# Model Development for Adoption Factors for Sustainability Certifications in Tea Estates of Eastern India

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*Abstract :* Tea estates over the last decade has adopted the concept of sustainability into it's core operations. Opting for sustainability certifications is a way to demonstrate the commitment and also improving the image of the tea estate. This research aims to develop a model for the adoption factors of these sustainability certifications in the Tea Estates located in eastern regions of India. Data obtained through questionnaire survey of 306 tea estates of which 129 certified and 177 non-certified were analyzed using Exploratory Factor Analysis to obtain the Driving Factors. Regression modeling was attempted with the driving factors and the status of certification. Management Commitment and Market, Regulatory & Social Dynamics was found associated with an increased likelihood of Adoption of Sustainability Certification, but increasing Perceived Benefits was associated with a reduction in the likelihood of Adoption of Sustainability Certification. Thus Management Commitment is found to be an essential driving factor for adoption of sustainability certification in Tea Estates of eastern India.

*Index Terms* - **Sustainability, Sustainable Agriculture, Sustainability Certifications, Tea, Tea Estate**

## I. INTRODUCTION

Sustainability certifications are voluntary, usually third party-assessed, certifications provided against these published sustainability standards relating to environmental, social, ethical and food safety issues. To address Sustainable Agriculture issues globally many scheme developers developed agriculture standards, codes and practices which are termed as Sustainability Standards. The standards are adopted by companies to demonstrate the performance of their organizations or products in specific areas.There is no compulsory standard for sustainable farming practices world over. Widely agreed upon standard or sustainable agricultural practice are not available. SAI, IFOAM, FLO, SAN have some voluntary Sustainable Standards and labels at the global level. Popular Certifications are – Rainforest Alliance, Fairtrade, UTZ, Naturland (Organic), Trustea etc.

As defined by the Western Sustainable Agriculture Research and Education program (SARE) [16] of Montana State University, "Sustainable agriculture can be defined in many ways, but ultimately it seeks to sustain farmers, resources and communities by promoting farming practices and methods that are profitable, environmentally sound and good for communities. Sustainable agriculture fits into and complements modern agriculture. It rewards the true values of producers and their products. It draws and learns from organic farming. It works on farms and ranches large and small, harnessing new technologies and renewing the best practices of the past."

Despite India's historical success with the tea industry, in recent years, the industry has faced serious competition in the international and national market which has led to the present crisis. In the market, the rising competition at domestic as well as international front has deepened the crisis of tea industry of India. Tea prices in India are being driven down by factors as below:

1. Decline in demand for Indian tea in the global market
2. Defects in auction system
3. Poor price realization
4. Defective market structure
5. Increase in cost of production
6. High rate of absenteeism of skilled workforce

The only solution to address these problems is to adopt the concepts of sustainable agricultural practices. Senarath and Athauda (2010) [15] have identified the adoption factors and challenges faced by Sri Lankan Tea Industries for Fairtrade Certification and have concluded that adopting of Fairtrade quality standard in the corporate tea sector is significantly determined by attitude, working experience of the estate manager, revenue of the estate and number of employees in the estate. The most important constraints perceived by the corporate sector tea estates were low market share in global market, lack of finance and unawareness of the workers about the Fairtrade. Some of the standards like no child labour and forced labour, non-discrimination, freedom of association, environmental friendly farming practices and safe working conditions can be observed in most of the estates.

Ochieng (2010) [2] indicates that the Rainforest Certification brings some important social and environmental benefits, for example, improved work conditions and to a limited extent, natural resource conservation. Certified tea farms maintain riparian strips to protect natural resources and also monitor their water quality more frequently than non-certified tea farms. However, there were no significant differences in some aspects including employee housing conditions and source of cooking energy.

Maina (2016) [17] states From the SAN standards and RA certification supported governance and public policy by upholding compliance to national laws, regulations, good agricultural practices, best practices, efficiency, transparency and accountability in the tea sector. Policy makers should mainstream relevant voluntary sustainable agricultural standards and certification as part of good regulatory practice and good public governance.

Zialon and Zailani et al (2009) [18] have identified the adoption factors of implementation of an environmental management standard in Malaysian manufacturing companies. The study indicates that the most influential factors are motivation, followed by role of top management, market orientation, and organizational culture. The study also revealed that perceived benefit factor not plays a significant role in determining adoption.

Malarvizhi & Yadav (2008) [14] pointed out that research on Indian organization's perception regarding the challenges to continually improve the EMS is limited also because of the lack of voluntary disclosure of data. It was observed that Indian companies follow diverse reporting practices on the internet viz., stand-alone environmental reporting or reporting along with the Annual/Financial Reports, or Sustainability Reporting (which include the economic, environmental and social issues).

Arif (2001) [12] identified that the major business drivers for adoption of environmental certification is acting consistently with corporate policy, societal responsibility and better corporate image. Companies realized the associated benefits for adoption to environmental certification as improved working environment, significant cost savings, decrease in environmental impacts, reduced complaints from regulatory authorities and pressure groups as well as higher staff morale.

Zutshi and Sohal (2004) [22] highlights the four main categories for adopting environmental certification are the market (mainly the external forces directly impacting the competitiveness of the companies), social (which includes pressure from various groups, the public and the community at large), financial (this broadly encompasses pressure from the financial institutions and insurance companies, not forgetting the fines and legal liabilities resulting from non-compliance) and regulatory (pressure from the guidelines and regulations at both national/international levels to continue working of the organizations).

The need for this study is envisaged since there is limited information and research work associated with adoption of sustainability certifications in Tea Estates. The aim of this study is to develop a probability model of major adoption factors or drivers for obtaining Sustainability Certifications in tea estates located in the eastern regions of India.

## II. MATERIALS & METHODS

This paper presents the results of a Sustainable Agriculture Management System field study that was conducted by means of an anonymous questionnaire survey. The survey was carried out from February 2018 to February 2019 with focus on tea estates in India. Most replies were gathered from tea estates from Eastern and North-Eastern states of India. An explanatory letter with questionnaires was sent via Internet and mail to 843 registered tea estates (all tea estates are registered by Tea Board of India). The final structure of the questionnaire is composed of two parts, firstly the demographic profile of the tea estates including the status of it's certification which shall have a binary response of either Yes or No. The second part of the questionnaire consists of 25 different response questions each with respect of a driver for adoption of certification and labelled as D1 to D25. The respondents were asked to rate the answer of each question on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree) to what extent the statement fits the situation in their organization. The target respondents for the questionnaire were Senior Management of Tea Estates who has direct control in decision making about adoption of sustainable certifications. Before the actual survey were conducted, the questionnaires were pre-tested and reviewed for structure, readability, ambiguity and completeness, and the survey instrument was refined in light of comments from the respondents. Cronbach's Alpha was calculated for the questions to test the reliability of the questionnaire and value obtained was more than 0.7 which confirmed that the questionnaire is fit to be used for data collection.

Dimension reduction of the variables were attempted using Principal Component Analysis and Varimax Rotation in SPSS 23 software and the 25 different variables were classified into 3 Driving Factors namely – Management Commitment (MGT), Perceived Benefits (BNFT) and Market, Regulatory and Social Dynamics (MRSD). Only the most probable variables having a factor loading above 0.7 was retained. This was done as suggested by Williams, Brett; Brown, Ted; and Onsman, Andrys (2010) [21].

Post dimension reduction, binary logistic regression was attempted to develop a probability model for the three driving factors influence on the status of adoption of sustainability certification. This was done as suggested by Neil Salkind (2007) [13], Encyclopedia of Measurement and Statistics.

## III. RESULTS & DISCUSSIONS

Altogether, 306 responses (36.6%) were received and filled correctly by respondents. 129 responses were received from certified tea estates and 177 responses were received from non-certified tea estates. Out of the total respondents 70 respondents are from Darjeeling (23%), 34 are from Dooars (11%), 105 are from Upper Assam (34%), 69 are from Lower Assam (23%) and 28 are from Cachar (9%). 48 (16%) are small sized tea estate whereas 127 (42%) and 131 (43%) are from medium sized and large sized tea estates respectively. 64% are having more than 500 workers, 20% are having workers between 251 to 500 numbers where as 17% have workers less than 250. Out of the total respondents 20% are having turnover less than INR 5 Cr where as 30% where within the INR 5 Cr. and INR 7 Cr. range where as 50% are having turnover more than INR 7 Cr. 43% of the respondents manufactures CTC Tea exclusively where as 26% of the respondents manufacture Orthodox Tea exclusively and 9% of the respondents manufacture all types of teas in their tea factories. 56% of the respondents operate both in domestic and export market, where as 28% operate exclusively in export market and only 16% operate exclusively in domestic market.

Of the total adopter respondents, majority have opted for Rainforest Alliance Certification (32%) and then combination of certification seems most popular with 28% responded opting for that. Location wise the highest adoption was noticed in Darjeeling and Upper Assam areas where 33% of the adopters are located. Majority of the adopters who responded in the survey cater to both domestic as well as export market, their numbers being around 51%, where as 42% of the adopters are 100% export oriented estates. This gives a very clear indication that a very small percentage of adopters cater exclusively to domestic market (7%). Adoption for certification was found to be equally distributed between Small and Large sized tea estates (43% and 41% respectively). Adoptions for sustainability certifications are more common in tea estates having more workers enrolled. 61% of the respondents are having worker strength of more than 500. 91% belongs to adopters are having an average annual turnover of more than INR 7 Cr. which directly relates to the resource capability of the tea estates. The percentage analysis of the adopters with respect to the type of teas manufactured at their tea estate doesn't throw up any remarkable trend.

Initially the reliability of the responses were analyzed using Cronbach's Alpha value and the results show that the value is 0.910 for 25 variables representing the Drivers, which is above the threshold value of 0.75 and thus the responses are accepted. Next Principal Component Analysis with Varimax Rotation was conducted on the same set of data to group the variables and scale it down to acceptable factors. The KMO value for sampling adequacy was calculated and the result came to 0.883 which is more than the threshold value of 0.6, thus the sample size used for analysis is adequate and we can accept the results obtained through this method. Also, the p-value (significance) is found to < 0.01 and thus the results obtained are valid. Exploratory factor analysis: A five-step guide for novices. J Emerg Prim Health Care, 19, Pages 42–50". From the total twenty five (25) variables three (03) most probable factors were obtained which explains 85.58% of the total variance of the variable. Based on the factor analysis, three (03) factors were summated and they are renamed as given in the table below:

**Table 1 - Driving Factors for Adoption of Sustainability Certifications**

| Sl. | Factor Name | Variables |
|-----|-------------|-----------|
| 1. | Management Commitment (MGT) | D19, D20, D23, D24 and D25 |
| 2. | Perceived Benefits (BNFT) | D12, D13, D14, D15, D16, D17, D18, D21 and D22 |
| 3. | Market, Regulatory & Social Dynamics (MRSD) | D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, and D11 |

We now attempt to address the next research questions with respect to the Driving Factors obtained from dimension reduction i.e. "Do perception of Management Commitment, Perceived Benefits, Market, Regulatory & Social Dynamics have an influence on the probability of adopting sustainability certification in Tea Estates of Eastern Regions of India?" To address the above, the researcher has used Binary Logistic Regression as a tool and have attempted to develop a Logistic Regression Model. For this analysis, we used SPSS 23 software and method used was Enter. The results are given in the following tables.

**Table 2 - Dependent Variable Encoding**

| Original Value | Internal Value |
|----------------|----------------|
| Non-Adopter | 0 |
| Adopter | 1 |

**Table 3 - Omnibus Tests of Model Coefficients**

| | | Chi-square | df | Sig. |
|--------|-------|-----------|-----|------|
| Step 1 | Step | 241.134 | 3 | .000 |
| | Block | 241.134 | 3 | .000 |
| | Model | 241.134 | 3 | .000 |

From the Omnibus Tests of Model Coefficients we can conclude that since the Chi-Sqaure significance is < 0.05 hence the prediction model which enters the 3 predictor variables (Management Commitment, Perceived Benefits and Market, Regulatory & Social Dynamics) fits significantly better than the null model without the predictor variable.

**Table 4 - Model Summary**

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|------|-------------------|----------------------|---------------------|
| 1 | 175.512[a] | .545 | .733 |

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

The above table contains the Cox & Snell R Square and Nagelkerke R Square values, which are both methods of calculating the explained variation. These values are sometimes referred to as pseudo R2 values. Therefore, the explained variation in the dependent variable based on our model ranges from 54.0% to 73.0%, depending on the Cox & Snell R2 or Nagelkerke R2 methods, respectively.

**Table 5 - Hosmer and Lemeshow Test**

| Step | Chi-square | df | Sig. |
|------|-----------|-----|------|
| 1 | 20.171 | 8 | .070 |

The above table showing Hosmer – Lemeshow (H-L) Test results also shows that the H-L Chi-Square statistics is significant (> 0.05) and thus the prediction model is expected to be a good fit. However no much reliance should be put on this test since the data set contains 306 observations and the test may give wrong results with observations less than 400.

**Table 6 - Classification Table**

| | | | Predicted | | |
|--------|--------|-------------|-------------|---------|--------------------|
| | | | Status | | |
| | Observed | | Non-Adopter | Adopter | Percentage Correct |
| Step 1 | Status | Non-Adopter | 149 | 28 | 84.2 |
| | | Adopter | 13 | 116 | 89.9 |
| | Overall Percentage | | | | 86.6 |
| a. The cut value is .500 | | | | | |

The above classification table denotes the cut value 0.5. This means that if the probability of a case being classified into the "Adopter" category is greater than 0.5, then that particular case is classified into the "Adopter" category. Otherwise, the case is classified as in the "Non-Adopter" category. The above classification table also shows that the overall accuracy rate is 86.6%. The rest is a false positive. Thus the prediction model is a good fit (86.6% at cut off value 0.5). It also shows that the prediction model does a better job for prediction of Adoption of Certification (correct percentage – 89.9%) than for prediction of Non-Adoption for Certification (correct percentage - 84.2%).

**Table 7 - Variables in the Equation**

|  |  | B | S.E. | Wald | df | Sig. | Exp(B) | 95% C.I.for EP(B) | |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  | Lower | Upper |
| Step 1ᵃ | MGT | 1.644 | 0.251 | 42.842 | 1 | 0 | 5.174 | 3.163 | 8.463 |
|  | BNFT | -0.723 | 0.179 | 16.215 | 1 | 0 | 0.485 | 0.342 | 0.69 |
|  | MRSD | 2.752 | 0.361 | 57.956 | 1 | 0 | 15.667 | 7.715 | 31.815 |
|  | Constant | -1.135 | 0.267 | 18.057 | 1 | 0 | 0.321 |  |  |
| a. Variable(s) entered on step 1: MGT, BNFT, MRSD | | | | | | | | | |

The final output table for binary regression analysis which gives us the odds value and the logistic regression coefficients (B) is given above. From the above table we can see that the Wald's statistics is significant ($p < 0.05$) for all the three predictor variables and thus we can firstly state that all the three predictor variables significantly contributes to the probability prediction of Adoption of Certification. We know that the odds of an event occurring are defined as the ratio of the probability that it will occur to the probability that it will not as given by the equation. Perception of Management Commitment is a significant predictor as mentioned already with an Odds Ratio of 5.174 (95% CI: 3.163 – 8.463). When the perception of Management Commitment increases by a unit, the odds of Adoption of Certification is 5.174 times higher if all other variables stay the same. Similarly, when the perception of Market, Regulatory & Social Dynamics increase by a unit, the odds of Adoption of Certification is 15.667 times higher if all other variables stay the same. However, when the perception of Perceived Benefit increase by a unit, the odds of Adoption of Certification is 0.485 times lower if all other variables stay the same. We can thus see that perception regarding Market, Regulatory & Social Dynamics is the strongest contributing factor influencing the decision for Adoption of Sustainability Certifications.

The equation showing probability of adoption of certification using the results of binary logistic regression for status of adoption of certification can be given as under:

$$\log (\text{Status of Certification}) = 1.644 \text{ MGT} + 2.752 \text{ MRSD} – 0.723 \text{ BNFT} – 1.135$$

## IV. CONCLUSION

We can thus conclude that Binary logistic regression indicates that perception of Management Commitment, Perceived Benefits and Market, Regulatory & Social Dynamics are significant predictors of Adoption of Sustainability Certification of Tea Estates in eastern regions of India [Chi-Square=241.134, df=3 and p=0.000 (<0.05)]. All the three predictors "explains" 73.3% (Nagelkerke R2) of the variability of Adoption of Sustainability Certification. Perception of Management Commitment, Perceived Benefits and Marker, Regulatory & Social Dynamics are significant at the 5% level [Management Commitment Wald=42.842 p=0.000 (<0.05); Perceived Benefits Wald=16.215, p=0.000 (<0.05); Market, Regulatory & Social Dynamics Wald=57.956, p= 0.000 (<0.05)]. The odds ratio (OR) for Management Commitment is 7.732 (95% CI 1.589 – 37.615) and for Market, Regulatory & Social Dynamics the corresponding figures are 15.667 (95% CI: 7.715 – 31.815). Similarly for Perceived Benefits the corresponding figures are 0.485 (95% CI: 0.342 – 0.690). The model correctly predicted 84.2% of cases of Non-Adoption of Certification and 89.9% of cases of Adoption of Certification, giving an overall percentage correct prediction rate of 86.6%.

Management Commitment and Market, Regulatory & Social Dynamics was found associated with an increased likelihood of Adoption of Sustainability Certification [Regression Coefficient (B) = 1.644 and 2.752], but increasing Perceived Benefits was associated with a reduction in the likelihood of Adoption of Sustainability Certification [Regression Coefficient (B) = -0.723]. This is contradicting the notion that Perceived Benefit would affect the decision to opt for certification.

The findings are in line with the adoption factors for environmental management systems as per Zutshi and Sohal [22]. It also corroborate the findings of Zialon and Zailani [18] that perceived benefit of certification is not a significant contributing factor which affects decision to opt for sustainability certification.

This study, like other ones, too have some limitations or the other and no study can be full proof no matter how much so the researcher wishes so. Selection of variables may be one such limitation where despite careful attempt by the researcher to identify the driver and challenging variables through literature review and case discussions with industry experts, yet errors may have crept in identification of the most appropriate variables which forms the basis of the research questionnaire. If important variables are missed, the results obtained may vary. The discussion in this study is based entirely on the responses to the research questionnaire therefore, ascertaining the genuineness of the responses was identified as one of the limitation of the study. Future study may incorporate impact of adoption of sustainability certifications in Indian tea estates.

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