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Value and Supply Chain Assessment of Dominica's Hot Pepper Industry

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Abstract

Globalization and trade liberalization have created both challenges and opportunities for small island states like Dominica. Post 1995, the removal of preferential access to EU markets for Dominica's banana resulted in increased competition and subsequently loss of market share to larger efficient producers. However, the liberalization of trade also presented opportunities for the marketing of nontraditional crops. Hence, Dominica embarked on diversification programmes establishing among others a hot pepper industry as a replacement to bananas to supply fresh hot pepper to local, regional and extra regional markets. While the industry may be attractive in terms of prices and volume demand, Dominica has been challenged to meet current market demands, and at competitive prices.

This study assessed the competitiveness of Dominica's hot pepper industry in a major extra regional market (Miami Wholesale Market) using the Export Competitiveness Coefficient Model (ECC). Value chain analysis was used to analyze the segments of the supply chain's contribution to production, processing and marketing.

The study found that Dominica's hot pepper industry was not price competitive at current levels of productivity (4lbs per plant) and the average market price. However, at higher levels of productivity (> 4lbs per plant), Dominica's hot pepper industry would be price competitive at all market price levels.

In addition, the study found that productivity of hot peppers in Dominica using irrigation was 50% higher and profitability 25% higher than rainfed technology. Finally, the study found that lack of information sharing and communications among key stakeholders were major constraints along the supply chain.

Keywords: value chain analysis, price competitive, export competitiveness coefficient

1. Introduction

Hot pepper is considered as a nontraditional crop, being grown in the Caribbean region for the purpose of domestic consumption and export to regional and international markets. The cultivation of hot peppers was promoted by regional governments and agricultural institutions under diversification programmes which were initiated since traditional crops such as bananas and sugarcane faced increased competition

and loss of preferential treatment on the European market.

Dominica embarked on this diversification strategy and has since its inception, invested significant resources towards increasing the production and productivity of the hot pepper industry. While hot pepper is only one of the crops promoted through these efforts, it is of strategic importance because of the short production cycle of the crop and its adaptability to various agro ecological zones across the country.

The production cycle of hot pepper enables farmers to earn a weekly income which mirrors that of the banana industry. This ability to generate weekly income is highly valued since the economic and social activity of the farm families has traditionally come to rely on this pattern of cash flow established through the banana trade. This elevates the importance of hot pepper among the crops used for diversification because of this characteristic and its overall income generating capacity.

Hot pepper is also ingredient in local cuisine and is marketed as fresh and processed products. However, although hot pepper remains a crop of significant cultural and economic importance, its full potential to generate increased revenue within the agricultural sector has not yet been fully maximized.

1.2 Aim

The study looked at the value being added to fresh hot pepper as it moves along the value chain from production in Dominica to the Miami Terminal Market, United States of America. It establishes Dominica's cost per lb of hot pepper at each stage of the process resulting in a final price, and establishes its competitiveness at current production levels and increased levels which can be attained through irrigated production.

The Export Competitiveness Coefficient (ECC) (developed by Singh et al. 2004), which benchmarks the export wholesale price with the border price is incorporated into the model to indicate whether Dominica's export to the Miami Terminal Market is competitive.

1.3 Objectives

The specific objectives of the study were as follows:

1. To determine the export competitiveness of fresh hot pepper produced in Dominica and exported to the Miami Terminal Market of the United States of America.
2. To identify major constraints at various levels of the supply/value chain.

2. Methodology

In order to undertake the assessment of the export competitiveness of hot peppers produced in Dominica and exported to the international market (Miami USA), three sets of analyses were undertaken.

1. Establishing the Cost Insurance and Freight (CIF) price of hot peppers at the Terminal Market in Miami USA, by determining:
 - The cost of producing one acre of the hot peppers at the farm level
 - The cost incurred by the marketing agency (DEXIA) during processing/packaging and transportation of hot peppers from the farm to the airport in Dominica.
 - The cost of airfreight to Miami, inland transportation and marketing margin of hot pepper
2. Calculation of the ECC, using the sum of the various costs identified and wholesale prices offered for Dominica's hot peppers in Miami.
3. A sensitivity analysis to determine how the competitiveness of the hotpeppers is affected when prices fall and also by increasing productivity (specifically increases in yield at the farm level).

The methodology employed required collection of primary and secondary data by questionnaire and archival research. The analysis identified Dominica's cost per lb of hot pepper at each stage of the supply chain up to the final wholesale

market price. The Export Competitiveness Coefficient (ECC) (developed by Singh et al. 2004), which benchmarks the export wholesale price with the border price was used to determine the level of price competitiveness of Dominica's hot pepper exports in the Miami Terminal Market in the USA.

2.1 Primary Research

2.1.1 Production

Data were obtained during the period, December 2009 – January 2010. The study focused on the cost per lb of hot pepper produced at the farm level. Production information was obtained from farmers located in three major hot pepper producing areas and two national input suppliers.

2.1.2 Freight

Air freight cost was obtained from Amerijet Air Cargo Company, the company currently used for transporting fresh hot pepper weekly to importers in Miami.

2.1.3 Marketing

The Dominica Export Import Agency (DEXIA), the agency responsible for the marketing of fresh hot pepper to importers in Miami was consulted as it relates to the provision of marketing data.

2.1.4 International Market Prices

Wholesale prices were obtained from importing agents in the Miami Terminal Market, Florida, USA as well as the United States Department of Agriculture (USAD) market prices data base.

2.2 Survey Instrument

Questionnaires were developed and used to gather information from farmers, the marketing agent, and the importing agents.

2.2.1 Administration of Questionnaire

Using the convenience sampling method, interviews were conducted with typical farmers who have been in the industry for a number of years and were accustomed to growing the hot pepper crop. These farmers were interviewed in order to obtain information for the Cost of Production. Information was collected off-site as well as on the farm. Collection of data off-site facilitated the collection of information at the farmers' time of convenience. In this case, the stakeholder interviews were done at home or their offices of operation for ease of access to records. Alternatively, site visits were conducted to monitor farm operations and to determine the extent to which the information provided was consistent with actual farm operations.

Visit to DEXIA's packing facility allowed for the determination of packaging procedures and costs. This site visit also afforded a visual confirmation of the procedures that take place beyond the farm gate and to the airport in Dominica.

Telephone interviews were conducted to confirm air freight arrangements between Amerijet Freight Company and DEXIA for moving fresh hot pepper berries from Dominica to Miami. Telephone and email communication to hot pepper importers / traders were used to confirm prices paid to DEXIA and wholesale prices in the Miami Terminal Market. Prices were also accessed from the USAD wholesale market price data base

2.3 Secondary Research

The internet was used to obtain trade and other relevant information required for the study. This was supplemented with desk research at the University of the West Indies Main Library and the Caribbean Agriculture Research and Development Institutes (CARDI) main office library. Data on hot pepper production, trade and prices were also sourced from the specific websites listed in Table 1.

3. Hot Pepper Trade

3.1 The USA Market for Hot Peppers

CAROCOM Countries export hot pepper to three main markets the United Kingdom, Canada and the USA. Of primary interest to CARICOM Countries is the USA market.

The USA market is dominated by supplies from Mexico. The varieties supplied by Mexico are predominantly mild flavored chili peppers. The USA also grows and exports a substantial amount of habaneros. Supplies from the Caribbean region represent a small amount of USA imports nevertheless, trade is significant since hot peppers produced by CARICOM Countries are among the most pungent and flavorful on the global market.

In addition, the close proximity of the region to the Miami and New York terminal markets facilitates easy access to the American market and by extension the population centers of the east coast USA. Of the two markets the Miami market is more attractive for CARICOM producers. It is the closest port of entry and prices are higher, and more stable in comparison to other USA terminal markets.

Caribbean exporters do face challenges in the USA markets. Although the Miami market is more attractive, exporters must meet stringent Sanitary and Phytosanitary (SPS) measures given that Miami/Florida has a sub-tropical climate which makes it susceptible to tropical pest

and diseases. Therefore produce entering the Miami market must be certified and treated where necessary. As a result Caribbean exporters must meet all SPS, Hazard Analysis Critical Control Point (HACCP) and Maximum Residual Levels (MRL's) before accessing the market.

The main Caribbean exporters to the USA are Trinidad and Tobago, Jamaica, Belize and the Dominican Republic. Smaller producers such as Dominica, St Vincent and St Lucia also export to the USA. The main varieties exported from the region are West Indian Red, CARDI Green, Caribbean Red and Scotch Bonnet. Hot pepper exports from Dominica and Trinidad and Tobago are ranked among the top three in the USA markets because of their pungency and unique flavor.

When exporting hot peppers, the international Harmonized System Custom Nomenclature is used to classify products. In this regard, hot peppers in different forms are classified by the HS Codes as shown in Table 1.

4. Results of the Study

Cost in the Hot Pepper Industry

The study documented all cost amalgamated along the value chain for one (1) lb of hot pepper (Landing price in the Miami port). The models used to analyze the value chain were as follows:

1. COP at farm level (Cost per lb at farm gate)
2. Marketing cost (Packaging and other marketing functions)
3. Value Chain including the Export Competitiveness Coefficient (ECC).

4.1 Cost of Production Model (Farm Level)

In economic theory, the cost of production of an object is determined by the sum of the cost of variable and fixed inputs that were used to create it. To accomplish this, a detailed Cost of Production (COP) model was developed and applied during the research process in an effort to capture all relevant cost involved in production at the farm level.

Detailing each activity is essential in determining the accounting cost of production per lb of hot pepper since it is well known that several activities are overlooked or omitted by farmers when determining the cost of production of various agricultural enterprises. The model also calculates the Net Return to the farm enterprise using the Farm Gate Price and Total Operating Cost figures (See Table 4).

The study analyzed the cost of production for one acre of hot pepper in Dominica under the following conditions.

- ❖ Spacing 3ft by 4ft,
- ❖ 3,630 plants per acre
- ❖ Yield of 4lbs per plant without the use of irrigation.

The research was based on the typical expected yield of 4lbs per plant. However, references were made to medium and high yields under rainfed technology and expected yields with irrigation. Productivity estimates were based on primary research conducted during the study and research carried out by CARDI in collaboration with DEXIA on the productive capacity of the Scotch Bonnet and CARDI Green varieties in Dominica.

Cost of Production data are provided in Table 4 (see appendix 1) with a summary in Table 5 in USA dollars. The total operating cost of one acre of hot pepper in Dominica was \$3642.50 variable cost, \$3035.41 fixed cost, \$607.08.

At yield of 4lbs per plant the total yield was 13,794 lbs per acre. Marketable yield of 90% resulted in a total of 12,414.60 lbs of saleable berries. A farm gate price of \$0.30 produced Gross Revenues of \$3719.73. Removal of operating cost resulted in net revenues of \$77.23

An analysis of activities indicated that harvesting labour contributed 21%, fertilizer 14%, crop maintenance labour 14% and agrochemical for pest and disease control 14%, respectively, to operating cost. They collectively account for 63% of cost while the other six activities namely, land preparation labour cost, planting material, transportation, management fees and overheads accounted for 37% of operating cost Figure 1.

Further analysis indicated that total labour cost accounted for 41%, agro chemicals (fertilizer/pesticide) 28%, management 7% and other activities (planting material, other applications, transportation and overheads) 24% Figure 2.

Based on all costs the study concluded that the total cost to produce one (1) lb of hot pepper at current levels of operation is \$0.29 (US).

Percentage representation of activity cost contributions to the total cost per pound (1 lb) of hot pepper produced at the farm level is presented in Figure 1.

4.2 Marketing Cost

The marketing costs were obtained from DEXIA the countries state agency responsible for marketing fresh hot pepper to Miami USA. Marketing agent's costs include administration, transportation cost to the packhouse facility, packaging and then onward to the airport. The total marketing cost per lb equals US \$0.68 (Variable cost \$0.34 and Fixed Cost \$ 0.34). Packaging material accounts for 38% and farm gate price 44% to the total cost per lb respectively.

The other six activities namely, transportation (in/out), processing and packaging, documentation cost, overhead and fixed cost only account for 18% of the total cost per lb. This illustrated in Table 6 and Figure 3.

4.3 Freight Cost

Air freight cost reflects the arrangement DEXIA has with Amerijet to get the commodity into the Miami Terminal Market in the freshest condition and is presented in Table 7 and Figure 4.

Freight charges total US \$0.36 comprising, freight, \$0.15 and administrative charges, \$0.21, representing 42% and 58% respectively.

5. Hot pepper Value Chain and Price Competitiveness

5.1 Export Competitiveness Coefficient

The (Export Competitiveness Coefficient, ECC) is considered simple and very applicable to any commodity. The formula uses the landing price and the wholesale price to produce a coefficient which indicates whether an industry is competitive or uncompetitive at a particular market price. The ECC was adopted from Singh et al. (2004).

Export Competitiveness Coefficient

The Export Competitiveness Coefficient model was used in this study to determine Dominica's competitiveness in the Miami market as follows:

Export Competitiveness Coefficient (ECC)
= $\frac{\text{Cost per (lb) Landing Price}}{\text{Wholesale Price per (lb) received by DEXIA}}$

Wholesale Price per (lb) received by DEXIA

$$= \frac{P_{HP}^{LP}}{P_{HP}^{MP}}$$

Where: P_{HP}^{LP} = Dominica's Export Landing Price of Fresh Hot Pepper

P_{HP}^{MP} = Wholesale Price per lb received by DEXIA from importers in Miami

Interpretations of the results:

If the coefficient is greater than one (> 1), the industry is uncompetitive

If the coefficient is less than one (<1), the industry is competitive

If the coefficient is equal to one (=1), the industry is neutral.

5.2 Value Chain Model

The study analyzed the value chain of Dominica's hot pepper industry and evaluated the contribution of all stakeholders in order to determine the competitiveness of the industry in the extra regional market. The model illustrates all industry activities from field production to the Miami port where it is delivered to importers who trade in the Miami Terminal market. The Value chain presents a low, medium and a high price received per pound and uses the Export Competitiveness Coefficient (ECC) to determine the industries competitiveness at these price levels. Table 8 presents prices received by DEXIA from importers who trade in the Miami Terminal Market. Figure 8.1 provides a detailed description of the value added to a pound (lb) of hot pepper as it moves from production in Dominica to the Miami Terminal market.

The major Cost are as follows:

- Production cost (variable cost of \$0.24 + fixed cost of \$0.05) =US \$0.29
- DEXIA processing and Packaging cost, variable cost \$0.34 and fixed cost \$0.34 results in an export price of US \$0.68.
- Added freight charges of \$0.36 results in a CIF price of US \$1.04 per lb.
- Percentage contributions to total wholesale cost price are production, 29%, processing and packaging, 35%, and freight, 36%. (DEXIA cost equal 71% of final CIF price).
- The application of price range received by DEXIA from importers (US\$):

- Low price \$1.00
- Medium price \$1.25
- High price \$1.50

The data in Table 8 above will then be used to calculate the degree of price competitiveness of Dominica's hot peppers in the Miami Terminal market using the export competitiveness Coefficient. The following formula will be used:

Export Competitiveness Coefficient (ECC)
= $\frac{\text{Cost per (lb) Landing Price}}{\text{Wholesale Price per (lb) received by DEXIA}}$

Wholesale Price per (lb) received by DEXIA

$$= \frac{P_{HP}^{LP}}{P_{HP}^{MP}}$$

Where:

P_{HP}^{LP} = Dominica's Export Landing Price of Fresh Hot Pepper

P_{HP}^{MP} = Wholesale Price per lb received by DEXIA from importers in Miami

- (i) Calculation of the Export Competitiveness Coefficient at low terminal market price of US \$1.00

$$ECC = \frac{\$1.04}{\$1.00} = 1.04$$

- At current levels of productivity (4lbs per plant) Dominica's hot pepper industry was not competitive at the low market price (ECC > 1). ECC = 1.04 which results in a loss of US \$0.04 per lb

- (ii) Calculation of the Export Competitiveness Coefficient at the medium terminal market price of US \$1.25

$$ECC = \frac{\$1.04}{\$1.25} = 0.83$$

- At the medium market price of US \$1.25 per lb, Dominica's hot pepper producers remained competitive at that price. At medium price; ECC < 1 (ECC = 0.83 resulting in a profit of US \$0.21 per lb).

- (iii) Calculation of the Export Competitiveness Coefficient at high terminal market price of US \$1.50

$$ECC = \frac{\$1.04}{\$1.50} = 0.69$$

- At the high terminal market price of US \$1.50 per lb the ECC < 1 (ECC = 0.69 resulting in a profit of US \$0.46 per lb)

Figure 6 presents a diagrammatical representation of the results of the Export Competitiveness Coefficient (ECC), Figure 7; Dominica's complete hot pepper industry value chain and Figure 8

illustrates contributions by major stakeholders to the value chain in percentage form.

5.2.1 Percentage Contribution to Value Chain

Further analysis of the value chain for Dominica's hot pepper industry found that the farmer contributed 28% of the cost along the value chain, freight charges 35% and DEXIA handling, packaging processing cost 37% of total cost up to delivery to importers.

6. Increased Crop Productivity Impact on the Value Chain

The study assessed the impact of an increase in productivity on Dominica's hot pepper value chain from the lowest yield of 4lbs to the highest of 14 lbs per plant (Productivity data was obtained from CARDI/DEXIA hot pepper productivity research in Dominica). The analysis focuses on the impact of productivity increases on the total cost per lb (Landing price Miami Terminal Market), variable and fixed cost of stakeholders and net profits. The ECC is included to indicate increased levels of competitiveness.

The productivity analysis focuses on hot pepper cultivation under rain-fed or drip irrigation systems. Cultivation under rain-fed systems would require an average annual rainfall of 90 inches. Irrigation increases yields as much as 200% over rain-fed cultivation systems. Drip irrigation systems are the most effective and efficient system, since they reduce water wastage and facilitate nutrient application through fertigation. An acre of hot pepper requires approximately 7000 gallons of water per day, every three days.

The analysis revealed the following when the highest level of productivity was considered:

- Variable cost at the farm level is reduced by almost 50%.

- Overall production cost per lb is reduced at the farm level with similar effects on total cost (Landing price in the Miami Terminal Market).
- A reduction of \$0.32 in variable cost is observed between lowest productivity level (4lbs) and highest level of productivity (14lb).

7. Sensitivity Analysis

To analyze the industries vulnerability to price changes a sensitivity analysis was conducted. Table 10 illustrates the sensitivity model used to demonstrate the effect of a 5% drop in price on the extra regional market.

As reported above, the industry is uncompetitive at its current level of productivity (4lbs per plant) and at the low market price of US \$1.00 paid by importers in Miami USA.

Results highlighted in Table 10 reveal:

- (i) That the industry is increasingly vulnerable and less competitive at the low market price, if a 5% drop in price is effected by importers in Miami USA.
- (ii) With increased productivity using irrigation, (14 lbs per plant) the industry secures net returns of \$0.18, \$0.42 and \$0.66 per lb at low, mid and high prices.
- (iii) The industry remains competitive at medium and high levels of productivity with a 5% drop in prices.

8. Hot Pepper Industry Profitability

Assessment of profitability of hot peppers produced in Dominica using rainfed and drip irrigation technologies.

Results are as follows:

- At the lowest level of productivity net returns are only US \$77.23.
- An increase to 7lbs per plant yields net returns of \$2,134.71 a difference of \$2,057.48.

The results are further amplified with the use of irrigation.

- Net profits increase by 49% from \$2,134.71 to \$4,191.96 a difference of \$2,057.25 (at 10lbs per plant).
- The difference between the current level of productivity (4 lbs per plant) under rainfed conditions and the highest level of productivity (14 lbs per plant) with irrigation is \$6,858.27.

As productivity increase the average cost of production decreases and profits increase.

9. Conclusions and Recommendations

9.1 Industry Competitiveness

The study assessed the international competitiveness of fresh hot pepper produced in Dominica in the Miami Terminal Market. A thorough look at Dominica's hot pepper value chain indicated that the industry is uncompetitive at its current level of productivity (4lbs per plant) when the low price is received from importers in Miami USA. An ECC of 1.04 indicated that Dominica's landing price at the Miami Terminal Market is higher than the low market price paid by importers. (landing price = US \$1.04) (Low market price paid by importers US \$1.00)

Additionally, the industry is increasingly vulnerable at the low price if importers

decrease the price paid by 5%. The sensitivity test revealed the uncompetitive nature of the industry at all three levels of productivity (4, 5.5, and 7 lbs per plant) under rainfed technology. The ECC at these levels of productivity were 1.1, 1.0, and 0.99 indicating that landing price at the Miami Terminal Market is greater or almost equal to the price received from importers. The use of irrigation increases competitiveness as demonstrated in the ECC calculations. Coefficients are all below 1.0 after a 5% reduction of price. (low, medium and high price) at all productivity levels Table 10.

9.2 Cost of Production Value Chain

The study found that COP at the farm level was 29% of total cost in the value chain. Air freight cost was the highest contributor to cost at 36%, while marketing followed closely accounting for 35%. Past experiences by industry professionals in negotiating freight cost have proven difficult. Therefore, DEXIA should examine its cost since a reduction in DEXIA's cost would reduce overall cost and increase profitability within the value chain. Special attention should be paid to the cost of packaging material (38% of marketing cost) Figure 3.

9.3 Productivity and Profitability

The study found that the use of irrigation increases productivity by 250% over the current level. In addition the use of irrigation increases overall profitability of the value chain by 50%. Net returns at the farm level amount to a difference of US \$6,858.27 from the lowest level of productivity of 4lbs to the highest productivity level of 14lbs per plant.

9.4 Major Cost Constraints

The Study found that the following were major contributors to total cost in

Dominica's hot pepper value chain in the following order;

1. Marketing cost (Cost of packaging Material)
2. Freight cost

At the farm level

3. Harvesting labour cost
4. Cost of inputs (Chemical inputs and fertilizers)

9.5 Overall Recommendations

Based on the results of this study it is recommended that efforts are made to increase the productivity of labour in hot pepper production, especially harvesting. Irrigation should be implemented on hot pepper farms to increase the productivity.

The cost of packaging material and freight cost are not directly under the control of Dominican actors in the value chain. These costs depend on the strength of the negotiations between the various parties. In this regard DEXIA has a critical role to play and should seek to improve its terms of trade with the Miami importers and air cargo carrier.

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Table 1: Market Information and Intelligence Website Addresses

Agency	Website
Dominica Export Import Agency (DEXIA)	www.dexia.dm
United Nations Community Trade Statistics Data Base (UN comtrade)	www.comtrade.un.org
Food and Agriculture Organization of the United Nations Statistical Data Base (FAOSTAT)	www.faostat.fao.org
International Trade Center (ITC)	www.intracen.org
Caribbean Agriculture Research and Development Institute (CARDI)	www.cardi.org

Table 2: Hot Pepper HS Code Classification

HS Code		Description
Hot Pepper	0709.6091	Fresh or chilled or Pimenta fruits of the genus capsicum
Dried/ ground hot pepper	0904.20	Fresh pepper dried in ovens or open air and then grounded to a powder.
Hot pepper mash	0904.2073	Fresh fruit crushed and preserved with salt or vinegar, some are stored for up to three years where it ages for a much sharper flavour
Hot pepper sauce	2103.901	Hot pepper mash mixed with water, natural flavours and stabilizers, sometimes include tropical fruits.
Hot pepper extract	3303.9999	Oleoresin and Capsaicin oil from hot peppers

Table 3: Dominica Hot Pepper Industry Segments of Value Chain

Field Production	Packaging House Operations	Transportation to Miami	Hot Pepper Delivered to Importers at Miami Port (CIF)	Importers Trade Hot Pepper at the Miami Terminal Market
<ul style="list-style-type: none"> ➤ Purchasing of Seedlings ➤ Land Preparation ➤ Crop Establishment ➤ Agronomic/Cultural Practices ➤ Harvesting 	<ul style="list-style-type: none"> ➤ Transportation to Packhouse ➤ Grading and sorting ➤ Packaging ➤ Transportation to Airport 	<ul style="list-style-type: none"> ➤ Air Freight using Amerijet air freight service. 	<ul style="list-style-type: none"> ➤ Prices offered to DEXIA by Importers (Low, Medium and High Price) 	<ul style="list-style-type: none"> ➤ Miami Terminal Market wholesale prices received by Importers (Low, Medium and High Price)

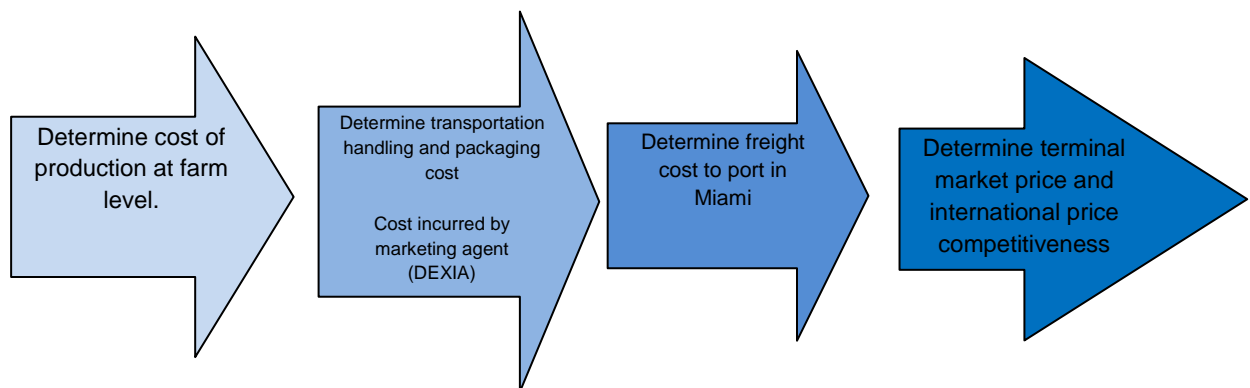


Table 4: Hot Pepper Production Cost (\$US)

One Acre (# of Plants)	3630				
Activity	Units	No. of Units	Unit price	Total Unit Cost	Total Cost
Land Preparation (Labour Cost)					
Spraying	Man days	1	\$14.98	\$14.98	
Land Clearing	Man days	6	\$14.98	\$89.89	
Preparation of Holes	Man days	3	\$14.98	\$44.94	
Drainage / SCP	Man days	3	\$14.98	\$44.94	
Liming	Man days	1	\$14.98	\$14.98	
Mulching	Man days	0	\$14.98	\$0.00	
Ploughing	Man days	0	\$14.98	\$0.00	
Total Land Preparation					\$209.74
Planting Material					
Seedlings		3630	\$0.09	\$339.89	
Total Planting Material Cost					\$339.89
Crop Maintenance (Labour Cost)					
Transplanting	Man days	2	\$14.98	\$29.96	
Pruning	Man days	5	\$14.98	\$74.91	
Weed Control	Man days	6	\$14.98	\$89.89	
Fertilizer Applications	Man days	8	\$14.98	\$119.85	
Chemical Applications	Man days	10	\$14.98	\$149.81	
Total labour Cost					\$464.42
Fertilizing					
Foliar Fertilizer					
Miracle Grow	Pkt	1	\$7.49	\$7.49	
Nutri Green	Pkt	1	\$7.49	\$7.49	
Bountiful Harvest	Bottle	1	\$5.99	\$5.99	
Compound Fertilizer					
NPK	Bags	10	\$29.96	\$299.63	
Manure					
Chicken manure	Bags	100	\$2.25	\$224.72	
Total Fertilizer Cost					\$545.32
Other Applications					
Ph Plus	Bottle	3	\$6.74	\$20.22	
Spreader Sticker	Bottle	1	\$30.90	\$30.90	
Lime	Bags	5	\$9.36	\$46.82	
Total					\$97.94
Pest & Disease Control					
Insecticides					
Pirate	Bottle	2	\$26.78	\$53.56	
Cure	Bottle	2	\$24.06	\$48.13	
Diafenthiuron	Bottle	2	\$29.59	\$59.18	
Fungicides					
Acrobat	Pkt	11	\$4.34	\$47.79	
Bellis	Pkt	6	\$13.35	\$80.11	
Mankocide	Pkt	4	\$15.54	\$62.17	

One Acre (# of Plants)	3630				
Activity	Units	No. of Units	Unit price	Total Unit Cost	Total Cost
Weedicide					
Systemic/Contact	Gals	3	\$33.71	\$101.12	
Pre-emergent Weedicide		0	\$0.00	\$0.00	
Total P&D Control Cost					\$452.06
Irrigation					
Water	Gals	0	\$0.00	\$0.00	
Irrigation Equipment		0	\$0.00	\$0.00	
Total Irrigation Cost					\$0.00
Harvesting (Labour Cost)					
40lb Crates	Crates	310.37	\$2.62	\$813.69	
Total Harvesting Cost					\$813.69
Transportation					
Harvest/Other	Trips	15	\$7.49	\$112.36	
Total Transportation Cost					\$112.36
Technical Services					
Extension		0	\$0.00	\$0.00	
Other Services		0	\$0.00	\$0.00	
Total Technical Services					\$0
Total Variable Cost					\$3,035.41
Overhead Cost (10% of VC)		0.1			\$303.54
Management Fees (10% of VC)		0.1			\$303.54
Taxes			\$0.00	\$0.00	\$0.00
Land Lease/Rent		0	\$0.00	\$0.00	\$0.00
Total Fixed Cost					\$607.08
Total Operating Cost					\$3,642.50
Returns					
Plants/Acre (5% loss)		0.05			3449
Yield/Acre (lbs)	Per Plant	4			13794
Marketable Yield (90%)		0.9			12414.60
Farm Gate Price		\$0.30			\$0.30
Average Cost per lb (Total Yield)					\$0.26
Average Cost per lb Incurred (Marketable Yield)					\$0.29
Profit per lb					\$0.01
Gross Revenue					\$3,719.73
Total Operating Cost					\$3,642.50
Net Revenues					\$77.23

Summary of Cost of Production

Table 5: Production Cost Per lb(Farm Level)

Activity	Cost Per lb
Land Preparation (Labour Cost)	\$0.02
Planting Material	\$0.03
Crop Maintenance (Labour Cost)	\$0.04
Fertilizer	\$0.04
Other Applications	\$0.01
Pest and Disease	\$0.04
Irrigation	\$0.00
Harvesting (Labour Cost)	\$0.06
Transportation	\$0.01
Overheads	\$0.02
Management fees	\$0.02
Tax	\$0.00
Lease/Rent	\$0.00
Average Cost per lb	\$0.29

Table 6: Marketing Cost (\$US)

Activities	Description	Cost Per lb
Transportation In	From Farm Gate to Packaging Facility	\$0.02
Packaging Material	8lb Cardboard Box	\$0.26
Processing Cost	Sorting/Grading and Other Processes	\$0.04
Documentation Cost	Record Keeping and Document Preparation	\$0.01
Transportation Out	From Packaging Facility to Airport	\$0.01
Total Variable Cost		\$0.34
Overhead Cost 10% of VC	Utilities/Administrative Expenses	\$0.04
Fixed cost	Packing Facility Equipment	\$0.00
Fixed cost	Farm Gate Price per lb	\$0.30
Total Fixed Cost		\$0.34
Total Processing Cost		\$0.68

Table 7: Air Freight Cost (\$US)

Activity	Cost Per (lb)
Freight	\$0.15
Administrative and Other Charges	\$0.21
Total Cost	\$0.36

Table 8: Prices Received by DEXIA from Importing Agents (Miami USA)

Price Per lb (\$US)	
Low	\$1.00
Mid	\$1.25
High	\$1.50

Table 9: Productivity Analysis

Productivity	Production Cost			DEXIA Cost		CIF Price \$US	Net Profit Per lb			ECC		
(Lbs) per Plant	Variable Cost	Fixed Cost	Profit Per lb	Processing and Packaging Cost	Freight		Low Price	Mid Price	High Price	Low	Mid	High
							\$1.00	\$1.25	\$1.50			
Analysis with Rainfed Technology												
4	\$0.24	\$0.05	\$0.01	\$0.38	\$0.36	\$1.04	(\$0.04)	\$0.21	\$0.46	1.04	0.83	0.69
5.5	\$0.19	\$0.04	\$0.07	\$0.28	\$0.36	\$0.94	\$0.06	\$0.31	\$0.56	0.94	0.75	0.62
7	\$0.17	\$0.03	\$0.10	\$0.22	\$0.36	\$0.88	\$0.12	\$0.37	\$0.62	0.88	0.70	0.58
Analysis Using Irrigation												
10	\$0.15	\$0.03	\$0.12	\$0.15	\$0.36	\$0.81	\$0.19	\$0.44	\$0.69	0.81	0.65	0.54
12	\$0.13	\$0.03	\$0.14	\$0.13	\$0.36	\$0.79	\$0.21	\$0.46	\$0.71	0.79	0.63	0.52
14	\$0.12	\$0.03	\$0.15	\$0.11	\$0.36	\$0.77	\$0.23	\$0.48	\$0.73	0.77	0.61	0.51

Table 10: Value Chain Price Sensitivity Analysis

Productivity Lbs per plant	CIF Price (Landing Price Per lb) \$US	Net Profit Per (lb)\$ US			ECC		
		Miami Market Price Per (lb)			Cost per (lb) Landing Price		
		(5% Reduction in Price)			Wholesale Market Price per (lb) (Miami)		
		Low	Mid	High	Low	Mid	High
		\$0.95	\$1.19	\$1.43			
Net Returns Rainfed							
4	\$1.04	(\$0.09)	\$0.15	\$0.39	1.1	0.9	0.73
5.5	\$0.94	(\$0.01)	\$0.25	\$0.49	1.0	0.8	0.66
7	\$0.88	\$0.07	\$0.31	\$0.55	0.9	0.7	0.62
Net Returns With Irrigation							
10	\$0.81	\$0.14	\$0.38	\$0.62	0.9	0.68	0.57
12	\$0.79	\$0.16	\$0.40	\$0.64	0.8	0.66	0.55
14	\$0.77	\$0.18	\$0.42	\$0.66	0.8	0.65	0.54

Table 11: Profitability Assessment (\$US) (Net Returns at Farm Level)

(Lbs) per Plant	Yield per Acre (lb)	Marketable Yield (90%) (lb)	Farm Gate Price per (lb)	Average Cost per (lb)	Profit (\$) per (lb)	Gross Revenue	Operating Cost	Net Revenue
Net Returns With Rainfed Technology								
4	13794	12414.6	\$0.30	\$0.29	\$0.01	\$3,719.73	\$3,642.50	\$77.23
5.5	18966.75	17070.08	\$0.30	\$0.24	\$0.06	\$5,114.63	\$4,008.66	\$1,105.97
7	24139.5	21725.55	\$0.30	\$0.20	\$0.10	\$6,509.53	\$4,374.82	\$2,134.71
Net Returns With Irrigation								
10	34485	31036.5	\$0.30	\$0.18	\$0.12	\$9,299.33	\$5,107.37	\$4,191.96
12	41382	37243.8	\$0.30	\$0.15	\$0.15	\$11,159.19	\$5,595.36	\$5,563.84
14	48279	43451.1	\$0.30	\$0.14	\$0.16	\$13,019.06	\$6,083.56	\$6,935.50

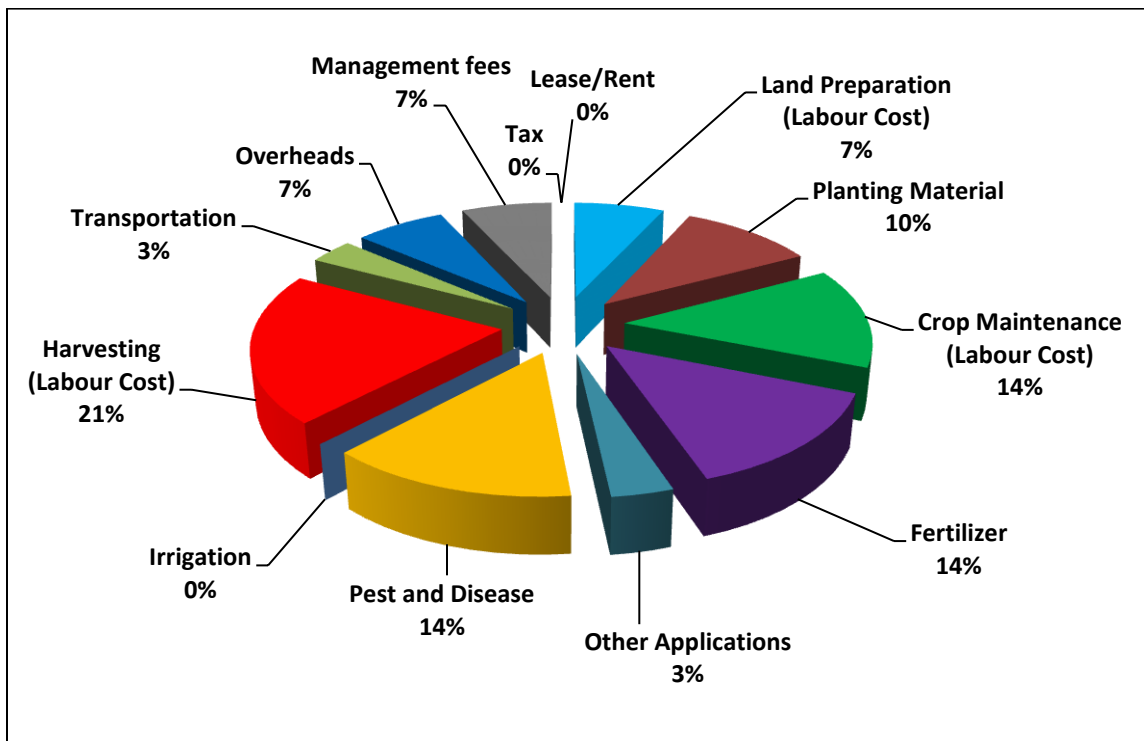


Figure 1: Hot Pepper Production Activity Cost (Percentage)

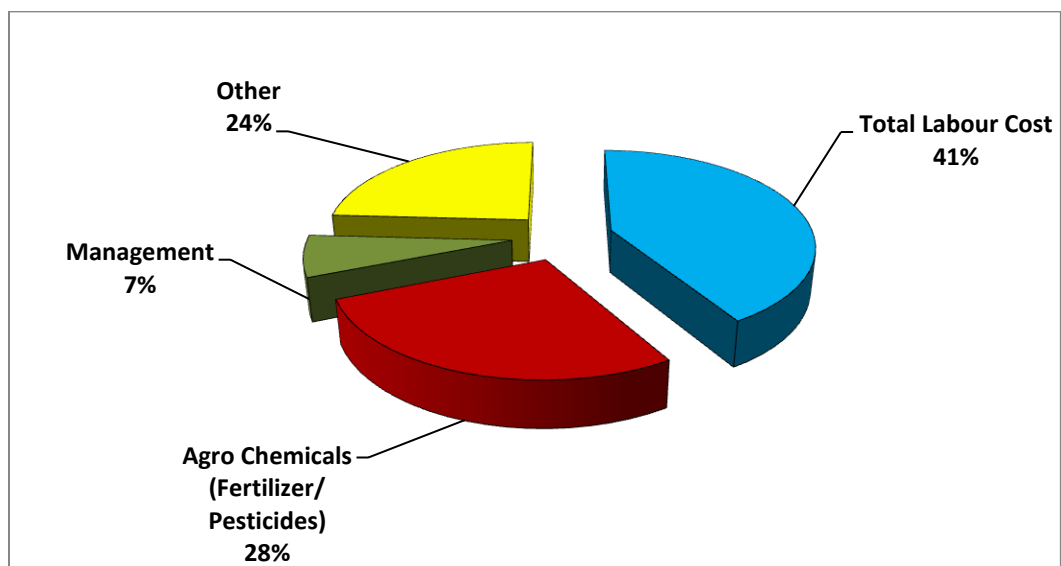


Figure 2: Major Production Cost Categories (Percentage)

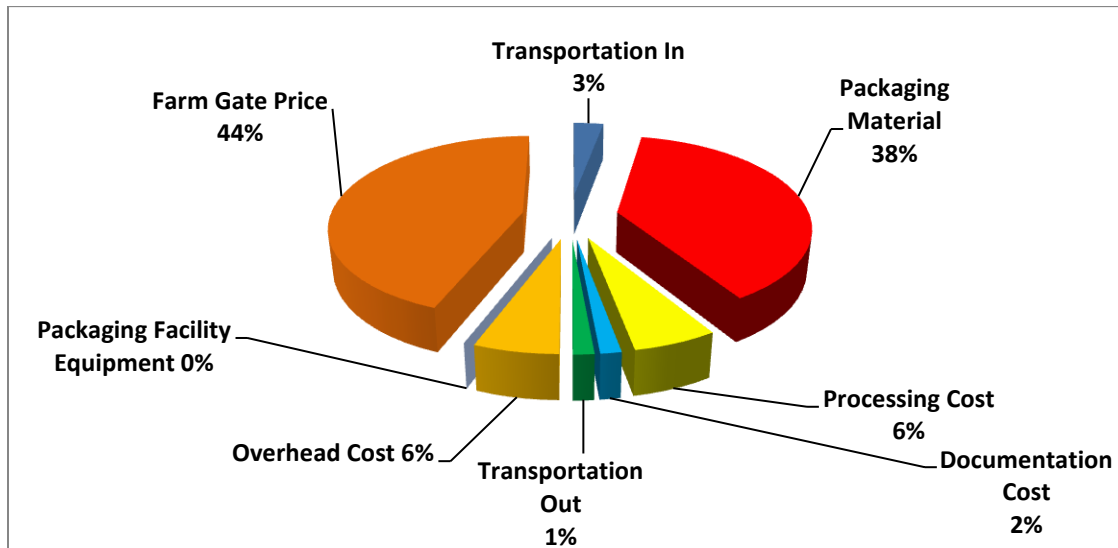


Figure 3: Cost to Marketing Agent (Percentage)

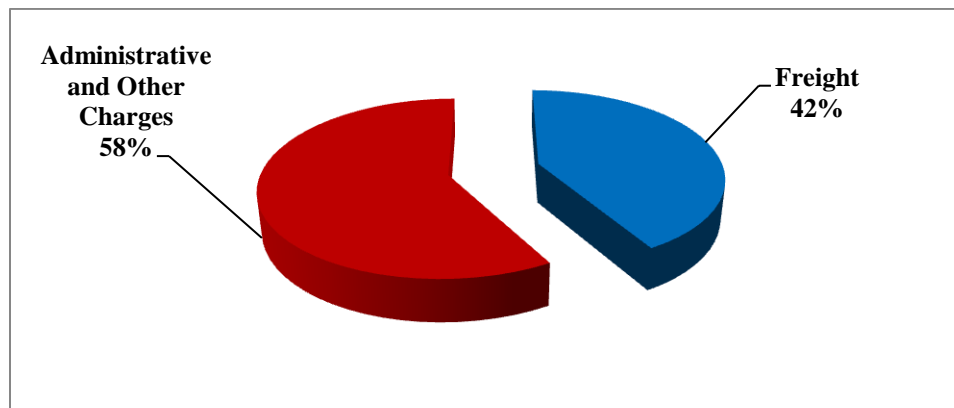


Figure 4: Freight Cost (Percentage)

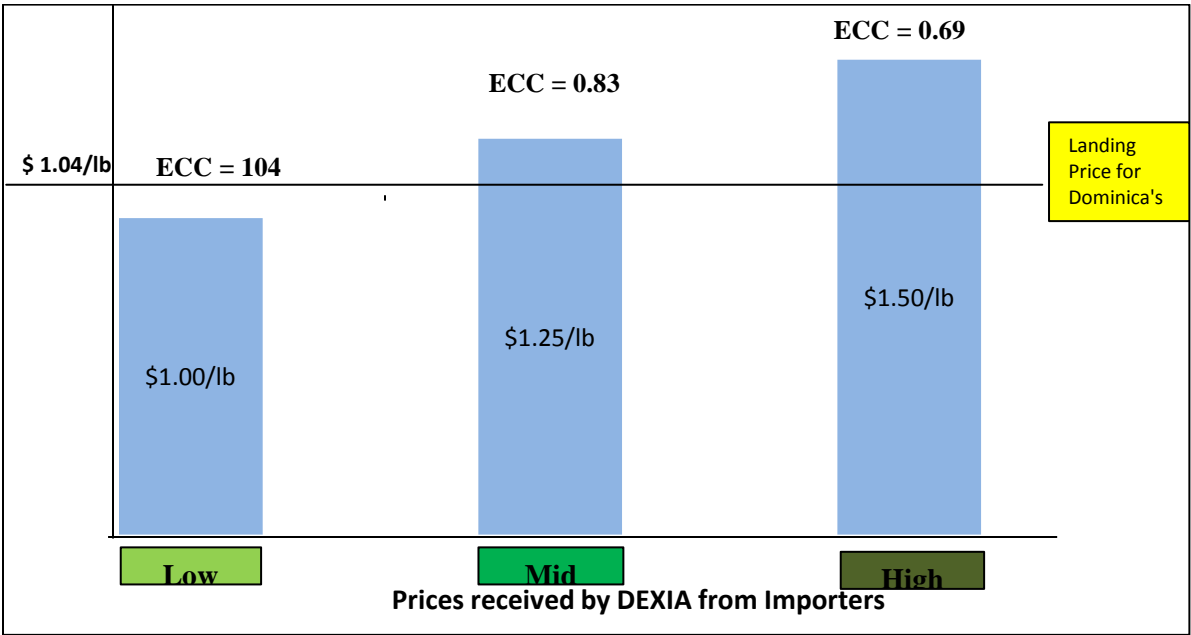


Figure 6: Results of ECC Calculations

Figure 7: Dominica's Hot Pepper Industry Value Chain (2010) (Estimate per lb)

Figure 7: Dominica's Hot Pepper Industry Value Chain (2010) (Estimate per lb)

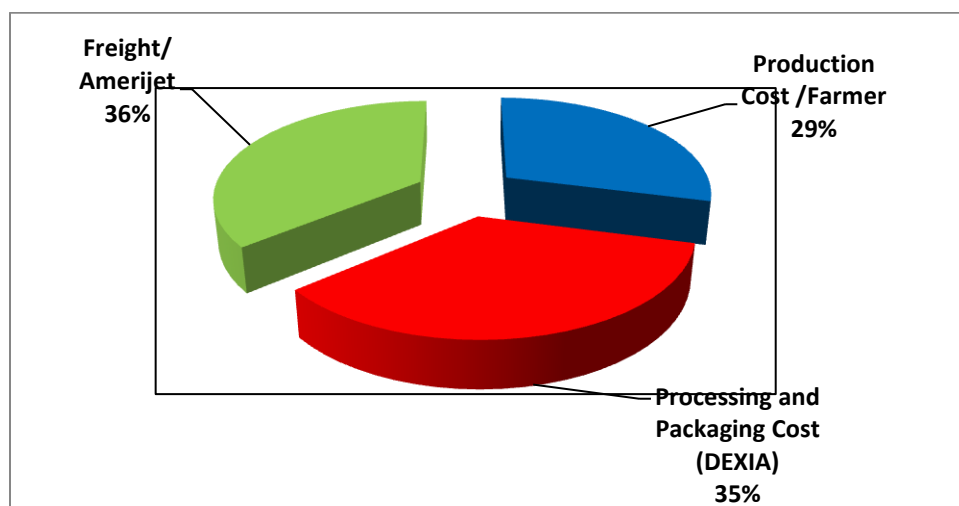


Figure 8: Value Chain Cost (Percentage)

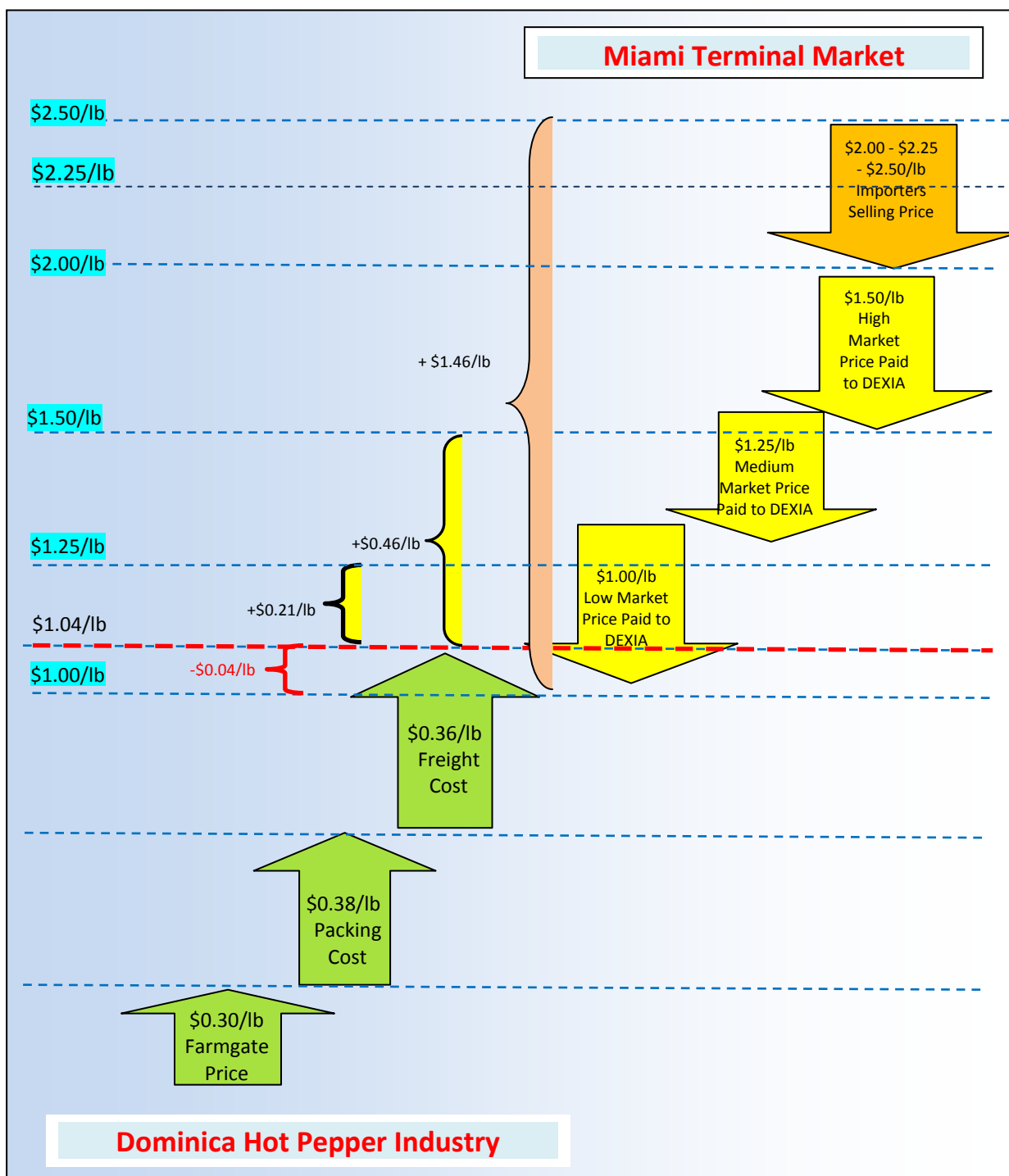


Figure 9: Dominica Hot Pepper Industry Value Chain -2010, (All Prices in USD/lb)

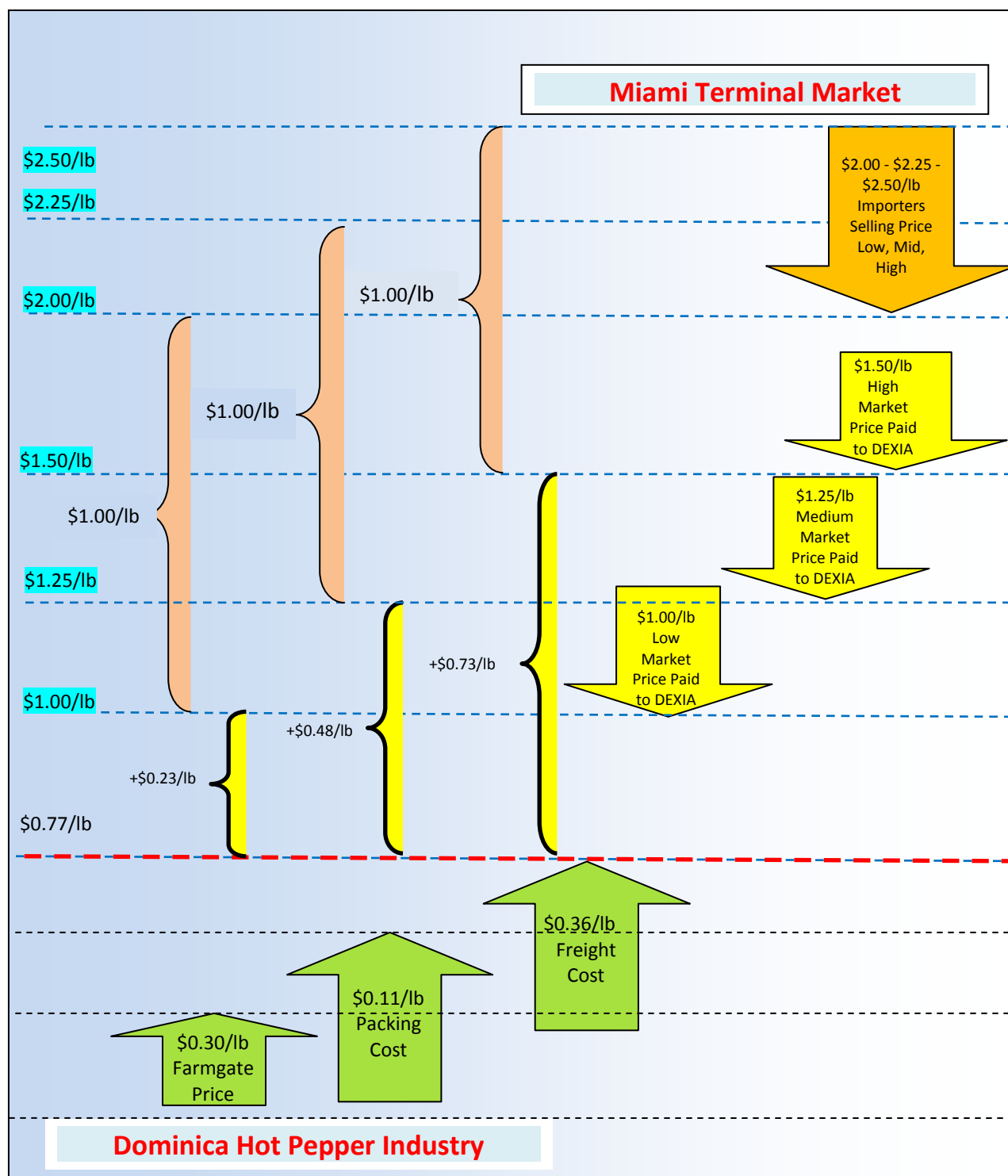


Figure 10: Dominica Hot Pepper Industry Value Chain -2010, (All Prices USD/lb)
 Analysis based on the highest level of productivity (14 lbs per plant)

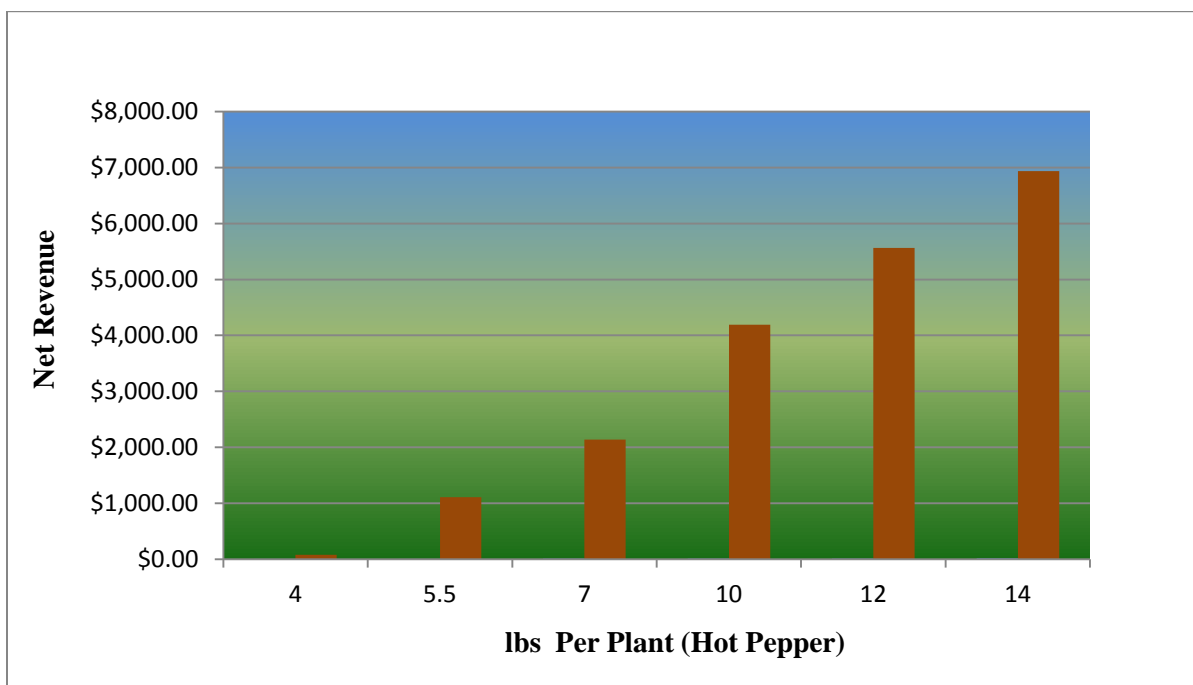


Figure 11: Profitability Assessment