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Are Cocoa Farmers in Trinidad Happy? Exploring Factors Affecting their Happiness.

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Abstract

This paper set out to determine for cocoa farmers in Trinidad and Tobago their happiness status, the factors that determine this status as well as the distribution of their happiness efficiency. A Cantril Self Anchoring Ladder scale was used to measure the Present Happiness Score and Future Happiness Score. Information for the estimations was obtained from a mail survey, in which 102 farmers in Trinidad and Tobago registered with the Cocoa and Coffee Industry Board (CCIB) responded. Two types of analyses were undertaken. For the present life satisfaction, stochastic frontier analysis was used to estimate a "happiness" frontier and the happiness efficiency of a farmer was then measured by the closeness of this farmer to this efficiency frontier. Ordinary linear regression was also used to investigate the factors affecting the future life satisfaction score (or future happiness score) for the farmers.

With respect to the present life satisfaction, farmers who were happier were those whose main crop was not cocoa; older farmers, farmers with smaller household sizes, as well as farmers who were in favour of the new payment system. Household size significantly increased the variance of the inefficiency error term while the farm size negatively affected the idiosyncratic error term of the happiness function. With respect to the Future Happiness Score, farmers who favoured lower cocoa prices, females and those who were in favour of a new payment system perceived themselves to be happier in five years' time.

Keywords: *Happiness, Stochastic Frontier Analysis, Cocoa Farmers, Trinidad and Tobago*

Introduction

Trinidad and Tobago has played a very important role in developments in the world-wide cocoa industry. In particular, the "Trinitario" is one of the three major varieties of cocoa and has its origin on the island of Trinidad (Bekele, 2004). Also, the International Cocoa Agreement, 2010 identifies 17 countries in the world that can produce fine or flavoured cocoa (The International Cocoa Organization (ICCO), 2010) and Trinidad and Tobago is identified as one of these producers. In addition, the Cocoa Research Centre at The University of the West Indies in St Augustine, Trinidad and Tobago was established in 1963 and this Centre continues "to support the sustainability of the cocoa sector through management of genetic resources, research, innovation and outreach" as outlined in their mission statement (Cocoa Research Centre (UWI-CRC), 2016).

The Centre is also the custodian of the International Cocoa Genebank, Trinidad (ICGT) recognized by Biodiversity International, CACAONET and the FAO Trust (UWI-CRC 2016).

Many studies have attempted to identify reasons for the decline of the cocoa industry in Trinidad and Tobago (Pemberton and Ragbir, 2005; Bekele, 2004; and Pemberton, 1986). These studies note that cocoa estates continue to be abandoned and the majority of farmers are mature and close to retirement. There continues to be a lack of new young entrepreneurs involved in the industry. Those who still grow cocoa utilize traditional as opposed to new technological practices. Also, the existence of profitable niche markets for its fine or flavoured cocoa has not arrested the decline in the production of cocoa in Trinidad and Tobago (Howai, Pemberton and Patterson-Andrews, 2013)

In 2012, the Cocoa and Coffee Industry Board of Trinidad and Tobago (CCIB) made a change to the payment system for cocoa for farmers in the country. Previously, a two-stage payment system was used, which involved a guaranteed price of TT $9.55/kg for Grade 1 cocoa beans, with an interim price of TT $4.40/kg paid to the farmer at the time of delivery of the beans and at the end of the crop year, the farmer was paid TT $5.15/kg (Pemberton and Ragbir 2005). The guaranteed price was part of a price support scheme, whereby the price support was the difference between the guaranteed price and the price obtained on the export market. However, from October 1st, 2012 a “New Payment System” was started, whereby the full price for cocoa was paid on delivery.

Objective of the Study

This study was an investigation into the happiness of cocoa farmers. *Psychology Today* (n.d.) defines “happiness” as: “More than simply (a) positive mood, happiness is a state of well-being that encompasses living a good life—that is, with a sense of meaning and deep satisfaction.

An American philosopher, Haybron (2003) identified four reasons why scientists should be concerned with the individual’s level of happiness:

1. Humans often appeal to considerations of happiness when deliberating on important decisions in life;
2. Individuals assess their personal situation in terms of happiness; and
3. Happiness can lead to clear explanations and predictions of human behaviour.

The General Assembly of the United Nations in its resolution 66/281 of 12 July 2012 proclaimed 20 March, the International Day of Happiness, recognizing the relevance of happiness and well-being as universal goals and aspirations in the lives of human beings around the world and the importance of their recognition in public policy objectives (UN, n.d.). Thus, happiness is being increasingly recognised as being a supreme measure of the sustainable development of nations and communities.

Frey and Stutzer (2002) have also stressed the importance of happiness as a goal in life shared by the majority of human beings. They state that economic activity, such as the production

of goods and services, is for most persons certainly not an end in itself, but such activity only has value in so far as it contributes to human happiness. In tracing the development of "happiness economics", they note the emergence of a "happiness function". This function seeks to establish econometric relationships between happiness and the determinants of this happiness (Frey and Stutzer, 2002). Utilising these functions researchers have identified three sets of factors as determinants of happiness:

- Demographic and personality factors: such as age, gender, family circumstances as well as nationality education and health;
- Economic factors: such as unemployment, income, and inflation; and
- Political factors: such as the extent of possibilities for citizens to participate in politics and the degree of governmental decentralization (Frey and Stutzer, 2002).

The objective of this study was to explore the happiness of a sample of cocoa farmers in Trinidad and Tobago and in particular to establish their happiness status and the factors that determine this status. This study proceeded to do this as a pioneering effort by the estimation of a happiness function for the farmers. This function was estimated as a stochastic happiness frontier which allowed for the determination of the "happiness efficiencies" of these farmers.

Methodology

The Survey

Data for this study was collected through a mail survey of all cocoa farmers in Trinidad and Tobago, who were registered with the CCIB. This sample frame listed approximately 1000 cocoa farmers with their names, phone numbers, mailing addresses and the addresses of their cocoa estates.

The questionnaire comprised 32 open and close-ended questions designed to collect a combination of both qualitative and quantitative data in four sections. The first section solicited socioeconomic or demographic information such as the age and gender of the farmer and household size. The second section collected data on the cost of production and marketing of cocoa. The third section gathered opinions on the New Payment System. Finally, the fourth section measured the farmer's happiness status using Cantril's Self Anchoring Ladder Scale (Cantril 1965). Cantril's approach has been utilized successfully in studying the happiness and motivation of farmers in a number of studies, for example Pemberton (1985), Pemberton and Craddock (1979).

This application of Cantril's Self Anchoring Ladder Scale proceeded as follows:

(a) The farmer's *Present* Happiness Score or status was determined as follows:

1) First the farmer was asked about his/her wishes and hopes as follows:
    - "All of us want to achieve certain things in our lives, when you think of the best possible life for yourself, what are your wishes and hopes for the future if you are to be happy?"

2) Then the respondent was asked:
    - "What are your worries and fears for the future?"
3) A Cantril Ladder Scale (Figure 1) was then used to measure the farmer's Present Happiness Score with the following instructions:
    - "Below is a picture of a ladder where the top of the ladder represents the best possible life for you. Kindly circle the number that best represents where your life is at the present time on this Ladder."

Then

(b) The farmer's perception of his/her happiness in five years' time, or Future Happiness Score was determined by also using another Cantril Ladder Scale as in Figure 1, with the following instructions:
    - "Now below is another ladder. On this ladder kindly circle the number that best represents where you think your life will be in five years' time?

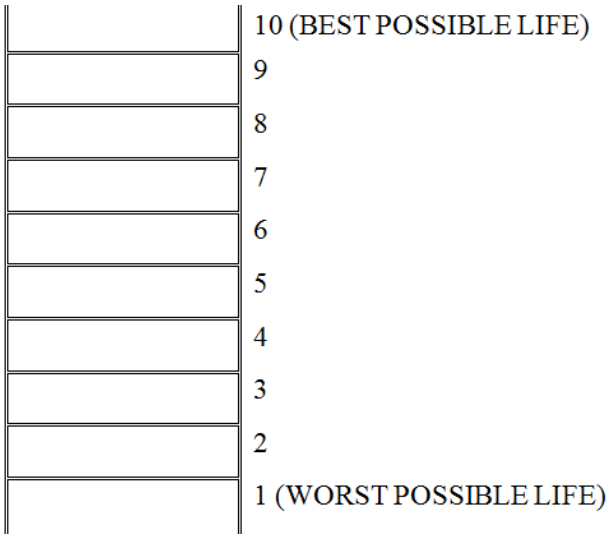


Figure 1. Cantril Self Anchoring Ladder Scale (Adapted from Cantril, 1965)

The Cantril Self-Anchoring scale has been included in several Gallup research initiatives to rank the relative happiness of countries of the world (for example, Clifton, 2017). In these initiatives, the respondent is asked to imagine a ladder with steps numbered from zero at the bottom to 10 at the top, and then asked questions as to where their lives are at present and where their lives will be in five years, in a similar manner to the questions above. Gallup (n.d.) argues that it is useful to categorize responses using any scale, into meaningful groupings in order to easily communicate the results of the Cantril scoring and for comparisons across populations. Based on their responses, Gallup utilizes the following happiness or well-being groupings which were adopted in this study:

- ***Thriving*** for positive respondents who have present scores ≥ 7 and even more positive scores in five years ≥ 8.

- ***Suffering*** for respondents who have negative or poor views of both their present and future situations (present scores and scores in five years ≤ 4)
- ***Struggling*** All other individuals with moderate or inconsistent views of their present and future situations.

According to Mendes (2012), in Table 1, the median percentage suffering score for the countries of the Americas Region was the lowest of all the worlds' s regions at 6%. In other words, it was estimated that approximately 6% of the population of the Americas Region were "suffering". The highest median percentage suffering score was recorded for the countries of the Europe Region at 14%. This was followed by the countries of the Africa Region at 13%. The countries of the Asian Region had a median percentage suffering score of 11%.

Table 1. Median Percentage "Suffering" Score for Countries by World Region in 2011

Region	Median Suffering (%)
Europe	14
Africa	13
Asia	11
Americas	6

Source: Mendes (2012)

In this study, as illustrated in Figure 1, an explicit 10 point scale was utilized with an implicit zero. This was based on pretesting of the questionnaire in previous studies with African and Caribbean samples, which detected a tendency for non-response for individuals who may interpret a zero value to imply their demise or "death". Since mail surveys characteristically have high non-response, all measures were taken to minimise the non-response in this study.

Questionnaire packages were mailed out from October 2013. Four months after the initial mailing, phone calls were made to the first 400 farmers on the list to remind and encourage participation and to prompt the return of the questionnaires in the prepaid envelopes provided. At the end of this lengthy exercise 102 cocoa farmers completed and returned the questionnaires.

Stochastic Frontier Analysis and Estimation

The concept of a happiness efficiency frontier has been developed in the so called "happiness economics" literature. For example, Cordero, Salinas-Jiménez and Salinas-Jiménez (2014) state that this frontier forms an efficient boundary represented by the best performance by individuals in transforming their resources into the highest levels of happiness. Thus, the distance between an individual's happiness score and the frontier would represent the level of inefficiency shown by that individual in obtaining happiness from his/her set of resources.

The estimation of the happiness frontier by Cordero, Salinas-Jiménez, (2014) was carried out by non-parametric methods, in particular, data envelopment analysis (DEA). This study instead utilised parametric stochastic frontier analysis to analyse the present state of happiness of the cocoa farmers. Stochastic frontier analysis has been applied successfully to ascertain aspects of farmer efficiency in the Caribbean (Patterson-Andrews and Pemberton, 2009).

In this study, in the first instance, it was assumed that there exists a happiness function (f) that defines the maximum happiness (h) or the highest happiness efficiency score that farmers can derive from varying levels of the vector of demographic and farm related factors x determining their level of happiness. Such a happiness function defines a happiness efficiency frontier for the farmers and can be represented as:

$$h = f(x)$$

If all farmers are behaving in an optimal fashion, they would all operate or lie on the happiness efficiency frontier, obtaining the highest levels of happiness at points along the frontier consistent with their personal values of their factors or "resources" in the vector x. In reality however, and in line with the stochastic frontier analysis, each farmer's happiness (h_j) can be represented functionally as follows:

$$\ln h_j = f(\ln x) + v_j - u_j \tag{1}$$

Variations from the maximum happiness on the happiness efficiency frontier are assumed to arise in two ways. In the first instance there may be random or stochastic sources of variation, which are likely to arise from un-measured factors associated with (h_j). These factors are incorporated in the stochastic error term v_j and allow for stochastic estimation procedures, such as ordinary least squares regression. However, and in addition, there is a one-sided error term u_j which accounts for any other systematic reasons, why farmers would lie away from and below the boundary established by the happiness efficiency frontier. Observations below the happiness efficiency frontier can be deemed "inefficient", so from an estimated happiness efficiency frontier, it is possible to measure the relative happiness efficiency of farmers within groups (for example the group of cocoa farmers) from the relationship between their observed happiness and the ideal or maximum potential happiness, represented by a point on the happiness efficiency frontier (Pascoe et al. 2003).

Both v_j and u_j are assumed to be independently and identically distributed (iid) with variance σ^2_v and σ^2_u respectively.

Given that the happiness of each farmer *j* can be estimated as:

$$ln\,\hat{h}_j = f(ln\,x) - u_j \tag{2}$$

While, the maximum happiness (i.e. no inefficiency) is defined by the happiness function when u_j equals zero and is therefore:

$$ln\, h^* = f(ln\, x) \quad (3)$$

Then the happiness efficiency of farmer *j*, HE_j can be defined as follows:

$$ln\, HE_j = ln\, \hat{h}_j - ln\, h^* = -u_j \quad (4)$$

Hence: $HE_j = e^{-u_j} = \hat{h}_j / h^*$ (5)

HE_j is therefore a relative measure of his/her happiness as a proportion of the corresponding frontier ("maximum") happiness and as defined, HE_j is constrained to be between zero and one in value. If u_j equals zero, then HE_j equals one, and the farmer *j* is said to be happiness efficient. As u_j increases the happiness efficiency of the *j*th farmer decreases and the limiting value of HE_j as u_j approaches infinity is zero. Since a farmer is defined as being happiness efficient if his/her happiness level is on the frontier, this implies that for happiness efficiency HE_j (=$\hat{h}_j / h^*$) is equal to one.

In the estimation of the stochastic frontier, heteroscedasticity was assumed in the two error terms such that the variance of the error terms were assumed to be a function of a set of farmer and farm related variables (z) such that:

$$\sigma_v^2 = g(z)\ and\ \sigma_u^2 = h(z) \quad (6)$$

For the stochastic frontier estimation, the dependent variable and the factors in the vector x were:

Dependent variable:

Y_1 ln (Present Happiness Score)

Factors in the vector x were:

x_1 $x_1 = 1$ cocoa is the main crop of the farmer; $= 0$ Otherwise
x_2 hired labour $x_2 = 1$ the farmer hired labour; $=0$ Otherwise
x_3 ln (age of the farmer)
x_4 ln (household size)
x_5 ln (number of years the farmer has been growing cocoa)
x_6 ln (size of the cocoa farm)
x_7 ln (best price for dry cocoa beans as stated by farmer)
x_8 $x_8 = 1$ farmer prefers new payment system; $= 0$ prefers old payment system.

The factors that were included in the (z) vector were: gender (as defined below), age, household size, number of years farmer has been growing cocoa and farm size. The stochastic frontier was estimated using the normal distribution for the stochastic error term *v* and the exponential distribution for the inefficiency error term *u*, using STATA 12 (StataCorp LLC, n.d.)

Linear Regression Estimation

Ordinary linear regression was used to determine the factors that explain the farmers' perceived happiness score in five years' time. The regression model used was:

$$Y_2 = f(X_i) = \beta_0 + \sum \beta_i X_i + u_i \text{ where } i = 1,\ldots,8 \quad (7)$$

and the variables were as follows:

- Y_2 the farmer's Future Happiness Score, the dependent variable
- β_0 the intercept coefficient
- u_i the stochastic disturbance term; and

Independent variables:

- X_1 age of the farmer
- X_2 household size
- X_3 number of years the farmer has been growing cocoa
- X_4 size of the cocoa farm
- X_5 best price for dry cocoa stated by the farmer
- X_6 gender of the farmer $X_6 = 1$ Male; $= 0$ Female
- X_7 $X_7 = 1$ cocoa was the main crop of the farmer; $= 0$ Otherwise
- X_8 $X_8 = 1$ the farmer hired labour; $= 0$ Otherwise
- X_9 X_9 =1 prefer new payment system; = 0 prefer old payment system

Standard post-estimation tests were performed for the significance of the regression coefficients, the test of overall significance of the regression line (F-test) and a test for the presence of heteroscedasticity – the Breusch-Pagan test. As well, variance inflation factors were calculated to detect the occurrence of multicollinearity.

Results

Descriptive Statistics

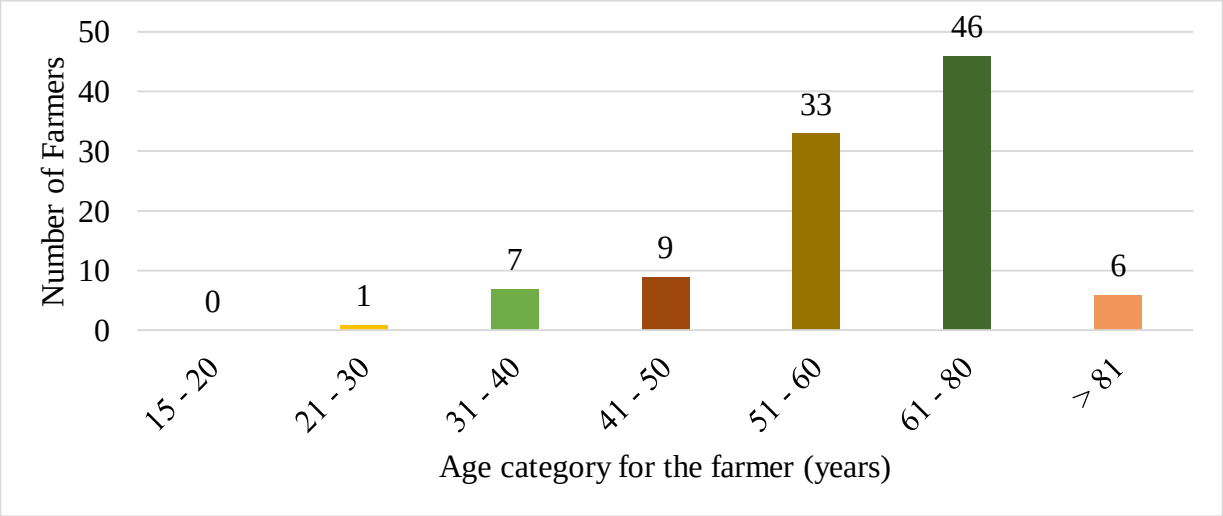
Table 2 presents some descriptive statistics for the sample of cocoa farmers. As seen in this table 83.3% of the respondents were male. The mean age of the farmers in Table 2 was 60.53. Figure 2 below shows a bar graph of the age distribution of these farmers. The most frequent age

category was between 61-80 years. The mean number of years the respondents was farming was 29.67. The mean household size was approximately four. The mean farm size was 8.52 acres and approximately 71% of the farmers stated cocoa was their main crop.

Table 2: Descriptive Statistics for the sample of Cocoa Farmers

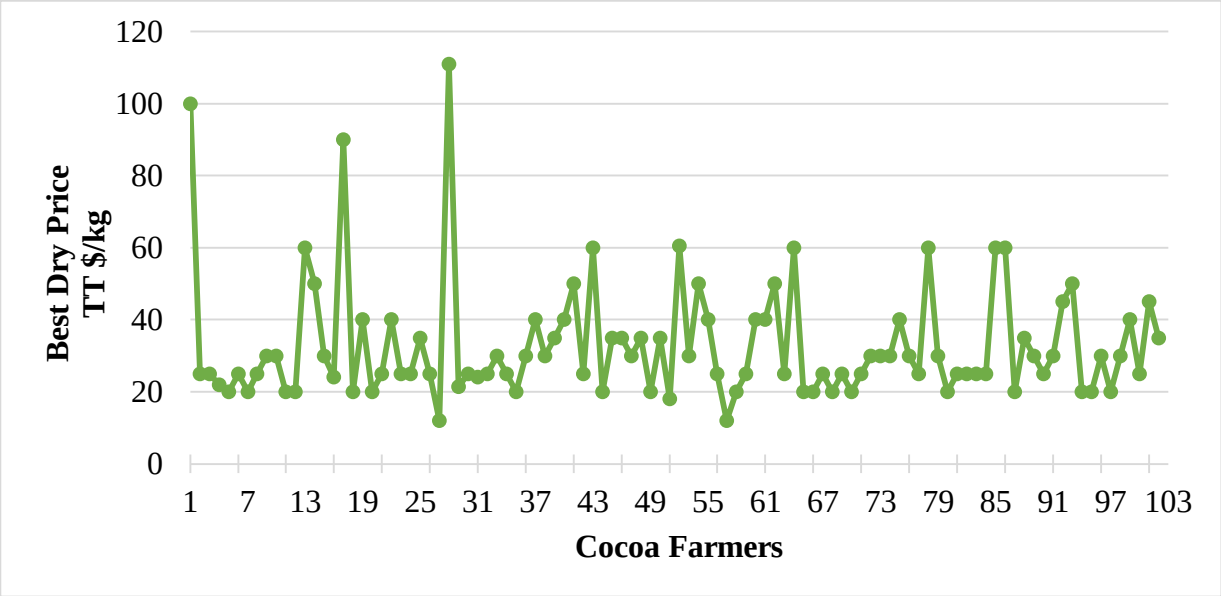
Variable	Mean	Standard Deviation	Percentage (%)
Gender (Male)			83.33
Age	60.53	12.55	
Household Size	3.98	2.06	
No. of years farm	29.68	16.02	
Farm Size	8.52	5.84	
Cocoa Is Main Crop (Yes)			70.59
Hired Labour (Yes)			62.75
Best Dry Price	32.84	16.54	
New vs Old (New)			55.88
Present Happiness Score	5.81	2.11	
Future Happiness Score	7.03	2.60	

Figure 2. Age Distribution of Cocoa Farmers



In the survey 94.12% of the cocoa farmers stated that they would like the price of cocoa to be increased. The price of dry cocoa during the survey was TT $20 per kilogram. The scatter graph in Figure 3 displays the range of the farmers' response to what should be the best dry price for cocoa in TT$/kg. From the graph, it can noted that the lowest best price for cocoa suggested was $12/kg and the highest suggestion was $110/kg. The range of the responses was $98, the mode was $25/kg, the median was $30/kg and the mean was $32.84/kg as seen in Table 2.

Figure 3. Best Price for Dry Cocoa Beans Stated by Farmers



In Table 3 it is seen that for most cocoa farmers to be happy they hoped for good health, an increase in cocoa prices, a reduction in crime, for Trinidad and Tobago to become a food secure nation and for there to be better infrastructure and utilities (roads, water supply, electricity etc.).

Table 3: Wishes and Hopes for the future for the sample of cocoa farmers

Wishes and Hopes	Percentages of Farmers (%)
Increase in the price of cocoa	27.65
Increase in the production of local cocoa	9.57
Good Health	30.85
Reduction in crime (peace & happiness)	23.4
Own a house	8.50
Trinidad and Tobago to be food secure	17.02
Better infrastructure and utilities (roads, water, electricity)	10.63
Cheaper labour	4.70
Recognition as a cocoa farmer	4.26
Payment of subsidies	9.57
To leave behind a legacy	4.26
Involvement of youths	3.91
Other (Learn to make chocolate, Land ownership, modernized regional program, pension fund, etc.)	9.49
Nothing	4.26

In Table 4, the major fears and worries of cocoa farmers in Trinidad and Tobago were that the cocoa industry would be closed down, followed by issues involving scarcity of labour, praedial

larceny; and being affected by disasters such as floods and bush fires. Other notable concerns were the lack of youth involvement in cocoa production, crime; and poverty.

Table 4: Worries and Fears for the future for the sample of cocoa farmers

Worries and Fears	Percentage of Farmers (%)
Labour Issues (shortage of labour and increasing labour cost)	17.02
No Youth Involvement in Cocoa	12.77
Crime	11.72
Natural Disasters	14.89
Closure of the Cocoa Industry	29.79
Lack of government Support	8.51
Praedial Larceny	14.89
Increase in Production Costs	4.26
Low cocoa prices	4.26
Competition	2.13
Poverty	11.72
Illness	9.57
No worries	2.13

Table 5 presents the results of the Present Happiness Scores for the farmers. Here it is seen that less than a quarter of the farmers had very low Present Happiness Scores (≤ 4). Table 5 also shows that the same percentage had high as opposed to moderate scores (38.24%). The mean Present Happiness Score was 5.81 as given in Table 2.

Table 5. Present Happiness Score of the Sample of Cocoa Farmers

Present Happiness Score	≥ 7	6 - 5	≤ 4
Number of Cocoa Farmers	39	39	24
% of Cocoa Farmers	38.24%	38.24%	23.52%

In Table 6, it is seen that most of the farmers perceived that they would be much happier in five years, as 62 % had high happiness scores in five years greater than 8. In fact, only 16% of them had very low scores in Table 6. Indeed 57.84% of the farmers had higher happiness scores in five years than their Present Happiness Scores, which is a general feature of the Cantril scale scores (Gallup, n.d.). The mean Future Happiness Score was 7.03 as seen in Table 2.

Table 6: Future Happiness Score for the Sample of Cocoa Farmers

Future Happiness Score	≥ 8	7 - 5	≤ 4
Number of Cocoa Farmers	63	23	16
% of Cocoa Farmers	61.76%	22.55%	15.69%

Table 7 presents the classification of the farmers utilizing the Gallup groupings. It is found that only 11 % of the farmers can be classified as "suffering" or experiencing the lowest levels of overall happiness, while 34% of the farmers could be classified as "thriving" or experiencing the highest levels of overall happiness. Most of the cocoa farmers (55%) were classified as being struggling.

Table 7: Number and Percentage of Cocoa Farmers by Happiness Groupings

Gallup Groupings	Thriving	Struggling	Suffering
Number of Cocoa Farmers	35	56	11
% of Cocoa Farmers	34.31%	54.90%	10.78%

According to Mendes (2012), as seen Table 1 the median percentage suffering score for the Americas Region was 6% which shows that in general a greater percentage of cocoa farmers were suffering than the percentage for the population in the Americas. However, in general the percentage of cocoa farmers suffering was less than the percentage suffering in the populations of Europe and Africa and just about the same as the percentage for the population in Asia.

Results of the Stochastic Frontier Analysis

As seen in Table 8, the following variables significantly affected the dependent variable, the log of the Present Happiness Score. The significant variable "Cocoa is the main crop?" shows that farmers who did not have cocoa as their main crop were happier as also those farmers with smaller households. The farmers who wanted a lower price were happier, as well as farmers who preferred the new payment system. The Wald Chi-squared test demonstrated the overall significance of the regression model. The results generally suggested that farmers who were less dependent on cocoa were happier, as well as those who had less family commitments in terms of smaller families with less demands for financial resources.

Table 8: Results of Stochastic Frontier Estimation - Normal/Exponential Model

Number of observations = 102						
Wald $chi^2(8)$ = 20.49						
Prob > chi2 = 0.0086						
Log likelihood = -39.2515						
Y_1	**Coefficient**	**Std. Err.**	**z**	**P>z**	**[95% Conf. Interval]**	
x_1	-0.192	0.080	-2.39	0.017**	-0.349	-0.035
x_2	0.025	0.092	0.27	0.787	-0.156	0.205
x_3	0.065	0.226	0.29	0.772	-0.377	0.508
x_4	-0.221	0.104	-2.12	0.034**	-0.426	-0.017
x_5	-0.002	0.039	-0.04	0.969	-0.078	0.074
x_6	0.022	0.088	0.25	0.802	-0.151	0.195
x_7	-0.200	0.099	-2.02	0.043**	-0.394	-0.006
x_8	0.146	0.064	2.26	0.024**	0.020	0.272
Constant	2.719	1.104	2.46	0.014**	0.555	4.884
$lnsig^2v$						
X_6	-0.146	0.799	-0.18	0.855	-1.713	1.421
X_1	-0.038	0.027	-1.41	0.158	-0.091	0.015
X_2	0.213	0.173	1.23	0.218	-0.126	0.553
X_3	0.014	0.026	0.55	0.580	-0.036	0.064
X_4	-0.198	0.098	-2.01	0.044**	-0.390	-0.005
Constant	-0.709	1.569	-0.45	0.652	-3.785	2.367
$lnsig^2u$						
X_6	-0.379	0.704	-0.54	0.591	-1.759	1.001
X_1	0.008	0.031	0.25	0.799	-0.052	0.068
X_2	-0.481	0.245	-1.97	0.049**	-0.960	-0.001
X_3	-0.001	0.020	-0.04	0.970	-0.039	0.038
X_4	0.002	0.068	0.04	0.971	-0.130	0.135
Constant	-0.593	2.322	-0.26	0.799	-5.144	3.959

With respect to the variance of the stochastic error term, the results showed that its variance was significantly related to the size of the cocoa farm suggesting that variations in the present happiness score were highly related to the size of the farm. With respect to the variance of the (one-sided) inefficiency error term, the results showed that its variance was significantly related to the size of the household of the cocoa farmer suggesting that variations in the Present Happiness Score of the farmers were highly related to the sizes of their households. In particular, it would be expected that the larger the household the smaller would be the variance associated with the Present Happiness Score.

Happiness Efficiency Scores of Cocoa Farmers

Table 9 presents the distribution of the happiness efficiency scores of the farmers. Here it is seen that approximately 53% of the famers have efficiency scores between 0.7 – 0.9 while about 22% of the farmers were mildly happiness inefficient with scores above 0.9. A minority of the farmers had efficiency scores below 0.7 (about 25%), showing a substantial degree of happiness inefficiency.

Table 9: Distribution of the Happiness Efficiency Scores of Cocoa Farmers

Happiness Efficiency Range	Number of Farmers	Percentage of Farmers (%)
Less than 0.5	14	13.73
0.5 - 0.7	12	11.76
0.7 - 0.9	54	52.94
Greater than 0.9	22	21.57
TOTAL	**102**	**100.00**

Figure 4 shows the plot of the happiness efficiency scores by farm size. As seen in the Figure most of the farms were less than 15 acres and there seems to be no relationship between the farm size and the happiness efficiency scores or the variance of these efficiency scores as suggested by the results in Table 8.

Figure 4. Graph of Distribution of Happiness Efficiency (HE) Scores by Farm Size

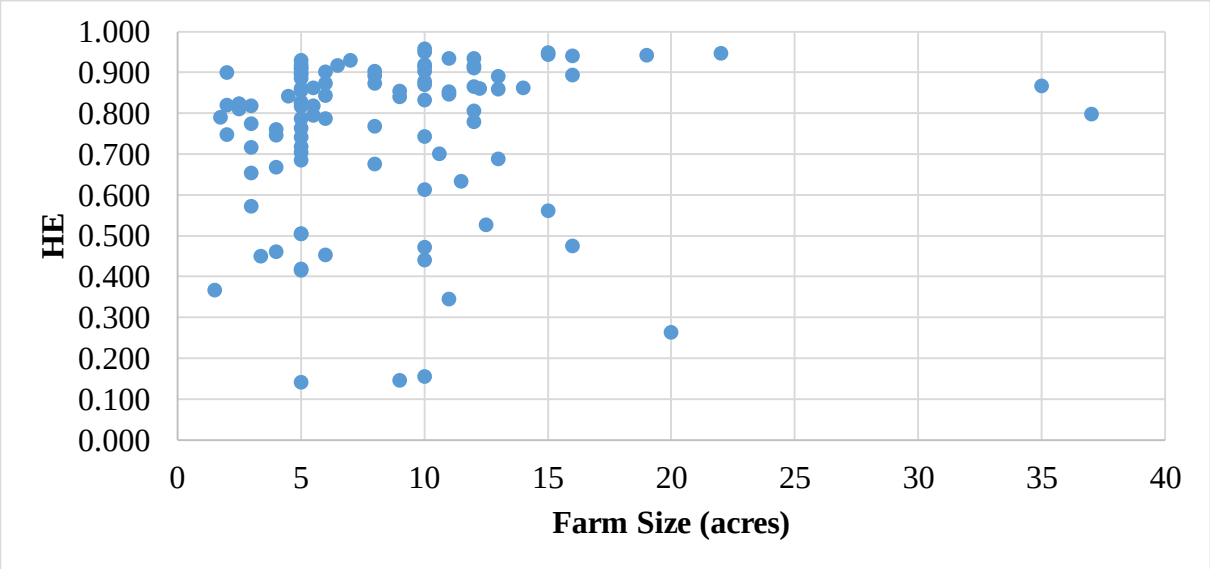


Figure 5 shows the plot of the happiness efficiency scores by household size. As seen in the figure most of the households had 7 persons or less. In this case it appears that the variance of the happiness efficiency scores appears to fall with increasing household size as suggested by the results of the stochastic frontier estimation in Table 8. There also appears to a trend of increasing happiness efficiency as the household size increased.

Figure 5. Graph of Distribution of the Happiness Efficiency (HE) Scores by Household Size

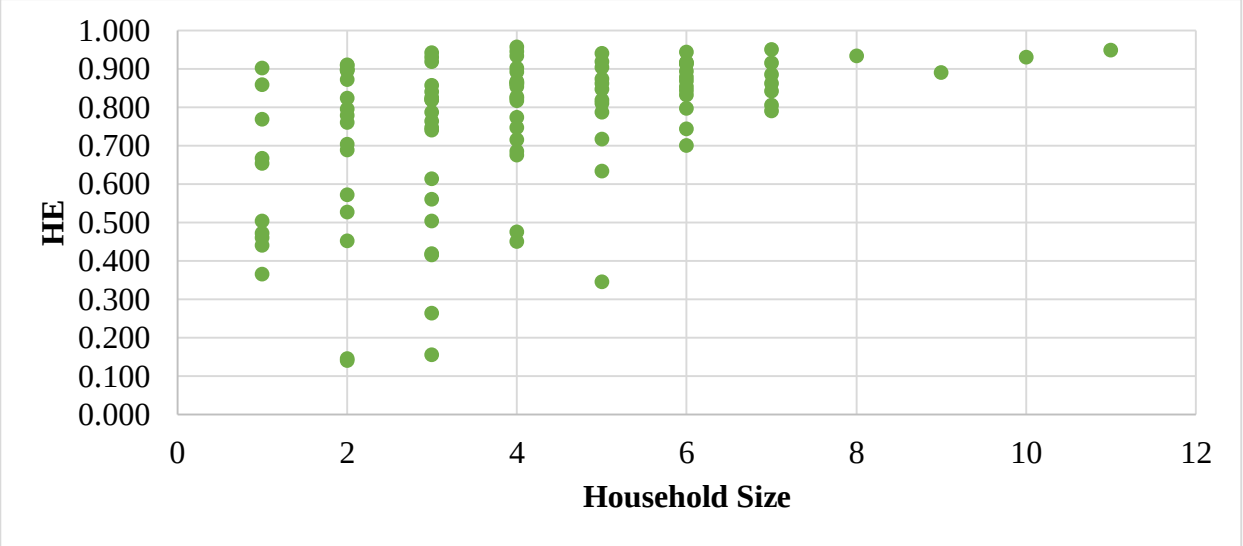
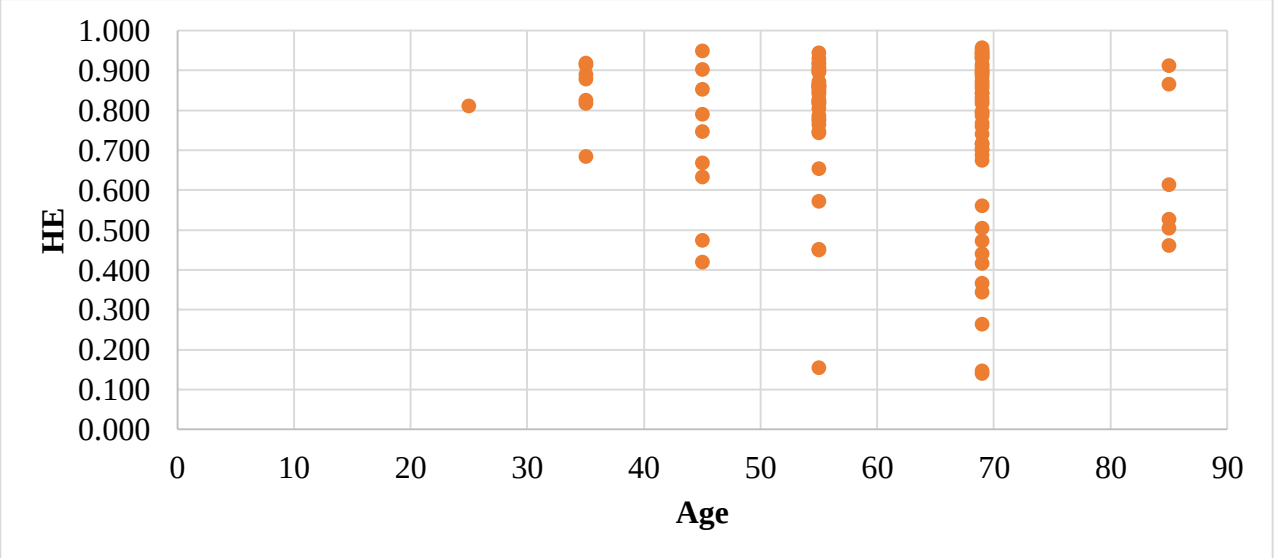


Figure 6 shows the plot of the happiness efficiency scores by the age of the farmer. As seen in Figure 6, most of the farmers were over the age of 50 years and only one was less than 30 years old. There seems to be no relationship between the age of the farmer and the happiness efficiency scores or the variance of these efficiency scores as suggested by the results in Table 8.

Figure 6. Graph of Distribution of the Happiness Efficiency (HE) Scores by the Age of the Farmers



Results of Estimation of the Ordinary Linear Regression Model

As seen in Table 10, the following variables significantly affected the dependent variable the Future Happiness Score of the farmer: the significant variable X_5 shows that farmers who wanted a higher price for cocoa also had lower Future Happiness Scores (*ceteris paribus*) in a similar pattern to the Present Happiness Score. Farmers who did not have cocoa as their main crop had higher Future Happiness Scores (*ceteris paribus*). Farmers with bigger households also had higher Future Happiness Scores which was the opposite position to the Present Happiness Score where bigger households had lower scores. Females had higher Future Happiness Scores than males and in a similar manner to the results for the Present Happiness Score, the farmers who preferred the new payment system also had higher Future Happiness Scores.

Also, as seen in Table 10, the results of the Breusch-Pagan test for heteroscedasticity showed that this problem was not highly likely to exist. Nonetheless, the model was estimated to generate robust standard errors. The variance inflation factors also showed that the problem of multi-collinearity was not expected to affect the estimation.

Table 10: Results of Ordinary Linear Regression Analysis

Number of observations = 102						
F (9, 92) = 3.06			Prob > F = 0.003***			
R-squared = 0.1949			Root MSE = 2.4411			
Y_2	**Coefficient**	**Robust Std. Err.**	**t**	**P>t**	**[95% Conf. Interval]**	
X_1	-0.025	0.021	-1.2	0.231	-0.066	0.016
X_2	0.206	0.116	1.77	0.080*	-0.025	0.436
X_3	-0.010	0.016	-0.59	0.557	-0.042	0.023
X_4	-0.048	0.046	-1.06	0.291	-0.139	0.042
X_5	-0.040	0.018	-2.27	0.026**	-0.076	-0.005
X_6	-1.186	0.609	-1.95	0.055*	-2.396	0.024
X_7	-0.248	0.511	-0.49	0.628	-1.263	0.766
X_8	-0.262	0.514	-0.51	0.611	-1.284	0.759
X_9	0.920	0.477	1.93	0.057*	-0.026	1.867
Constant	**10.561**	**1.356**	**7.79**	**0.000*** **	**7.867**	**13.255**

Breusch-Pagan test for heteroscedasticity	
Test statistic: LM = 10.751157 with p-value = P(Chi-square (9) > 10.751157) = 0.293152	
Variable	**VIF**
X_3	1.36
X_2	1.29
X_1	1.28
X_8	1.24
X_4	1.18
X_9	1.12

X_5	1.11
X_7	1.09
X_6	1.08
Mean VIF	1.19
VIF(j) = 1/(1 - R(j)^2), where R(j) is the multiple correlation coefficient between variable j and the other independent variables.	

Conclusions

A Cantril self-anchoring ladder scale was used to determine a Present Happiness Score as well as a Future Happiness Score (in five years) for cocoa farmers in Trinidad and Tobago, anchored by their own identified perceptions of their best and worst possible lives.

Two types of analyses were undertaken. Regarding the Present Happiness Score, stochastic frontier analysis was used to estimate a "happiness" frontier for the farmers and also the factors that were significant in determining this score. Ordinary linear regression was used to investigate the factors affecting the Future Happiness Score for the farmers.

The results found that the following farmers were presently happier (*ceteris paribus* for each factor) – those whose main crop was not cocoa; older farmers, farmers with smaller household sizes, as well as farmers who were in favour of the new payment system. Household size significantly increased the variance of the inefficiency error term while the farm size negatively affected the idiosyncratic error term. With respect to the Future Happiness Score, it was found that farmers who favoured lower cocoa prices, females and those who were in favour of the new payment system perceived themselves to be happier in five years' time.

Regarding their happiness efficiency, 53% of the famers had scores between 0.7 – 0.9, while about 22% of the farmers were mildly happiness inefficient with scores above 0.9, in that they derived close to the maximum happiness possible from their "resources" (both in terms of physical resources such as their farms as well as their personal attributes). On the other hand, close to a quarter of the farmers had efficiency scores below 0.7 which suggests that they were significantly inefficient in deriving happiness from their "resources".

Most of the farmers perceived that they would be much happier in five years, as 62% had high Future Happiness Scores greater than 8. In comparison to the world scene as gauged by the Gallup groupings, it was found that only 11% of the farmers can be classified as "suffering" or experiencing the lowest levels of overall happiness. In general, the percentage of cocoa farmers suffering was less than the percentage suffering in the populations of Europe and Africa and just about the same as the percentage for the population in Asia. On the other hand, 34% of the farmers could be classified as "thriving" or experiencing the highest levels of overall happiness. Thus, 55% of the cocoa farmers were classified as being struggling.

Farmers with bigger households also had higher Future Happiness Scores, which was the opposite position to the Present Happiness Score where bigger households had lower scores. Females had higher Future Happiness Scores than males.

The research reported in this paper recognised the concern for happiness, especially for farmers in developing countries. It therefore set out to determine the happiness status of cocoa farmers in Trinidad and Tobago and factors that determine this status as a pioneering effort, especially because the cocoa industry has been in decline recently in Trinidad and Tobago.

In general, the cocoa industry did not appear to be the major positive contributor to the happiness of the farmers. Also, there seemed to be dissatisfaction with the price of cocoa, since farmers who wanted a higher price for cocoa also were less happy. Indeed, farmers who did not have cocoa as their main crop (ceteris paribus) perceived themselves to becoming significantly happier in the future than farmers who relied on cocoa as their main crop.

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