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Growers' Attitude Towards Organic Conversion in Non-Estate Tea Production

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Abstract
The rapid growth in the number of small tea gardens and expansion in area of plantation is changing the land use pattern of some districts of Assam. In most cases the traditional practices of cultivating bamboo, betel nut, orange, pineapple, thatch for roofing and other vegetables cultivation are replaced by small tea plantation. Small tea growers are occupying the grazing fields, government fallow land and forests as well. The use of chemical fertilisers, pesticides etc. are causing soil degradation and leading to contamination of harmful elements in the water body of the surrounding area of a tea garden. The change in the land use pattern for tea plantation and application of heavy dose of fertilisers, pesticides etc. are posing a threat to flora and fauna of the surrounding areas. In this paper an attempt has been made to study the impact of tea production in the non-estate sector on biodiversity and growers' attitude towards adoption of sustainable method of tea cultivation in reducing adverse impact on biodiversity in Sivasagar district and Lakhimpur district of Assam.

Keywords: Organic, Non-estate, biodiversity, contamination, sustainable.

Introduction

Assam is well known for tea production and the state contributes over 50% of the total tea production in India. Tea production in Assam includes estate sector and non-estate sector, i.e. small tea growers sector. Started in late 1980s, small tea gardens in Assam have shown a continuous growth over the years. Tea production in non-estate sector is becoming an integral part of the tea industry in Assam and for India as a whole. It is playing an important role in income and employment generation and contributed 44.01% and 40.02% to the total tea production of India and Assam respectively in the year 2016-17.

Tea plantation in non-estate sector is encouraged in many countries keeping in view of employment and income generation. However, the multiple environmental consequences are to be also addressed. Several authors have focused on environmental consequences of traditional tea plantation. Tea is a monoculture perennial crop and it replaces sizeable areas of biodiversity. When tea plantation is done by transforming forest area, then it may cause high bio-diversity loss in that area. The emergence of a small tea plantation is altering the land use pattern as well. Borah (2008) states that at the initial stage the small tea growers have used suitable highlands only for tea plantation, but with the continuous increase in the numbers of growers, tea plantation began in many highlands whether it belongs to the family of the growers or government forests. This has led to a reduction in the forest cover surrounding to small tea gardens. Small tea growers are using not only government forests, they are also converting their cultivable fallow lands, sugarcane fields and land under plantation crops, bamboo forest etc. to tea plantations which has affected flora and fauna of the surrounding areas (Sharma, 2016). Cutting of trees and forests for small tea plantation is reducing many species of flora that include many valuable tree species, herbs, medicinal plants, indigenous fruits, etc. Logging of firewood for the purpose of tea processing and growing habitation in the surrounding area lead to extensive deforestation. The application of harmful pesticides for killing pests negatively affects the local and wider environment as well as it reduces soil biodiversity and generates water pollution, harming aquatic life, animals and people who depend on the biodiversity (UNCTAD, 2016). Land clearance for tea plantation results in many environmental problems and it provides ideal conditions for several pests. Contamination of harmful chemicals is causing an adverse impact on the biodiversity with a decline in invertebrate species richness in rivers surrounded by tea plantations (Biervliet et al., 2009). Richness of invertebrates shows the general health of aquatic ecosystem, thus reduction in their diversity likely to show a reduction in the ecosystems integrity. Tea cultivation in the mountain areas led to degradation of adjacent stream ecosystems. Dissolved oxygen is necessary for aquatic diversity, which increases their concentration. The application of chemical fertilizers causes land degradation and reduces soil fertility (Linhai and Gabriel, 2011). According to the study of Linhai and Gabriel on tea plantations in Rwanda, it is found that due to application of chemical fertilizers with NO3+ causes soil degradation. The soil pH in their study area found to be ranging from 4.6 to 5.2 which is less than the normal required pH of 7. Pesticides are becoming inevitable inputs in modern agro-ecosystems even though variety of problems associated with them. Pesticides are applied to the environment for suppressing the adversity of plant and animal pests so that agricultural and industrial products can be protected (Dey et al., 2013). In most cases farmers are not aware of the health hazards associated with different pesticides and the consequences of their improper handling. Spraying of pesticides while women are working in the field could cause a variety of reproductive health problems to women in the reproductive age group. Study shows a close linkage of pesticide exposure and chronic disease like diabetes, hypertension, ophthalmic disorders, etc. It is evident that tea plantation in traditional way causes environmental degradation to a certain extent, thus some steps are essential to address those environmental issues. The environmental consequences caused by conventional tea plantations and health hazards associated with the consumption of conventional tea products inducing sustainable organic tea plantations and products. The environmental issues and increasing value of organic variety of tea in the international market give rise to the eco-friendly management of tea plantations. Transforming to sustainable organic tea farming from traditional farming is considered to be an option for the small tea growers to reduce environmental consequences.

Objectives

The present study is undertaken -

To study the change in land use pattern for small tea cultivation and its impact on bio-diversity in Sivasagar and Lakhimpur district of Assam.

To examine the tea growers willingness to adopt sustainable organic farming.

Methodology

The present study mainly uses primary data to fulfil the two objectives. Primary data were collected through a schedule cum questionnaire from the sample selected from the two districts viz. Sivasagar and Lakhimpur of Assam, India. The Sivasagar district is selected as one of the traditional tract of small tea cultivation and Lakhmpur district is selected as an emerging tract of small tea cultivation in Assam. The sample is drawn by using simple population proportion method from the data on total number of small tea gardens in Assam and the respective districts as provided in the report of All Assam Small Tea Growers Association (AASTGA), 2016-17. The sample size thus, determined is 180 out of which 160 is from Sivasagar district and 20 from Lakhimpur district. Simple percentage method is used as tool for the analysis of the first objective.

The socio economic profile and technical attributes of the small tea growers' in the sampled district is presented in the table-1.

Table-1: Small tea growers' socio economic profile and technical attributes

Sl. No.	Particulars	Values
1	Gender	Male=96.1% and Female=3.9%
2	Educational attainment	Primary and Upper primary=0.6%, High school=0.6%, Matriculate and Higher secondary=18.3%, Graduate and above=80.6%
3	Age distribution in years	20-30=3.9%, 30-40=28.9%, 40-50=45.6%, 50-60=20.6% and 60 and above=1% Average Age=43.5 years
4	Ethnic and Religious Distribution	Hindu=97.2% and Islam=2.8%
5	Member participation	Average family member=3.69 ≈ 4 and Average member participation=1.94 ≈ 2
6	Sale destination of green tea leaves	Leaf Agents=74.61%, Bought Leaf Factories=7.5% and Estate Garden Factories=17.89%
7	Institutional (Tea Board of India) Support	Yes= 34 No= 146
8	Subsidy	Yes= 10 No= 170
9	Credit support	Yes= 17 No= 163
10	Years of experience	1-5=12.22%, 5-10=20%, 10-15=21.67%, 15-20=27.22%, 20-25=7.22%, 25-30=9.44%, 30-35=0% and 35-40=2.22%

Source: Authors calculation based on sample data from field survey.

The willingness to adopt organic plantation is a binary variable and hence, a binary logistic regression model has been used to analyse the second objective. The model can be mathematically represented as:

$Y = \ln p/(1-p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots + \beta_k X_k + e$

Where, "Y" is the dependent variable; "X" represents the independent variables having 'k' covariates in the model. "p" means the probability of occurrence of the event, Y(0,1) and "e" are the residuals. In our case, the dependent variable Y (0, 1) has exactly two responses i.e. whether a small tea grower will adopt organic farming (1) or not (0).

Results and discussions

Objective-1:

The rapid growth of the small tea plantation is immensely contributing to the economy of Assam in terms of income and employment generation. However, the rapid expansion is not beyond the purview of criticism because of the changing pattern of land use and loss of bio-diversity. The rapid growth of the small tea plantation is causing a drastic change in the land use pattern in Assam. Though small tea cultivators in Assam initially used suitable highlands only, but with the growth in numbers they have cultivated tea in many highlands that belongs their own or government forest. This has led to a reduction in traditional practices of cultivating bamboo, betel nut, orange, pineapple, thatch for roofing and other vegetables cultivation. Besides, small tea growers are occupying the grazing fields, government fallow land and forests. Thus, the changing pattern of land use and deforestation for tea plantation has brought a change in the environment of the surrounding area. An overview of the land use before tea plantation in the sample districts is shown in the table-2.

From the table-2, it is observed that 32.22% of small tea growers have planted tea in barren tract of land while 23.89% of growers have done plantation on occupied government forests including grazing fields. During the field survey it was found that most of the small tea planters in the sampled districts have claimed to do plantation on their own barren land. However, while they were asked about types of possession of their land, majority of them were found to be occupied government lands.

Table-2: Land use pattern before tea plantation in the sample districts

Sl. No.	Land use	Percentage of Growers
1	Barren	32.22
2	Government forest including grazing field	23.89
3	Tree orchard (Bamboo, Mango, Jackfruit and other trees)	21.11
4	Other plantations (Betel Nut, Pineapple, Banana, Rice etc.)	22.78
Total		100

Source: Field survey (2023).

As revealed in the table-2, there is a considerable amount of deforestation because of land clearance for small tea plantation which is leading to change in the bio-diversity of the surroundings of the small tea gardens in the study area which has been observed by Sharma (2016).The study of Sharma (2016) reveals that due to growth in small tea gardens various indigenous trees, fruit trees, vegetable plants, medicinal plants etc. are reducing rapidly. On the other hand habitat of various aquatic life species, animals, invertebrates, birds etc. also reducing. The author finds that application of pesticides in the nearby tea gardens have lowered the production of Muga (Silk) thread produced from silkworms. It is causing adverse effect on the people who are engaged in traditional practice of Muga silk worm. The same has been reported by "The Assam Tribune'' a daily English newspaper published from Assam on April 30, 2018. They reported it that spraying of pesticides in nearby small tea gardens have destroyed Muga silk worm worth several lakhs in Dhakuwakana sub-division of Lakhimpur district. This led to conflict between small tea growers and farmers of Muga silk worm in that area.

Objective-2:

As it is evident that tea production may cause environmental degradation to a certain extent, therefore some steps are essential to address those environmental issues. The environmental issues and increasing value of organic variety of tea in the international market gives rise to the eco-friendly management of tea plantations. Transforming to organic tea farming from traditional farming is considered to be an option for the small tea growers to reduce environmental consequences.

In view of the environmental consequences and health hazards associated to traditional tea plantation and products, an attempt has been made to examine the attitude of small tea growers in the study area towards adoption of organic plantation.

Conversion of traditional tea plantation into sustainable organic farming by the growers may be influenced by several variables. Karki et al. (2011) have used several discriminant variables that distinguish between organic and conventional farmers. The variables are household size, level of education, affiliation with institutions, age of farmers, experience in tea farming, farm size, gender, contact with agricultural technicians, participation in training, availability of loan, ethnicity and time required to reach the market. Based on the study of Karki et al. (2011), the present study tries to analyze different factors which are influential in conversion of conventional small tea gardens to organic garden. However, this study excludes the variables gender, ethnicity and time required to reach the market. The variable gender is excluded as 96.1% of the sampled respondents in the present study are male and hence it will not be considered as significant. The variable ethnic distribution is excluded as 97.2% of the sample growers of the study area are belong to indigenous Assamese Hindus. On the other hand, time variable has been excluded because 74.61% of the small tea growers in the study area sale their produce to leaf agents where leaf agents collect leaves from the garden itself and remaining small tea growers sale their produce to estate factories or bought leaf factories situated very nearby to their gardens. The Tea Board of India (TBI) through its different branches provides institutional support in terms of training, dissemination of technical knowhow to the growers. Thus for the present study the variables affiliation with institution, participation in training and contact with agricultural technician are merged into one variable i.e. TBI support. Moreover, to study the impact of grower's income from conventional tea plantation and subsidy on the organic conversion, this study includes two new variables viz. income from tea and subsidy as explanatory variables. Therefore, the present study incorporates eight explanatory variables which are age of farmers, level of education, family member participation, and area of tea plantation, income from tea, credit support, TBI support, subsidy and years of experience. The result of binary logistic regression is presented in the table-3.

Table 3: Binary Logistic Regression Estimates of Likelihoods of Organic Transformation

Characteristic	Coefficient (β)	S.E of estimate (β)	Wald	Odds ratio Exp (β)
Age	-0.049	0.028	3.063	0.952*
Education :				
1	-18.953	40192.97	0.000	0.000
2	22.785	40192.97	0.000	7863
3	0.612	0.520	1.386	1.844
4 ®				1.000
Member Participation	0.176	0.299	0.344	1.192
Tea Area(Acreage)	0.150	0.081	3.421	1.162*
Income From Tea	0.000	0.000	2.524	1.000
Credit Support:				
Yes	21.466	8899.254	0.000	2101
No ®				1.000
TBI Support			3.301	

Yes No®	1.067	0.587		2.905* 1.000
Subsidy Yes No ®	1.840	1.247	2.179	6.296 1.000
Years of Experience	0.063	0.031	4.118	1.065**
Pseudo R^2	0.422			
Log Likelihood	- 173.405			
Wald Chi^2	67.165			
Observations (N)	180			

Source: Primary Survey
Notes: *, **, *** represents significance at 10%, 5% and 1% respectively.
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The effect of explanatory variables on dependent variable has been presented in the table-3 with their corresponding standard error (S. E.), significance level and odds ratio.
According to the fitted model, the variables which have appeared as significant predictors for organic transformation are age, tea area (acreage), TBI support and years of experience. In accordance with their importance these variables have statistically significant effect on likelihoods of organic transformation.
The result of the study shows that age variable is negatively significant in conversion to organic tea production in the study area for the small tea growers. This result leads to the conclusion that the older farmers are less likely to convert to organic tea production. This finding is in contrast to the findings of Karki et al. (2011) that older farmers are more likely to convert to organic production in Nepal. In the context of Assam it evident from the sample result that young and middle age farmers can take the risk of conversion to organic cultivation of tea.
Holloway et al., (2002) found that level of education play a significant role in the adoption of new technologies by reducing cost of learning. In contrary to this result this study shows a non-significant relationship of education with the adoption of organic farming, which is similar to the result found by Karki et al. (2011). As organic farming requires lot of experience cultivation, so experience is more important than level of education.
Another result of the study shows that tea area or the size of the land holding is an important determinant in adoption of organic farming. Tea area is positively significant so growers with more land holding have more likely to adopt organic farming. This result is similar to the findings of Karki et al. (2011) where land ownership determines the growers' adoption to organic farming as they are financially for stronger.
TBI support act as an incentive for organic transformation in terms of training, dissemination of technologies. There is a positively significant relationship between TBI support and growers adoption of organic farming. Therefore areas with better TBI support have more likely to adopt organic farming. Extension services plays important role in the process of conversion to organic farming, especially for illiterate farmers (Pornpratansombat et al., 2011; Sarker et al., 2010).
This study also points out that farmer with more years of experience are more likely to convert to organic tea production as years of experience is a significant and has a positive relation to the adoption of organic farming. Therewith, this study supports the finding of Svotwa et al. (2009) in Zimbabwe and

Karki et al. (2011) in Nepal. Subsidy is not an important factor for the growers' transformation to organic farming. In this study only 10 growers reported of receiving subsidy out of the total sample size of 180.

Conclusion

The practice of traditional tea cultivation has definite environmental impact in terms of deforestation and loss of bio-diversity. To reduce the risk of environmental degradation due to change in land use pattern for small tea cultivation is necessitating some immediate measures. Instead of cultivating tea as mono crop, growers may adopt the practice of intercropping so that further deforestation and de-vegetation can be reduced. In Assam there are various vegetable or tree crops such as cucumber, tomato, betel nut and betel leaf, black pepper, coconut, sasi tree etc. which can be planted with tea. By adopting intercropping in the same plot of land growers can earn additional income from other crops along with tea. The practice of intercropping provides insurance against main crop failure. Intercropping helps in increasing soil fertility by adding organic matter through decomposition of fallen leaves into soil, controlling weeds, protecting soil from erosion and enabling the growers in efficient utilisation of resources.

The issues of loss of bio-diversity and health hazards can be addressed through adoption of organic or sustainable methods of tea cultivation. The primary focus of sustainable agriculture is to address environmental and social concerns, but it also offers innovative and economically viable opportunities for all stakeholders in the entire food ecosystem (Onduru et al. 2012). The concern about sustainability focus on the necessity to adopt technologies and practices that do not cause adverse effects on the environment, the technologies should be easily accessible to and effective for farmers. Although organic tea plantation is considered being an option for reducing environmental risks and it is adopted by many gardens in the world including India, but the conversion of conventional estate to organic estate is a complex process which involves risk and problems. It requires a minimum of three years for conversion of an established conventional garden to organic, and it has to be certified by a certifying agency (Yugandhar et al., 2018). The certification process goes through a complex and tedious process for which many of the small tea growers reluctant to follow the processes. Moreover, the cost of organic tea farming is comparatively higher than non-organic farming. There is a very competitive international market for organic tea and the international market is accessible only through fair trade channels (Baruah & Handique, 2019). Small growers have limited information and knowledge on marketing issues in comparison to large organic tea producers and thus, big producers find dominant place and it gives rise to possibility of pushing out of small producers from the organic tea market.

Despite all the limitations of organic tea plantation, the small organic tea growers in Assam who are making handmade teas have found a market to suit their size (FAO, 2012). Innovative marketing and new products, such as hand-crafted and limited editions of specialty teas, have an advantage in the market. It is also applied in South India, where organic teas are increasingly being marketed through direct factory labelled products. The growers can use the platform of e-commerce as a media of promoting and marketing organic tea, and this medium is gaining popularity to reach out to prospective consumers. Keeping view of the gradual increase in the demand for organic tea in the domestic as well as in international market, conversion of traditional tea cultivation to organic cultivation is highly recommendable so that environmental adversity caused by traditional tea practice can be reduced.

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