrotechnology & Food Innovations) is used for a quantitative assessment of a number of points for improvement (categorized in different scenarios). Consequently, scores are awarded to the three sustainability aspects - profit, people and planet (the triple P approach) - for the various scenarios.

2. Activities and Methodology

2.1 Approach

In order to achieve the objectives stated in section 1.2, a thorough analysis has been made of the current chain through which Ghanaian pineapples are exported to the Netherlands. The strengths and weaknesses that emerged from this form the basis for improvements in the entire chain for the purposes of selling high-quality products in the European market. In order to achieve this, the possible competitive disadvantages of Ghanaian pineapple growers need to be reduced or completely eliminated in relation to 'example countries' like the Ivory Coast and Costa Rica. Any particular strengths of the Ghanaian pineapple sector must then be emphasized. Three matters are of importance in this respect:

- The financial feasibility of redesigning the chain. The costs of both the Ghanaian chain and of a competing chain (in this case, that of Costa Rica) will therefore be mapped out.
- The minimum storage life of a perishable product. In this context, a comparison of the product quality will be made by means of a simulation of the various options.
- Western enterprises also attach increasing importance to corporate social responsibility. To be able to determine the direct effect of such a chain redesign on the environment, the CO_2 emissions are calculated for the different variations.

2.2 Methodology

The working plan is summarized in the table below:

Table 2.1: 'Working plan of project with applied methodology'

Activity	Specification	Explanation	Methodology
CHAIN ANALYSIS	1) Mapping out current chain	Inventory of current chain in Ghana and Costa Rica	Chain analysis by means of desk research and field research carried out by experts
	2) Identification of problem areas	Identifying problem areas in the fields of Marketing, Production and Logistics by means of mission Ghana and Costa Rica	Sector analysis by means of interviews by experts
	3) Formulation of recommendations	Derive points for improvement from the identified problem areas	Make inventory of expert opinions and categorize them
	4) Conclusions of chain analysis	Conclusions based on the chain analysis	Draw conclusions from the most important findings
	5) Achievement of 'benchmark'	Compare farmers with each other on the basis of various criteria by means of benchmark tool, for the purposes of 'Pre-selection tool'	Identification and assessment of Key Performance Indicators (KPIs)
CHAIN SIMULATION	6) Simulation of various chains/scenarios	Simulate Ghana and Costa Rica chain in 'Aladin.'[1] Measure the effect of potential chain improvements	Apply chain simulation
	7) Comparison of achievements of the various chains	Analysis of the differences between chains, both cost analysis and sustainability analysis	Compare results of the chain scenarios against each other
	8) Formulation of recommendations on the basis of chain redesign	Derive points for improvement from the results of the simulation	

2.3 Theoretical framework

A 'whole supply chain' approach was used for the purposes of identifying the problem areas and for the formulation of points for improvement. Various aspects within a chain are then examined, together with the way in which they relate to each other. These areas are:

- Marketing
- Logistics
- Cultivation and post-harvest treatment
- Packaging

[1] Aladin is a chain simulation model designed by A&F, part of Wageningen UR.

The methodology employed in this can best be summarized by means of the figure below:

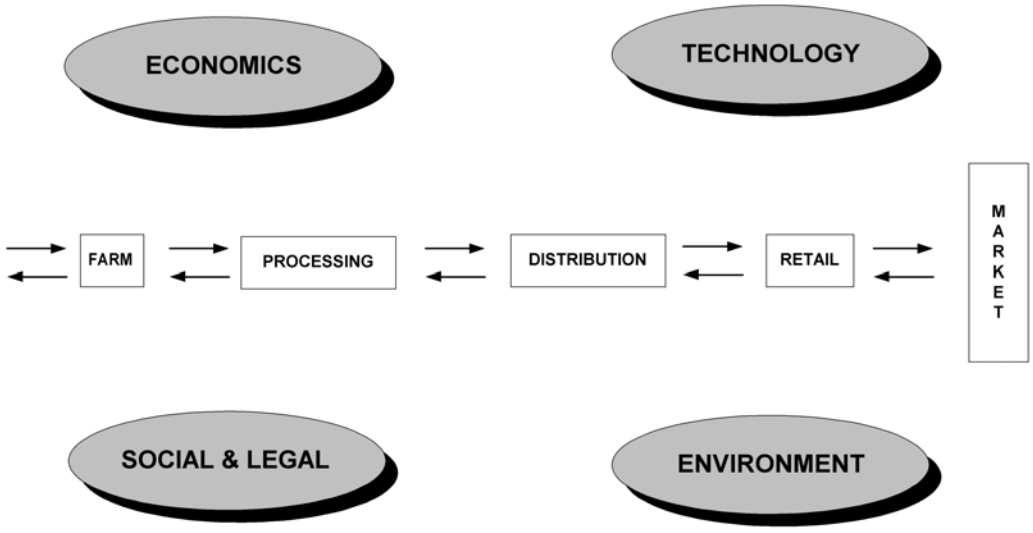


Figure 2.1: 'Dimensions in a food chain' (source: Trienekens, 2002)

There are four important dimensions in a food chain. One of these is an 'enabler,' namely:

- Technology. Current technological situation determines whether or not certain things are possible. Examples include Tracing & Tracking (ICT development), but also innovative concepts, such as new load carriers (such as the envirotainer).

The other three dimensions are:

- The economic dimension (profit). Keywords here are: financial feasibility, transaction costs, added value, division of chain costs, price-making, the time required to recover the investments, productivity, etc.
- The social dimension and (local) legislation in the field of labour (people). Keywords here are: local legislation such as Collective Labour Agreements and occupational health and safety law, good conditions for employees, prohibition of child labour, housing of employees etc.
- The environmental or surroundings dimension (planet). Examples of this include damage to the natural environment, over cropping, harmful CO2 emissions, sustainability of the planet, etc.

Together, these last three dimensions form the 'triple P' approach (people, planet and profit).

2.4 Why changes to the chain?

We can distinguish four main groups (stakeholders) that can exercise power over a chain, namely: (1) industry, (2) citizens (clustered into civil-society organizations), (3) consumers, and (4) the government.

These four stakeholders influence the chain by attaching different interests to each of the three Ps. Conflicts may arise between these differing interests and emphases. These are summarized in the table below:

Table 2.2: 'Interests and spearheads of the four stakeholders in a chain'

	Primary interest	**Secondary interest**
Industry	PROFIT: economic viability and yield	PLANET: environmentally conscious entrepreneurship PEOPLE: good conditions for employees
Citizens	PLANET: clean environment; no environmental pollution PEOPLE: good conditions for employees	PROFIT: price-making of product
Consumers	PROFIT: cost price of product	PEOPLE: good conditions for employees PLANET: clean environment; no environmental pollution
Government	PEOPLE: protection of employees PLANET: protection of planet	PROFIT: collection of funds from transactions

A chain is subject to changes (dynamic chains) on account of stakeholders continuously making new and changing demands of the chain.

Every chain change has a positive, negative or neutral effect on each of the three Ps of sustainability. If a chain change only results in positive effects, this will by definition lead to a more efficient chain. However, with both positive and negative effects, it is difficult to determine whether the chain has become more or less efficient on balance. 'People' and 'planet' are generally approached in a qualitative manner while 'profit' is approached in a quantitative manner (in terms of levels of costs or yields), and they cannot easily be compared with each other. It is possible to weigh the components against each other by expressing the 'planet' component quantitatively within this research, in terms of quantities of emissions.

3. Chain analysis

3.1 Current pineapple chains

An analysis was made of three different chains when making an inventory of the current chain:

1) Fresh pineapple, transported by boat from Ghana to the Netherlands (via Belgium) and sold in that form (1A) or sliced in the Netherlands (1B).
2) Fresh pineapple, transported by boat from Costa Rica to the Netherlands (via Belgium) and sold in that form (2A) or sliced in the Netherlands (2B).
3) Pineapple sliced in Ghana and subsequently flown to the Netherlands (3).

In the abovementioned chains, one or more activities are carried out by various companies. These are presented in the table below.

Table 3.1: 'Activities carried out in the different scenarios'

	Scenario				
	1		**2**		**3**
Chain activity	**A**	**B**	**A**	**B**	
Primary producer / exporter	• Large-scale specialized farms, with small-scale farmers as suppliers • Large, diversified farms • Small farms, some members of cooperatives				
Transport in land of origin	• Own transportation • Hired goods transportation				
Production / collection point	n/a		n/a		'Blue Skies' (sliced)
Sea / air transporter	• Dole, (to Antwerp) bulk transport (twice a week) • Maersk (to Rotterdam), containers (on the basis of need)		• Dole (daily) • Private bulk transporters		• KLM (daily transportation combined with passenger transport.)
Transport in destination country	Bakker Barendrecht		Bakker Barendrecht		Rockwood (including clearance)
Production / collection point	Enspijk (labelling)	Greensnack (slicing)	Enspijk (labelling)	Greensnack (slicing)	*Landelijk Vers Centrum (*National Fresh produce Centre, LVC) and regional distribution centre (RDC)
Retailer	Albert Heijn				

3.2 Key figures for Ghana, the Ivory Coast and Costa Rica

Several varieties are used for exports of pineapples. In recent years, the traditionally popular 'Smooth Cayenne' has made way for the much sweeter variety 'MD2.' Costa Rica has a significant advantage in terms of sales of pineapples abroad (see tables below). In view of Costa Rica's successful switch to 'MD2' and the disappointing results in Ghana with this new variety, Ghana will have difficulty in making up this lost ground.

Exports of pineapples from Ghana and the Ivory Coast are primarily destined for the European market. However, only half of Costa Rica's exports go to European countries. In absolute terms, the exports of Costa Rica and the Ivory Coast are many times larger in scale than Ghanaian exports. Ghana plays a much more significant role in terms of exports of sliced pineapple (see table 3.4).

In the 1980s, Costa Rica was aiming to diversify the agricultural products it offered and to specialize. As a result of this development, larger scale production and exports of non-traditional agricultural products (including citrus fruit, melons and pineapples) was set in motion. This led to explosive growth in the production of pineapples and the increase in the scale of the holdings. This is presented in figure 3.1.

Whereas Costa Rican farmers have therefore dramatically improved their efficiency, little improvement has been made in Ghanaian production yields per hectare over the last 40 years. Consequently, on average, the yield (production level) of pineapples per hectare in the Ghanaian sector is a long way below that of Costa Rica and the Ivory Coast, as shown in figure 3.2.

Table 3.2: 'Production and % export of the total production of whole pineapples (in tonnes of product)'

	Production of whole pineapples			**Exports of whole pineapples**		
	Costa Rica	**Ghana**	**Ivory Coast**	**Costa Rica**	**Ghana**	**Ivory Coast**
2000	903,125	60,000	225,675	322,453	26,173	187,836
2001	950,400	60,000	235,000	386,921	37,167	- *
2002	992,000	60,000	225,000	458,728	- *	173,829

* Data not available
Source: faostat.com

Table 3.3: 'Exports and % export of the total production of whole pineapples (in tonnes of product)'

	Exports of whole pineapples to the European market			**Exports of whole pineapples to the European market (in %)**		
	Costa Rica	**Ghana**	**Ivory Coast**	**Costa Rica**	**Ghana**	**Ivory Coast**
2000	136,581	21,035	186,349	42%	80%	99%
2001	162,753	32,286	- *	42%	87%	- *
2002	178,695	- *	173,139	39%	- *	100%

* Data not available
Source: ITC/WTO data (TSA)

Table 3.4: 'Exports of sliced pineapple (in tonnes of product)'

	Exports of sliced pineapple		
	Costa Rica	**Ghana**	**Ivory Coast**
2000	7	1,487	672
2001	16	2,551	- *
2002	9	- *	92

* Data not available
Source: ITC/WTO data (TSA)

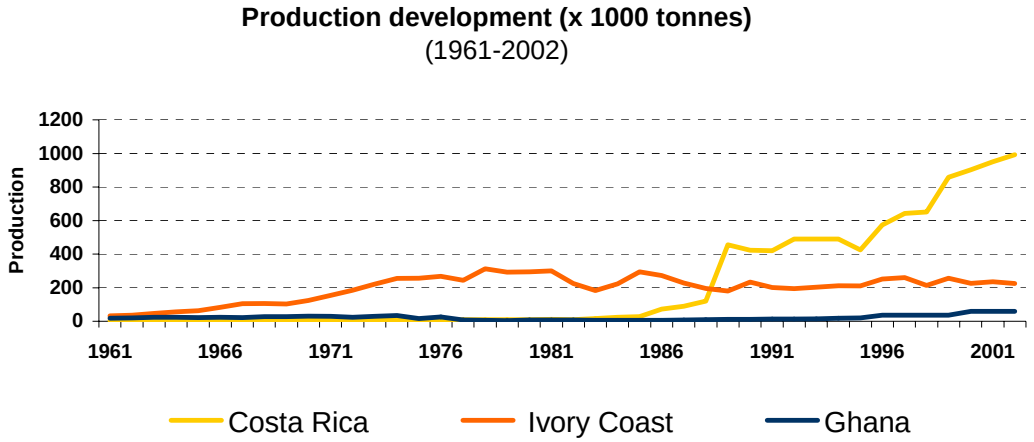


Figure 3.1: 'Production development in Costa Rica, the Ivory Coast and Ghana' (source: faostat.com)

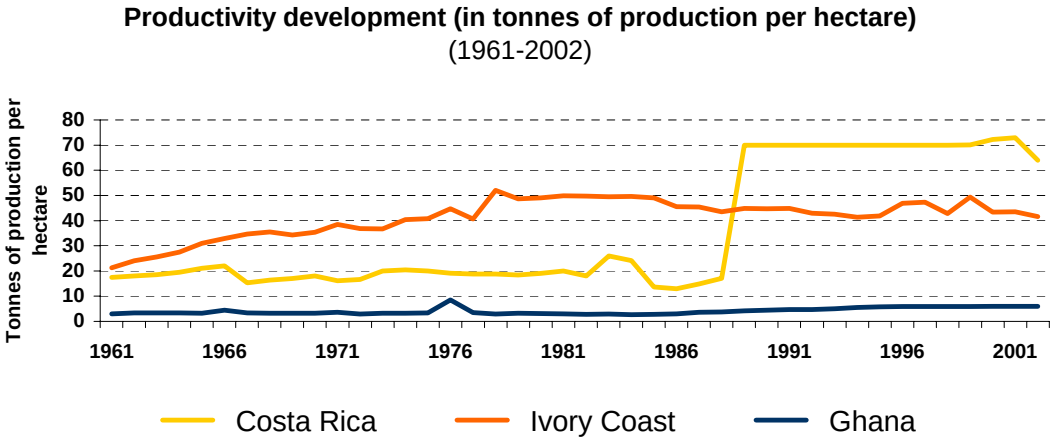


Figure 3.2: 'Productivity development in Costa Rica, the Ivory Coast and Ghana' (source: faostat.com)

3.3 Problem areas and areas for improvement

We used a 'whole supply chain' approach in our analysis. In order to determine the performance of the chain, we looked at the performance of the various individual aspects of the chain, such as:

- Marketing
- Logistics
- Cultivation and post-harvest treatment
- Packaging

Problem areas in marketing

The European market is divided into various market segments with different price and quality ratios. However, the Ghanaian growers do not have a strategy that is adapted to suit these markets in terms of diversification or individual cultivation decisions, and the selection of the varieties to be cultivated - such as Smooth Cayenne, MD2, Queen of Sugar Loaf - is in no way based on the current market developments or on the wishes of consumers and/or supermarkets (see box).

BOX 1: Points for attention regarding supermarkets and consumers

Supermarkets

- Reduce price differences
- Better positioning and promotion of sustainable products
- Stimulation of consumption

Consumers

- Price reduction (25%)
- Better information provision (19%)
- More promotion (13%)
- Less packaging (11%)
- More environmentally friendly production (9%)

(source: snm 2004)

The choice of cultivation method used and/or the certification used (such as organic cultivation, fair trade or EUREP-GAP) is not attuned to market developments either.

One can conclude that the market orientation of the Ghanaian pineapple sector is limited. Consequently, Ghana has not profited from the declining exports of its neighbour the Ivory Coast, resulting from political instability. There is also little trust between importers and pineapple growers. Trust is essential in building a sustainable relationship.

Foreign companies have responded to the demand for cheaper sliced pineapple products well; fruit salads through the British company Blue Skies and vacuum-packed sliced pineapple (bulk packs) through the Dutch company Tongu fruits. First Catering, a company with Swiss origins, has also taken advantage of the catering need for fresh fruit of airline companies. This development in the niche market for pineapple has resulted in Ghanaian exports of sliced pineapple (to the rest of the world) rising far above those of Costa Rica and the Ivory Coast. Table 9 presents the strengths, weaknesses, opportunities and threats for the marketing side of the Ghanaian pineapple sector.

BOX 2: Government urged to provide new variety of pineapples to farmers

Newsletter Kumasi, 8 September 2004 GHANA

The Ghana Institute of Horticulturists has warned that Ghana risks losing its share and competitiveness in the marketing of pineapples on the international market if the government's efforts in giving pineapple smallholdings access to MD2 plant materials - a new variety of pineapple - are not speeded up.

Mrs G.M Timpo, President of the institute, said the value of Ghana's 'Smooth Cayenne' pineapple has been declining since its introduction into the European markets, marking a shift in taste from Smooth Cayenne to MD2 pineapples.

The MD2, which was developed in Costa Rica, has captured about 70 per cent of the European market.

Mrs Timpo was addressing the two-day fifth annual general meeting of the institute at its opening on Wednesday.

The MD2, she said, is described as super-sweet, self-ripening and having a longer storage life. Furthermore, its value is more than twice that of the Smooth Cayenne pineapple.

In an address read on his behalf, Prof Kassim Kasanga, the Minister of the Environment and Science, said that the horticultural export industry in Ghana is a success story of a private sector-led industry, giving meaning to the government's vision of turning the private sector into the engine of growth. He said the total volume of Ghana's horticultural exports had more than doubled in the past decade.

The Minister said he was unhappy that most Ghanaian horticultural exports target the low value end of the market, denying the country of the true value of the volumes of exports.

Prof Kasanga suggested that horticulturists should expand the production base of existing export crops and also develop new ones on a sustainable basis in order to lift the horticultural industry to a higher level of sophistication.

The institute should also develop a more co-ordinated approach to the development of the horticultural industry and ensure that small-scale growers and exporters are not left out of the growth of the industry.

In an address read on his behalf, Mr Sampson Kwaku Boafo, the Ashanti Regional Minister, said the increase in the production of traditional crops like cocoa "does not necessarily entail increase in export earnings, mainly because the world prices are dictated to the producers by the buyers."

Mr Boafo said the government would therefore fully commit itself to diversification to help the country to depend less on traditional exports.

Source: ghanaweb.com

Table 3.5: 'SWOT analysis of the marketing side of the Ghanaian pineapple sector (market orientation)'

STRENGTHS	WEAKNESSES
- There is an existing sales channel to Europe for sliced pineapple - SPEG (Sea Freight Pineapple Exporters Association) is already trying to represent its members from the strongest possible position. This role can also be extended even further. - The collaboration between the SPEG and the exporters will be examined - The small-scale farmers are very flexible - A great many projects in the Netherlands are subsidized by the PSOM and the EU in order to encourage the commercial activities of various sectors in Ghana - Research is continuing into ways of strengthening the domestic chain in Ghana, for example through the World Bank.	- Relatively small export volumes - Unstructured supply - Uncontrolled, steered by production volume, growth in the pineapple sector - Financial limitations, high interest rate (up to 50% on sort-term loans!!!) - Little knowledge of the wishes of consumers - Lack of market information systems - Lack of management capacity. Only practical management available - Own capacity overestimated - No unity. Great competition between growers producing for the same customers - No Ghanaian agent in Europe - No laboratory available for testing quality and certification - Limited knowledge of organic cultivation - The local market is small - Poorly developed local market, particularly with respect to cushioning the effects of overproduction or lack of exports - Major cultural differences between Ghana and Europe - Little trust between Ghanaian suppliers and importers or European purchasers
OPPORTUNITIES	THREATS
- Short distance to the European market - Relatively low prices due to devaluation of the local currency - The creation of a national quality mark through a joint effort by the five largest growers - High potential of domestic and regional market - A great deal of help is offered in the field of knowledge transfer, certification etc. - More could be done with the by-products of processed pineapple - When the Tema Fruit Terminal is complete, this could provide an enormous boost to exports of pineapples. A precondition for this is that quality control arrangements are in good order in the preparation phase - There are many alternatives alongside whole pineapples, such as tinned pineapple, pineapple juice and fruit salads	- Competition from the world market (including Costa Rica) and a global surplus of supply - Competition from new varieties of pineapple (MD2) - The Ghanaian growers are at a disadvantage in terms of information, in contrast with European customers. They do not have all the information, whereas the European customers are generally well informed - Quality systems to be implemented are becoming ever more complex and therefore difficult to implement in the Ghanaian sector.

Areas for improvement for marketing

In order to prevent further losses in the market and to gain new sections of the market for the Ghanaian pineapple sector, it is essential to set targets in the field of Customer Relationship Management (CRM). Customer Relationship Management is a business strategy that takes the relationship with the client as its starting point. Neither the product nor the process but rather the client occupies the central position in the business operational management.

The Ghanaian farmers could improve their competitiveness by better anticipating the needs of the customer. In other words, they should devote more attention to the CRM aspects described in box 3, below.

BOX 3: Relevant CRM solution for more market-oriented actions by the Ghanaian pineapple sector:

- Accessibility: Accessibility has various forms, from physical accessibility to the more abstract meaning of accessibility of products.
- Familiarity: Once a relationship exists between a customer (or potential customer) and a company, it is of great importance that the company makes use of that familiarity in a positive manner.
- Advice: The correct advice in the perfect match between the wishes of the client and the characteristics of the product of that company. The customer wants information quickly in response to his questions at the time. Advice is about understanding the questions and needs of the client. Knowledge of one's own products and services is also an important factor. Maintaining the level of quality of the knowledge and the opening up of knowledge can be a very complex affair, particularly for the Ghanaian sector.
- Keeping promises: The ability of a company to deliver the correct product or service at the agreed time and at the agreed price. The basis for keeping promises lies primarily in the internal communications, harmonization, planning and production processes. After all, in order to make realistic promises, it is necessary to be aware of all the goings on within the organization. Only then can a company keep its customers appropriately and well informed.
- Price: If the customer considers the product too expensive, the deal will not go ahead. Setting the price is therefore a process that always brings with it a certain amount of natural tension.
- Delivery: If the delivery does not meet the customer's expectations, this all too often means an end to the relationship between the customer and the supplier. In the supermarket sector in particular, saying 'no' is far from advisable.
- Communication: Communication is the outwardly visible form of all Customer Perception Factors. Without communication, there can be no relationship with the customer. That communication may consist of personal contact, but may also take place through numerous different media: through a voice response system, a fax or a website, etc. However, customers are all too often fobbed off with the excuse that 'something went wrong with the communication' if there are problems with fulfilling promises. In most cases, this is untrue or inaccurate. If one digs a little deeper, one comes across problems that lie in the field of the other perception factors.

Problem areas in logistics

In recent years, there has been a lot of investment made in the Ghanaian infrastructure. This came about primarily because the World Bank lends a lot of money both to the government and to private companies. This is illustrated in table 3.6.

Table 3.6: Differences in infrastructure in Ghana, Costa Rica and the Ivory Coast'

Infrastructure	Ghana	Costa Rica	Ivory Coast
Area (km2)	239,460	51,100	322,460
Railways (km)	953	950	660
Asphalted roads (km)	11,665	7,896	4,889
Unmetalled road (km)	27,744	27,996	45,511
Inland waterways (km)	1,293	730	980
Ports	2	6	4
Airports (asphalted runways)	7	30	7

Source: www.theodora.com

The table shows that almost 30% of the total number of kilometres of road in Ghana are asphalted. Costa Rica (20%) and the Ivory Coast (10%) are less well off in this respect. However, where absolute numbers of metres of asphalted road per square kilometre of land are concerned, Costa Rica (with its 155 metres per square kilometre) scores better than Ghana (49 metres) and the Ivory Coast (15 metres). Such figures, combined with the very antiquated means of transport (particularly for smaller-scale poorly-organized farmers) in Ghana and the inadequate refrigeration facilities, result in a lower quality product.



Photograph 1: 'Example of transport in Ghana'

The pineapple sector is not well organized. The continuous demand is low, due to the poor product quality and the inadequate reliability of deliveries.

The 'you buy what we produce' mentality needs to make a complete 180-degree turnaround, becoming a 'we produce what you can sell' philosophy, so that sales can be increased.

As a consequence of the low volumes, there is only one shipping company available to transport freight from Ghana. The 'Dole' boat, which calls at the Tema port twice a week, charges a fairly high price, which is not proportional to the distance that it travels (see box). These freight costs account for 40% of the cost price, which has a negative influence on the final cost price of Ghanaian pineapples.

The most significant problem areas in the field of logistics are:

1. a poor infrastructure
2. poor quality of the means of transport used
3. a lack of refrigeration facilities, resulting in inferior product quality,
4. the exported volumes are too low
5. the freight costs are too high

The mutual dependency between the last three factors is demonstrated in the figure below:

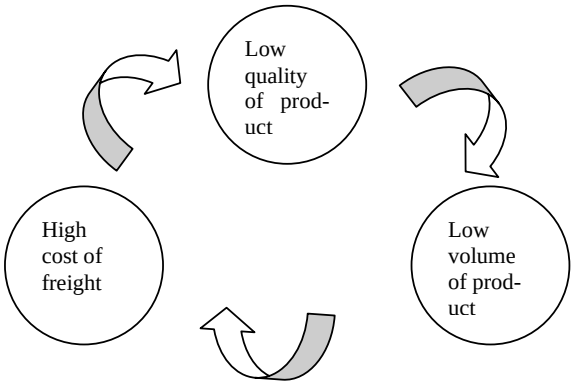


Figure 3.3: 'Vicious circle of three shortcomings in Ghana'

BOX 4: Enormous difference in freight charges between Ghana, the Ivory Coast and Costa Rica

Globalization and liberalization lead to an increase in the international transport flows of agricultural produce as the distance between the source and the sales region of agricultural products is becoming greater and greater. In general, an increase in sales has a positive effect on the prices and brings global prices closer to each other. However, many price differences are still evident.
Various reasons for this are given below:

-Prices are dependent on the **quantity of freight carried**. However, due to the combination of large capacity and the low frequency of cargo ships, it is difficult to increase the frequency. An increase in the number of ships is only possible in the event of a permanent increase in the volumes to be carried. This presents particular problems for developing markets. As the high freight costs put a lot of pressure on the final sales price, there is little scope for the improvement of product quality. Consequently, the volumes remain low and the freight costs remain relatively high (due to little supply). It is a vicious circle that seems to be difficult to break.

-Geographical situation can have a great impact on prices. For example, the prices of transport by sea are not only dependent on the quantities being carried. The cargo being transported in the opposite direction is also an important factor determining the price. The difference in the loads being carried between the eastern (51%) and the western (76%) routes between Asia and Europe thus results in enormous price differences. Attempts to minimize empty holds on the eastern route ensure a market price that converges in the area of the marginal costs (port and administrative costs). This will lead to a higher price on the western route.

-The **port charges** can vary greatly by country, as they are based on the scale, the initial investment costs of the port and the number of ships calling at the port, amongst other things. The government can also introduce levies, which can drive prices higher.

Source: McKinseyquarterly.com

Table 3.7: 'SWOT analysis of the logistics of the Ghanaian pineapple sector'

STRENGTHS	WEAKNESSES
- Good geographical location of Ghana. The 'Dole' boat takes between eight and twelve days to reach Europe. In comparison, the journey time from South America to Europe is twelve days or longer - Medium-sized and large farms are taking steps to fulfil the European standards (such as EUREPGAP). However, there is still insufficient 'drive' to achieve a fully refrigerated chain - It appears that most of the larger farms also take care of the logistical and packing activities (this can improve reliability) - Competitive air freight charges in comparison with other African countries - An average journey time of one to three hours from the farm to the port. (In Costa Rica, this is four to five hours) - Relatively low labour costs (Ghana: $30 per month, Costa Rica: $10 per day) - The political stability in Ghana is favourable for further development of the sector	- The 'Dole' boat only sails from Ghana to Antwerp twice a week - The transportation on the 'Dole' boat from Ghana to Antwerp is uncertain, since it works on the basis of available space - Pineapple growers are forced to attune their harvesting to the sailing schedule, resulting in a loss of quality (due to the perishability of the product) in the event of the boat being delayed, due to the lack of refrigeration facilities in the Tema port - The sailing time of the Maersk (container) service between Ghana and Rotterdam is too long, due to transhipment in Spain (approximately 20 days), and is therefore not a good alternative - The transport costs are very high ($182.50 per pallet) compared with other African countries (costs in the Ivory Coast, for example: $120 per pallet), which brings a competitive disadvantage - The product quality is negatively influenced by the lack of refrigeration facilities on the growers' premises and the lack of refrigerated transportation - Late VAT refunds in Ghana result in cash flow problems for growers and other links in the chain - Few opportunities to borrow money as reasonable rates of interest - Growers have no insight into the treatment at the final destination. As a result, deliveries are often refused, bringing obvious financial consequences - There is insufficient monitoring in accordance with EUREPGAP, as insufficient inspections, audits and certification take place - Little monitoring of the chain, resulting in a lot of losses - Ghana is hindered by a poor infrastructure, and the quality of the means of transport is too low
OPPORTUNITIES	**THREATS**
- Cooperative opportunities in order to be able to offer more volume - Large farms are better able to work with the so-called 'out-growers' in order to increase flexibility of supply - In view of the political instability of surrounding countries, there are opportunities to take over the role of meeting the European demand. - Sales opportunities for sliced pineapple in the USA, since Ghana (along with just four other airports in African countries) has obtained the right to fly directly to America - Large wealthy foreign parties can bring about changes by means of investment	- Few alternatives to sea freight. This situation checks competitive transport prices - Few financing opportunities for small farms - Little access to high quality plant material

Areas for improvement for logistics

Important improvements that can be achieved in the field of logistics.

- Improving product quality: In the medium term, this should lead to higher export volumes, which in turn could lead to slightly lower freight costs;
- Medium-sized and large-scale growers should build up long-term relationships with the small-scale growers that supply to them. Advantages of outsourcing instead of producing are:
  - Faster response time (cultivation takes at least two years, from planting to harvesting)
  - Lower investment costs
  - Less risk of losses (the grower bears this risk)
  - Better quality, 'out-growers' are specialized in cultivation;
- Allowing producers to work together in order to generate certain volumes. Consequently, the certification of the production is also simplified;
- Investing in refrigeration facilities in order to safeguard product quality.

Problem areas in cultivation and post-harvest treatment

Correct post-harvest treatment is very important in view of the fact that the average loss following harvesting is between 20 and 50 per cent. Improvements following harvesting can therefore lead to a substantial reduction in loss.

The main reason for losses with regards to Ghanaian pineapples is the lack of a closed refrigerator. The long transit time also plays a major role. However, this transit time is 80 to 90% dependent on the sailing time of the 'Dole' boat. Since air transportation is a very expensive alternative, the greatest profit can be gained through the refrigeration of the pineapple directly after harvesting. Lastly, it is important to harvest the pineapple at the correct stage of ripeness, in order to achieve the longest possible storage life.

The table below presents the strengths, weaknesses, opportunities and threats for the cultivation and post-harvest activities of the Ghanaian pineapple sector.

Table 3.8 'SWOT analysis of the cultivation and post-harvest activities in the Ghanaian pineapple sector'

STRENGTHS	WEAKNESSES
- A number of growers have successfully exported fresh and sliced products to Europe - Growers are aware of the effects of the heat, and therefore harvest in the morning - The sorting and packing of pineapples takes place in the shade or in sheds - The transit time for air freight is just 16 hours between harvesting and the aeroplane - A product of a reasonable quality is cultivated. Even if the flows go via 'outgrowers'	- Many growers are forced to harvest the pineapples at a lower Brix value than the optimum value for taste (12-14) in order to extend the storage life - There is a lot of damage to products during transportation. On the one hand, this is due to poor packaging, but it is also due to inadequate procedures during loading and unloading and due to the poor roads - Although the fruit is placed in the shade, no effort is made to actually refrigerate the produce after harvesting - Most of the pineapples are transported within Ghana in non-refrigerated conditions. They are sometimes kept in high temperature conditions for 12 to 72 hours - Growers claim that the fruit has a sufficiently long storage life. However, there is no data to support this. - The yield of Ghanaian growers per hectare is on average less than that of growers in Costa Rica - The cultivation methods of small-scale farmers vary greatly
OPPORTUNITIES	THREATS
- Although not yet used intensively, there are already refrigeration facilities available	- The fruit is generally harvested too early, in order to generate a longer storage life - Little attention is paid to refrigeration - The new variety, MD2, is expected to be even more sensitive (susceptible) to temperature changes than the Smooth Cayenne - Illiteracy makes it difficult to keep track of matters related to certification

Areas for improvement for cultivation and post-harvest treatment

Improvements in cultivation methods are often far-reaching and time-consuming. However, there are still a number of structural changes required if Ghana wants to increase its production per hectare. There is still a great lack of expertise on technical cultivation matters. For example, cultivation on hillsides is very commonplace, whereas cultivation on level soil would reduce erosion.

- The dissemination of knowledge is the first step towards better cultivation methods

Through the improvement of the post-harvest treatment, a distinction can be made in the short-term points for improvement, whereby the current situation can be improved to some extent by means of minor adjustments, and the long-term areas for improvement, which will be accompanied by major investments and which demand more time.

The short-term points for improvement include:

- Early harvesting and ensuring that the harvested product reaches the packing station within 30 minutes;
- Ensuring that the products are always kept in the shade;
- Constructing roofing at the airport, so that the products are not affected by rain or the sun;

- Growers must be encouraged to install simple refrigeration systems themselves, in order to be able to refrigerate the product before loading;
- There is now a refrigeration facility available at the airport, but further facilities are necessary in order to speed up the loading of the refrigerated products.

Areas for improvement in the longer-term:

- Refrigeration facilities will be necessary at the Tema port, so that the pineapples can be refrigerated during storage and transhipment;
- Loading procedures should be more structured in order to speed up the process.

Problem areas relating to packaging

Good packaging is essential for exports. The packaging must be able to prevent damage during transportation. The requirements set for packaging are that they are strong while also allowing air to pass through and being sufficiently resistant to moisture. In addition, they must also meet the European and United States' norms of dimensions of 60x40cm.

There are three local packaging companies in Ghana, namely Poly Kraft, Ghana Carton and Packrite. However, the large-scale growers do not make use of these companies, as the packaging is of an inferior quality compared with the packaging that they import from South Africa (Mondipak), France (Smurfit-Socar) and the Netherlands (Kappa). This imported packaging is heat-glued whereas locally produced packaging has hand-folded corners. The imported packaging is much stronger and more resistant to moisture and rain. See table 3.9 for further strengths, weaknesses, opportunities and threats.

Table 3.9: 'SWOT analysis of the packaging method'

STRENGTHS	WEAKNESSES
- Ghana has three local packaging companies, namely Poly Kraft, Ghana Carton and Packrite. However, the large-scale growers do not make use of these companies, as they can obtain better materials from South Africa (Mondipak), France (Smurfit-Socar) and the Netherlands (Kappa). - The growers are very flexible in terms of consumer wishes regarding packaging - The local packaging companies are very flexible and service oriented. They intervene in the event of a shortage of packaging. This can result in their ultimately becoming a more reliable party than international suppliers.	- There are more problems with the locally produced packaging than with the imported packaging - Ghanaian packaging companies use hand-folded corners instead of the heat-glued corners. Hand-folded corners are not as strong. The reasons for this are the current problems in Ghana with electricity and the insufficient capital for investment in machinery - The cardboard produced in Ghana is not water-resistant. The high degree of atmospheric humidity can be disastrous for the strength of the packaging. - Insufficient checks and tests are carried out in the Ghanaian packaging industry. The transit time for the delivery of cardboard is long (4 to 5 months). - The large-scale growers obtain their packaging from Europe. This necessitates extra logistical dealings.
OPPORTUNITIES	**THREATS**
- Traders can use their influence in the chain to reduce the price of the cardboard boxes. Boxes currently cost approximately $1.20 each. - Initiatives involving recyclable plastic crates are already in motion, with the potential to reduce costs considerably - There are opportunities to work with heat-glued corners - Opportunities for the local packaging companies will arise when exports of pineapples increase.	- The costs of packaging are high, amounting to 21% of the total cost price. - There is little trust, and therefore little willingness to collaborate in collective purchasing of packaging - Moreover, the production of packaging for the fruit industry is only a small market and does not take priority

Areas for improvement relating to packaging

Possible areas for improvement in the field of packaging include:

- The use of recyclable crates would mean one less process for the chain. The boxes currently have to be transferred into the standard Albert Heijn crates by Rockwood or Bakker Barendrecht;
- Customers should be more precise in specifying the quality of cardboard that they wish to be used, since the growers themselves have little insight into this;
- Time and money need to be invested in the dissemination of expertise in Ghana, regarding goal-oriented practical expertise, such as information on types of cardboard, glued corners, water-repellent coatings etc.;
- Boxes should contain as little empty space as possible. This reinforces the boxes, thus ensuring more carrying capacity. Boxes are then also better able to withstand the forces exerted on them during transportation. Del Monte uses this type of box in Costa Rica with great success;



Photograph 2: 'Freight damage in the Tema port.'

- Research needs to be done into the optimum packaging methods for sliced pineapple, in order to extend the storage life;
- Research must also be carried out into packaging for fresh pineapples. Pineapples that can be transported without the crown cost 50% less to transport. If the storage life can be guaranteed, this could be applied to sliced pineapple. This is not an option for whole pineapples, as the customers want the crown on their pineapple;
- Temperature indicators should be hung on the pallets or boxes in order to monitor any temperature changes in the chain;
- Packaging is a very important element in the chain for quality. The possibility should be considered to start up a programme in packaging at the University of Ghana. There is great demand for this. Tongu fruits, one of the major growers, is also occupied with the provision of training in the field of packaging for small-scale farmers (out-growers) and is keen to collaborate with the university on this.

3.4 Conclusions of chain analysis

Alongside the abovementioned areas for improvement, a number of general conclusions were drawn on the basis of the chain analysis. These are summarized below.

- Ghanaian farmers do not appear to be very market-orientated;
- Ghana has a very underdeveloped pineapple sector, particularly in the field of refrigeration and packaging. In order to ensure that Ghanaian growers are of interest to European companies, they will need to present themselves in a more professional light and make major improvements in the field of product quality;
- Large-scale growers have already been able to make major improvements, but they still remain dependent on other parties in the chain, particularly with regards to refrigeration and therefore also product quality;
- An effective, closed refrigerator is essential for the export of pineapples from Ghana;
- Packaging material must be improved. A good alternative for this could be boxes such as those used by Del Monte;

- Quality control should be applied in the chain;
- The sliced pineapple salads have good sales possibilities in Europe, particularly in countries like Great Britain and the Netherlands;
- There is still great potential to increase exports of sliced pineapple. This can benefit the quality of the pineapples and therefore act as a stimulus for exports of fresh pineapple.

4. Chain simulation

4.1 Description of scenarios

When simulating the current chain, the scenarios described earlier in this report occupy a central position:

1. The fresh pineapple that is transported by boat from Ghana to the Netherlands (via Belgium) is transported and sold in that state (1A) or sliced in the Netherlands (1B).
2. The fresh pineapple transported by boat from Costa Rica to the Netherlands (via Belgium) is transported and sold in that state (2A) or sliced in the Netherlands (2B).
3. The pineapple fruit salad that is sliced in Ghana and then flown in to the Netherlands (3).

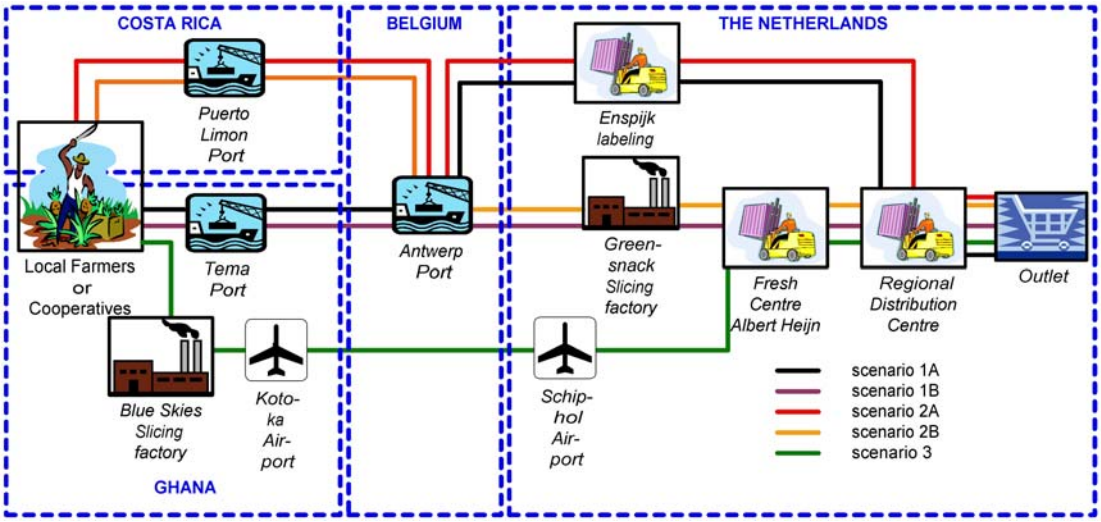


Figure 4.1: 'Diagram of the various scenarios'

4.2 Results of simulation; costs

An inventory has been made of the costs for the various chains, and these costs have been incorporated into the simulation environment (so that account can be taken of the loss percentage associated with certain processes).

The total logistical costs for the scenarios named in section 4.1 are presented in the table below.

Table 4.1: 'Logistical costs for the scenarios'

Logistical costs (scenario indicated in brackets)		Costa Rica Ship	Ghana Ship	Aeroplane
Costs in Euro/kg	Whole	*0.34 (2A)*	*0.34 (1A)*	*data not available*
	Sliced	*0.81 (2B)*	*0.80 (1B)*	*1.25 (3)*

In spite of the relatively low air freight prices in comparison with other countries (see chain analysis for logistics), the logistical costs in scenario 3 are very high. This is probably partially compensated by the much lower production costs in Ghana compared with the Netherlands, due to lower wages.

Further explanations will be given of the scenario comparison below.

Scenario	*Description*		*Scenario*	*Description*
1a	**Chain for whole pineapples from Ghana (not refrigerated)**	*VERSUS*	**2a**	**Chain for whole pineapples from Costa Rica (refrigerated)**

The net results of the logistical costs are presented in the figure below.

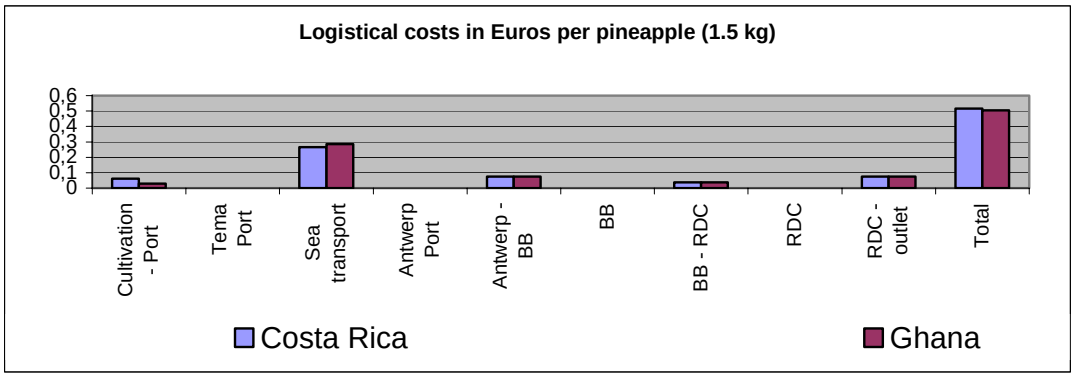


Figure 4.2: 'Logistical costs for both scenarios'

The logistical costs are chiefly the result of the high freight costs (sea transport) and these are responsible for more than half of the total logistical costs.

4.3 Results of simulation; storage life

A quality deterioration model is necessary in order to be able to determine the loss of storage life of the whole pineapples. The empirical model as shown in the figure below was chosen on the basis of data from literature. It appears that whole pineapples have a long storage life if kept at low temperatures.

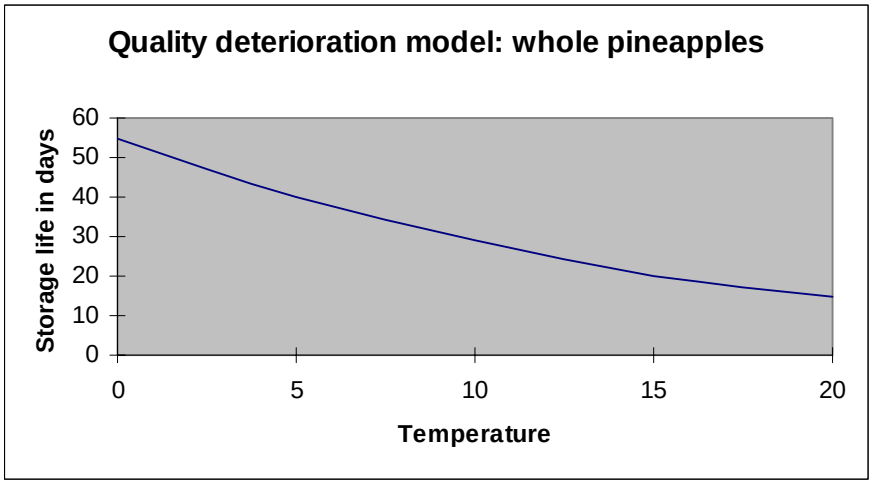


Figure 4.3: 'Quality deterioration model for whole pineapples'

The storage life of sliced pineapple is determined by the microbiological situation and more specifically the concentration of yeast present. A processed pineapple is not sterile. The initial bacterial content is greatly dependent on the previous history of the product: ripeness at the time of harvesting, harvesting conditions and chain conditions. The figure below shows the expert model in graph form.

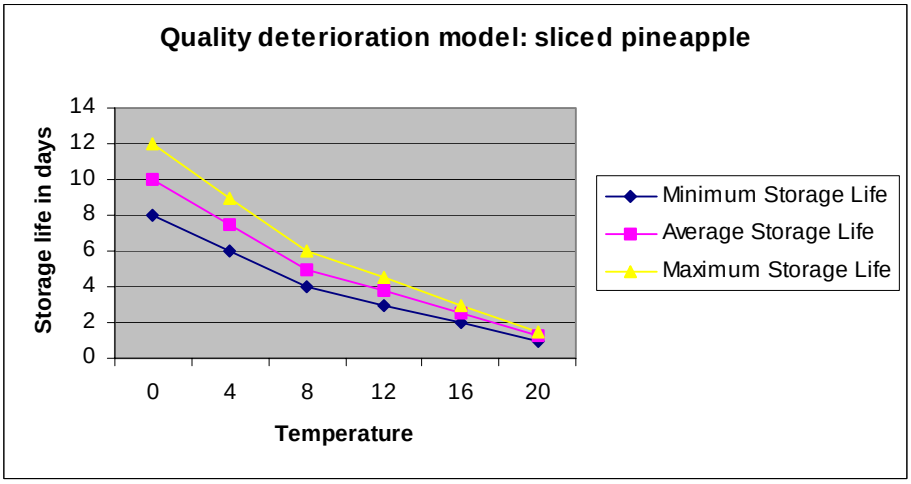


Figure 4.4: 'Quality deterioration model for sliced pineapple'

The total remaining storage life for the scenarios named in section 5.1 are presented in the table below.

Table 4.2: 'Remaining storage life for scenarios'

Remaining storage life in days		Costa Rica Ship	Ghana Ship	Aeroplane
Based on 20 degrees	Whole	*9.0 (2A)*	*5.0 (1A)*	*data not available*
Based on 7 degrees	Sliced	*5.1 (2B)*	*4.1(1B)*	*3.9 (3)*

Further explanations are given for three comparisons between scenarios.

First comparison: A simulation was carried out using the following two scenarios in order to be able to determine the effect of refrigeration versus non-refrigeration from harvesting time until reaching the port.

Scenario	*Description*		*Scenario*	*Description*
1a	**Chain for whole pineapples from Ghana (not refrigerated)**	*VERSUS*	**2a**	**Chain for whole pineapples from Costa Rica (refrigerated)**

The net results of the logistical costs are presented in the graph below.

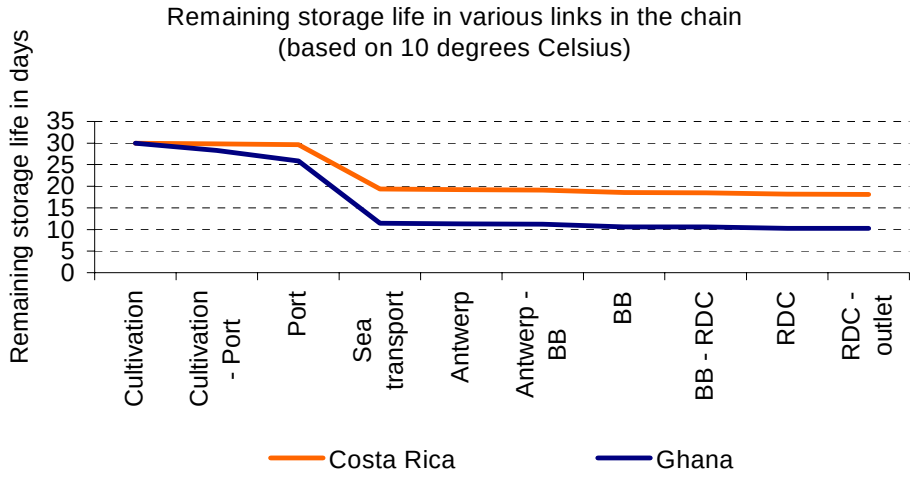


Figure 4.5: 'Remaining storage life in the two compared scenarios'

It appears that a great deal of quality is lost in the initial stages between cultivation and arrival at the port. The storage life is expressed at the various stages of the chain in terms of remaining storage life in days, based on a temperature of 10 degrees.

The final 18 days (for Costa Rica) and 10 days (for Ghana) of storage life at the outlet would be translated into a storage life of nine and five days respectively at room temperature in the consumers' homes.

Second comparison: The following scenarios were compared in order to gain insight into the remaining storage life of sliced pineapple fruit salad (sliced in the Netherlands) originating from both Ghana and Costa Rica.

Scenario	*Description*		*Scenario*	*Description*
1b	**Chain for sliced pineapples from Ghana (not refrigerated, and sliced in the Netherlands)**	*VERSUS*	**2b**	**Chain for sliced pineapples from Costa Rica (refrigerated, and sliced in the Netherlands)**

Due to the assumed history of perishability (part of the decay of the whole pineapple is carried through into the quality of the sliced pineapple), the storage life of the sliced pineapple is dependent on the quality of the imported whole pineapple. The net results of this chain simulation are presented in the following two figures. The number of days of storage life on the shelves is calculated on the basis of the number of days after production that a processor of perishable good gives its products. For example, P+5 means a further five days of storage life following production.

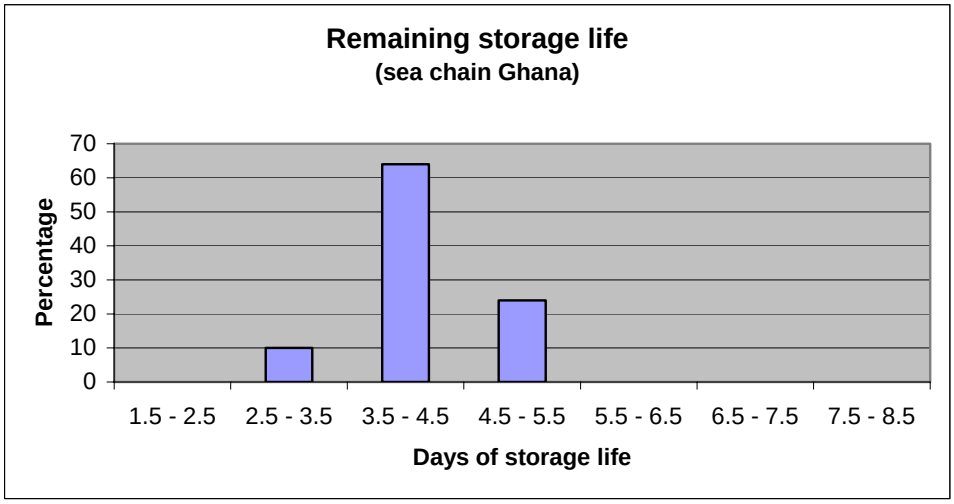


Figure 4.6: 'Remaining days of storage life for the Ghanaian sea chains'

The simulation shows that if a P+5 code (a realistic code for non-refrigerated pineapples needed to be processed) is given by a slicing factory in the Netherlands, 10.6 % of the pineapples do not reach the shelves 'on time'.

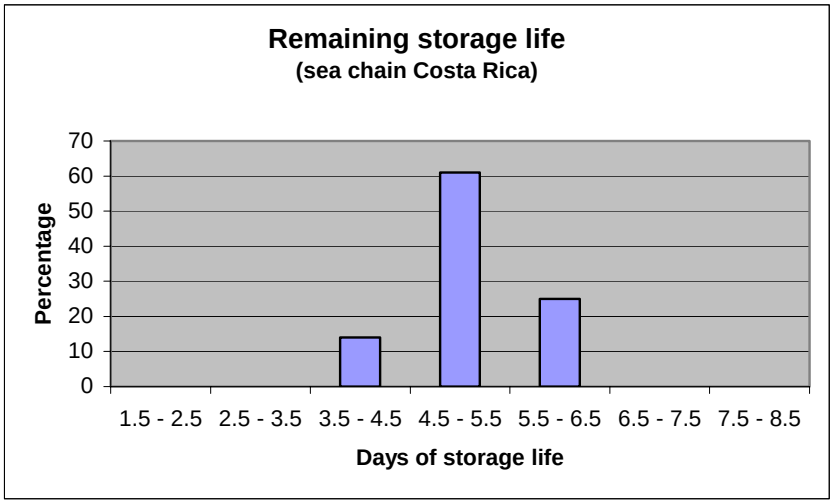


Figure 4.7: 'Remaining storage life for the Costa Rican sea chain'

The simulation showed that if a P+5 code were to be given to the products, 0% of the pineapples should be rejected on the shelves.

If a P+6 code were given, 11.8 % of the pineapples would not have reached the shelves 'on time'.

The two figures therefore show that if the pineapple sliced in the Netherlands has a fully refrigerated history (from harvesting up until reaching the slicing factory in the Netherlands), then the product will have almost one whole extra day of storage life. Consequently, sliced pineapple originating from Costa Rica can be designated as P+5 (for 100% acceptation of the products), as opposed to a P+4 for Ghanaian pineapples (in other words, having a storage life of five or four days respectively after slicing).

Third comparison: The scenarios presented below have been compared with each other in order to gain insight into the effect of the refrigeration in the aeroplane on the remaining shelf life of pineapple fruit salads sliced in Ghana.

Scenario	*Description*		*Scenario*	*Description*
3	**Chain for sliced pineapples from Ghana (flown in at a temperature of 7° Celsius)**	*VERSUS*	**fictional**	**Chain for sliced pineapples from Ghana (flown in at a temperature of 1° Celsius)**

The effects of the refrigeration in an aeroplane were examined with regards to the optimum temperature for sliced pineapple of 1 degree Celsius. This fictional scenario also provides insight into the possible use of so-called envirotainers.
The result of this simulation is presented in the figure below.

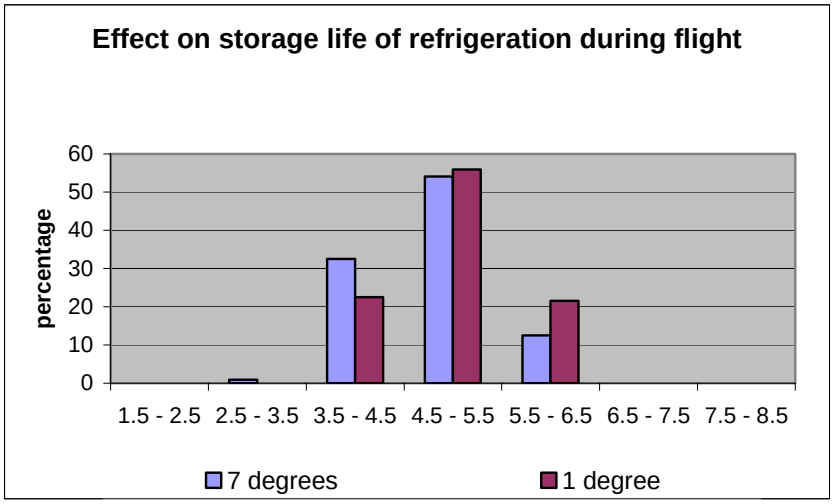


Figure 4.8: 'Effect of refrigeration during flight on the storage life of sliced pineapple '

The ultimate consequences for the storage life are minimal. At a temperature of 7 degrees, the average storage life is 4.8 days, whereas at a temperature of 1 degree the storage life is 5 days (only 0.2 days longer).

4.4 Results of simulation; sustainability

The environmental impacts (expressed in the quantities of emissions) for the various scenarios are presented in the table below.

Table 4.3: 'Emissions in the various scenarios'

Emissions per kg of product (scenarios in brackets)		Costa Rica Ship	Ghana Ship	Aeroplane
Emissions (grams CO2/kg)	Whole	*162(2A)*	*205(1A)*	*data not available*
	Sliced	*566(2B)*	*609(1B)*	*4,140(3)*

Two comparisons between scenarios are explained further.

Scenario	*Description*		*Scenario*	*Description*
1a	**Chain for whole pineapples from Ghana (not refrigerated)**	*VERSUS*	**2a**	**Chain for whole pineapples from Costa Rica (refrigerated)**

Firstly, the difference in emissions between the sea chains of Ghana and Costa Rica was examined. This provides insight into the damage caused to the environment through the export of pineapples.

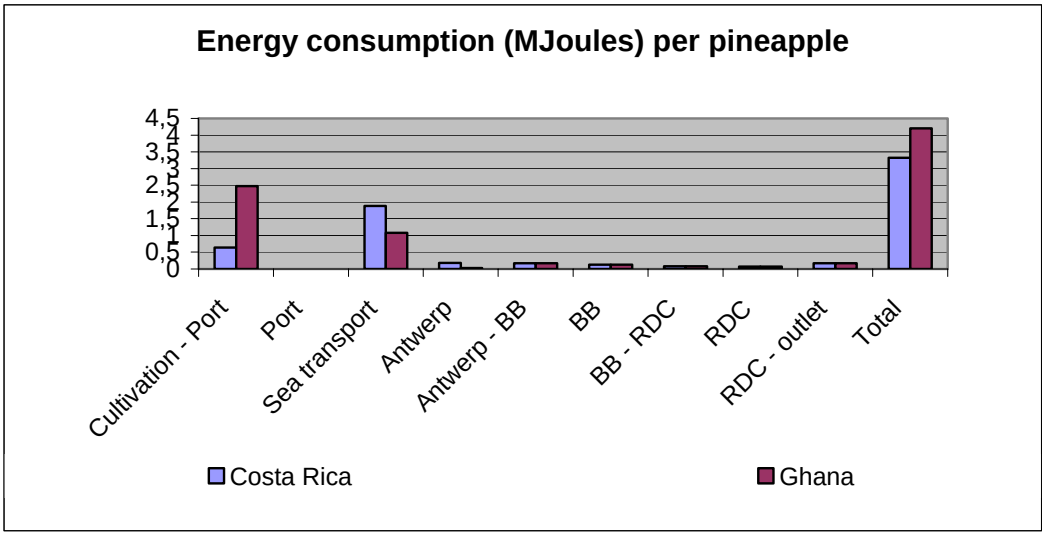


Figure 4.9: 'Effect of refrigeration during flight on the storage life of sliced pineapple'

It appears that the greater sailing distance from Costa Rica to Europe results in almost twice the emissions in comparison with the sea transportation from Ghana to Europe. However, this does not result in a negative verdict on the Costa Rican chain, since the levels of emissions in the Ghanaian chain between cultivation and arrival at the port are much higher. This is partly due to the fact that the distance to the port is a little longer on average (see table 1.1). Another reason is the relatively antiquated and smaller scale transport used. It should be noted that the latter point does not apply to the same extent to large-scale farmers in Ghana.

The second comparison involves the following two scenarios.

Scenario	*Description*		*Scenario*	*Description*
1b	**Chain for sliced pineapples from Ghana (not refrigerated, and sliced in the Netherlands)**	*VERSUS*	**3**	**Chain for sliced pineapples from Ghana (flown in at a temperature of 7° Celsius)**

Slicing in Ghana ensures that 60% of the pineapple remains in the country of origin as waste. Slicing in Netherlands therefore means two and a half times the transport volume. On the other hand, sliced pineapples need to be transported by air, and air transport produces greater CO_2 emissions than sea transport.

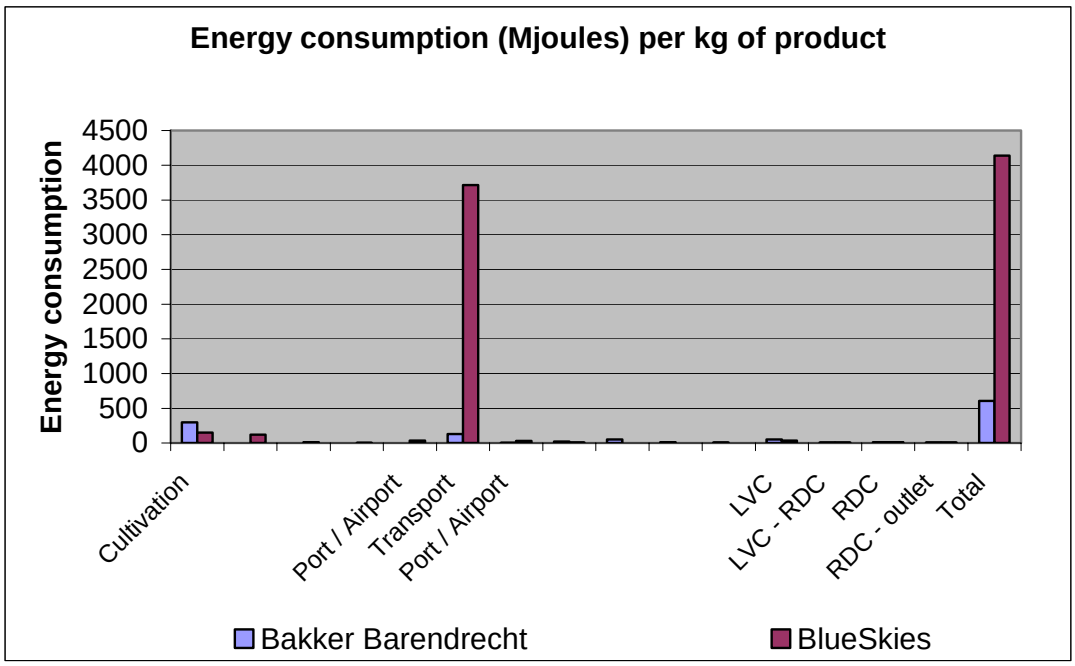


Figure 4.10: 'Comparison between slicing in Ghana and slicing in the Netherlands'

It appears that the lower transport volume between Ghana and the Netherlands with regards to flown-in pineapples doe not offset the damage caused by the air transport. The CO_2 emissions for this scenario are almost seven times greater than those resulting from scenarios in which slicing takes place in the Netherlands.

There is a linear relationship between the energy consumption as presented in the graph (in MegaJoules) and the quantity of CO_2 emissions. In this conversion, one MJ represents 73 grams of CO_2 emissions.

4.5 Comparison of results

The chain with the highest logistical costs is the Ghanaian air chain. One would expect that the savings in labour costs related to slicing in Ghana could compensate for these extra costs, thus making the Ghanaian air chain a more interesting prospect. However, it has become clear that this is not the case, in view of the recent decision by Albert Heijn supermarkets to switch back to slicing in the Netherlands, thus aiming for cost savings of 25%.

The logistical costs of the sea chain from Costa Rica are a little higher than the Ghanaian sea chain due to the use of reefer containers in Costa Rica.

A storage life of six days following production appears to be acceptable for the Ghanaian air chain. In the Ghanaian sea chain, P+5 or P+4 appears to be more logical than P +6. In the Costa Rican sea chain, less loss of storage life occurs with regards to whole

pineapples due to the largely containerized transportation. A 'use by date' of six days following production (P+6) may therefore still be feasible. The lead-time for slicing in the Netherlands is in any case much shorter. Consequently, the later placement of orders and greater flexibility must be possible.

The energy consumption is by far the greatest in the air chain. Air transport is a major factor in this. The Ghanaian sea chain requires more direct energy than the Costa Rican sea chain due to the use of open delivery trucks between the plantation and the slicing factory.

These conclusions are summarized in the table below.

Table 4.4: 'Summary of outcomes of simulation'

	Product quality	Logistical costs	Costs of logistics and processing	Energy and emissions
Ghanaian air chain	+	-	+	--
Ghanaian sea chain	++	+	-	+
Costa Rican sea chain	++	+	-	+

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Appendix: Developed model

The benchmark model that has been developed takes the Motorola Five-step Benchmark principle as its basis (see box). The benchmark model is used for the 'Pre-Selection' of farmers. A selection of farmers with the potential to supply to European supermarkets can be made in a relatively short space of time (using local people, for example).

BOX 4: The Motorola Five-step Benchmark Model
- Determine what you wish to benchmark;
- Determine the companies you are going to benchmark;
- Collect the data;
- Analyse the data & use the results to put together an action plan;
- Repeat the process. Determine what you wish to benchmark;

A list is drawn up on the basis of this principle, comprising relevant indicators by which farmers can be assessed.

These indicators relate to three different sorts of information, namely:

1. Information on the (individual) **cultivation methods**, with the following topics:
   - General
   - Specific cultivation method
   - Refrigeration method
   - Packaging method
   - Logistical matters
   - Financial
   - Management
2. Information on the **infrastructure** (regional/global), with the following topics:
   - Domestic roads
   - Facilities and services at the airport
   - Facilities and services at the sea port
   - Other (public) facilities
3. Information about the (global) **organization**, with the following topics:
   - General
   - International banks
   - Associations, (export) organizations
   - Agencies

A number of indicators have been drawn up for each of the topics, and these indicators have been coupled with a score from 0 to 5. A weighting has also been ascribed to each of the topics. This is based on a scale from 1 to 20. If all indicators have been given a score of five, the final score will be 100 out of 100 (see figure A1).

Scale of STANDARDS is 0 to 5.	
Scale of WEIGHT is 1 to 20.	
Colour of STANDARDS and SCORE	**1 or 2**
	3
	4 or 5
Colour of WEIGHT	**1 to 5**
	6 to 10
	11 or more

Figure A1: 'Scores and weightings of the model'

The benchmark model is made flexible by ascribing a weighting to each question, and it can also be used elsewhere in an adapted form. The model provides final scores (potential scores) in three fields of interest, namely:

- The potential to enter into agreements with European purchasers
- The potential to sell fair-trade products
- The collaborative potential, or the score relating to the organizational structure

The figure shown below presents an example of three benchmarked growers in Ghana. The higher the score, the more suitable the grower concerned is for production for export.

RESULTS:

	Overall score		
	FARM A	**FARM B**	**FARM C**
EUROPEAN INTEREST:	68,4	78,3	66,3
FAIRTRADE:	80,5	77,1	76,8
ORGANIZATION LEVEL:	62,0	72,8	55,8

Colour of score:	0 to 50
	50-75
	75-100

Figure A2: 'Results of pre-selection model'

This pre-selection model is easily modified (dynamically) by adjusting the weightings on the basis of expert opinions. In this way, it can become a tailored product for European purchasers, thus greatly simplifying the selection procedures. This applies particularly to supermarkets wanting to purchase their products in a new country where they do not currently have any commercial activities.