THE SMALL TEA GROWERS OF ASSAM: A STUDY OF THEIR MONOPSONISTIC EXPLOITATION AND PRODUCTION

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Doctor of Philosophy

By

KARABI DAS

REGISTRATION NO: 11614102

Department Of Humanities And Social Sciences

Indian Institute Of Technology Guwahati

India

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Indian Institute of Technology Guwahati
Department of Humanities and Social Sciences
Guwahati - 781039
Assam, India

DECLARATION

I, Ms. Karabi Das, hereby declare that the matter embodied in the thesis titled "**The Small Tea Growers of Assam: A Study of their Monopsonistic Exploitation and Production**", is the result of investigations carried out by me in the Department of Humanities and Social Sciences, Indian Institute of Technology Guwahati, under the supervision and guidance of Dr. Debarshi Das, Associate Professor (Economics), Department of Humanities and Social Sciences, Indian Institute of Technology Guwahati.

In keeping with the general practice of reporting observations, due acknowledgements have been made, wherever the work described is based on the findings of other investigators. The sources of secondary data utilized in this thesis are duly acknowledged.

Karabi Das

IIT Guwahati

Indian Institute of Technology Guwahati
Department of Humanities and Social Sciences
Guwahati - 781039
Assam, India

CERTIFICATE

This is to certify that the thesis entitled "**The Small Tea Growers of Assam: A Study of Their Monopsonistic Exploitation and Production**", submitted by Ms. Karabi Das, Roll No. 11614102, for the degree of Doctor of Philosophy in Economics in the Department of Humanities and Social Sciences of Indian Institute of Technology Guwahati, embodies bonafide record of research work carried out under my supervision and guidance. The collection of materials from the secondary sources has also been done by Ms. Karabi Das herself.

The present thesis or any part thereof has not been submitted to any other University or Institute for award of any degree or diploma. She has fulfilled all the requirements according to the rules of the Institute for submission of thesis.

All assistance received by the researcher has been duly acknowledged.

Dr. Debarshi Das

Associate Professor (IITG)

Thesis Supervisor

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IIT Guwahati

ABSTRACT

Small scale tea cultivation has become an integral part of the economy of Assam of late. The prospect of earning steady income has attracted a large number of rural people to start small tea cultivation. However, the sector is not free from challenges. The small tea growers are often exploited by the large tea estates. Workers employed in the small tea gardens seldom get their due benefits.

The main purpose of the present thesis is to investigate the production conditions in small tea gardens and the possible exploitation of small tea growers by buyers of tea leaves in Assam. The sustainability in the long-run would also be discussed.

A detailed review of studies relating to the emergence of small tea sector in Assam and the general problems faced by them has been done. The nature of the small tea cultivation is that of unorganized/informal sector as some of the features of the informal sector are evident in small tea cultivation. The sector started its fast expansion in Assam in the 1990s and has been experiencing a high rate of growth. The growth is reflected in terms of land under small tea gardens, number of gardens, production, etc. The small tea gardens are mostly concentrated in the Eastern Assam tea districts.

This high growth rate of small tea growing sector is in line with growth of informal industries in the country, and even world-wide. As in other informal sector units two distinct exploitations go on small tea gardens. First, the exploitation by the buyers of tea leaves, in terms of paying low price for the produce, i.e., raw tea leaves. Secondly, exploitation of the workers by the owners of small tea gardens. In this thesis we are focusing on the first exploitation, which can be termed as monopsonistic exploitation. Monopsonistic exploitation, according to the microeconomic theory, depends on the price elasticity of supply of raw tea leaves in an inverse manner.

The question of monopsonistic exploitation is linked with the possibility of long run survival of small tea gardens: more exploitation would imply less remunerative prices for the fledgling sector. The second question we pose is also linked with to the long run sustainability. It is about understanding the production conditions of small tea growers. If the nature of production

function is estimated it would give us a clue as to which factors need to be strengthened in order to push up the output of the small tea growers.

Both these research questions are empirical in nature. Accordingly, questionnaires were prepared and a pilot and a main survey were conducted. All the information and collected data have been analyzed and inferences have been drawn from them. As for exploitation, first we estimated the supply function through IV (instrumental variable) method, from where price elasticity of supply was obtained. This helped us estimate the degree of monopsonistic exploitation. We found that the exploitation is indeed present, it has a non-zero value. As the estimated price elasticity of supply that determines the degree of exploitation is just a number, hence the collected data has been divided into separate groups according to certain objective criteria. Accordingly price elasticity of supply of different groups have been measured and degree of exploitation of different groups have been calculated and explained for inter-group comparison of monopsonistic exploitation.

Next, we estimated the production function. Among the inputs of production land, fertilizer use, capital cost, along with the dummy for districts with high concentration of STGs are found to be statistically significant. We probed the question of technical inefficiency. It was found that technical inefficiency is indeed present in small tea garden production. Accordingly the determinants of technical inefficiency have been examined.

Finally we come to policy implications. Our recommendations rely on the findings of the empirical study. Existence of exploitation and technical inefficiency means that there are possibilities to improve the conditions of small tea gardens in terms of price they get and the output they produce respectively. Formation of co-operatives by the small growers which can negotiate better with the buyers may be helpful. It would reduce the monopsonistic exploitation as observed in the study. The central Government has been pushing the idea of FPOs (Farmers Producers Organizations, which are a midway between cooperatives and regular companies) of late. This may also be game changer in the small tea garden sector. The importance of land cannot be missed as has been underlined in our estimation of production function. Greater access to land by the Government would push up the output. The same holds true for capital and fertilizer. Role of banks and lending institutions are underlined in this context. Focus on priority sector lending (which is a policy but not implemented in spirit), pro-active role of the

Government in extending branches in remote areas, lending on easier terms for this sector would help the farmers access funds. That would allow them to push up the use of these critical factors of production. Extension services and training by the research institutes and Government bodies can help in mitigating the technical inefficiency observed in the data.

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LIST OF ABBREVIATIONS

AASTGA	All Assam Small Tea Growers Association
AGCL	Assam Gas Company Limited
BLFs	Bought Leaf Factories
CAGR	Compound Annual Growth Rate
C-D	Cobb-Douglas
CPFs	Co-operative Factories
CSR	Central Statistical Organization
CTC	Crush-Tear-Curl
CV	Co-efficient of Variation
DRDA	District Rural Development Agency
FLO	Fair trade Labelling Organization
FPO	Farmer Producer Organization
GTAC	Guwahati Tea Auction Centre
HYV	High Yielding Variety
IMF	International Monetary Fund
INDCO	Industrial Co-operative Tea Factory
ITA	Indian Tea Association
IV	Instrumental Variable
NABARD	National Bank For Agriculture And Rural Development
NETA	North Eastern Tea Association
NHYV	Non High Yielding Variety
NREGA	National Rural Employment Guarantee Act
NSSO	National Sample Survey Organisation
OLS	Ordinary Least Square
PLA	Plantation Labour Act
PSF	Price Sharing Formula
PSL	Primary Sector Lending
RFI	Regional Financial Institutions
SFA	Stochastic Frontier Approach
SHGs	Self Help Groups/Primary Producing Societies
SPTF	Special Purpose Tea Fund
STAP	Small Tea Growers' Advisory Programme
STGs	Small Tea Growers
STTL	Special Tea Term Loan
TBI	Tea Board of India
TMCO	Tea Marketing Control Order
TSHDA	Tea Smallholders Development Authority

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Chapter I

INTRODUCTION

Tea is one of the most important plantation crops of India. Its production takes place in both large plantation and small gardens. The production of tea in India and the contribution of small growers and big plantations have been studied by many scholars (see Hannan, 2013; Hazarika and Borah, 2013 for instance).

The small tea plantations emerged in early 1960s in India and these were mainly concentrated in South Indian states of Tamil Nadu, Kerala and Karnataka (Hannan, 2013). During the early 1990s that they spread in North-Eastern states including Assam in a major way. The concept of small tea cultivation in homestead gardens to sell the green leaf to the existing big factories for enhancing farm income was initiated during the seventies by the then Janata Government in Assam and encouraged by the subsequent State Governments (Arya, 2013). The increase in the number of small tea gardens was rapid in early 90's and they have been rising continually since then. The number of tea gardens increased specially from 1993 onwards and the numbers continue to grow.

The latest data says that India produces 23 per cent of global tea and Assam produces 50 per cent of India's total tea (Chang, 2015; Arya, 2013). Assam produces nearly 11.5 per cent of global tea. Out of the total tea production of Assam small tea growers produce 35 per cent (Mohan, 2016). Small tea growers of Assam are thus producing 4.26 per cent of world tea production. Today the small tea growers of Assam occupy an important place in the tea sector as well as in the economy of Assam. Though the tea industry of Assam is more than 185 years old, the concept of small tea cultivation is a recent phenomenon. Yet this sector has acquired a significant place by providing livelihood to thousands of unemployed youths in the backward pockets of the economy and by changing the nature of big factories. There are at present 35 administrative districts in Assam while the number of districts having large tea estates is 24 (Government of Assam, 2018). However, farmers in all 35 districts have taken up small tea cultivation in Assam. Most of the farms are small and owned mostly by individual owners who use labour-intensive technique of production. The size of workforce in these individual farms is too small as

compared to traditional estate gardens. It is also found that the small tea growers are facing various challenges, but still there has been a continuous rise in their number in the State. In the aspects like production condition, price of tea leaves received by small tea growers etc, not much research work has been done barring few exceptions like Bhuyan *et al.* (2004), Goswami *et al.* (2006), Medhi (2016), etc. The present study attempts to probe the factors which affect the possible exploitation of small tea growers by the buyers of tea leaves in the tea leaf market. We also examine the nature of production i.e., relation between inputs and output, possibility of technical inefficiency in these small gardens. Further we attempt to spell out policy suggestions which can help the small tea growers sustain in the long run.

1.1 Tea in Modern Assam

The East India Company was playing a monopoly role over tea trade in China during the early nineteenth century (Guha, 1977). It lost its monopoly in 1833 when the Chinese Government refused to renew its charter with the East India Company. Assam was suffering from a situation of chaos, lawlessness and oppression since 1770s with the Moamaria Civil War and the Burmese invasion of Assam plains during 1817-1824. In the meanwhile in the year 1823 Robert Bruce, an official of the British Empire, discovered tea as a native plant of Assam. The British troops which destroyed the Burmese power and after the Yandabo Treaty of 1826, the Burmese were forced to surrender their claim over Assam and the Burmese rule came to an end. The treaty laid the foundation of British rule in Assam and the British East India Company acquired the full control over the region. Thus British appeared in Assam as saviours of Assam from the Burmese control but soon it became apparant that its interest was to turn Assam into an agricultural estate of tea-drinking Britons and to transform local traditional institutions in such a manner as to suit the colonial pattern of exploitation. Their main intention initially was the establishment and consolidation of their power. But it was soon realized that after the control on Assam the revenue earned from the territory was declining. As a remedial policy to earn more revenue poppy cultivation and sale was made a Government monopoly in 1860. It became a criminal offence to cultivate the opium poppy in the province. As a consequence a considerable amount of land became fallow after 1860. This fact encouraged the use of the fallow land in tea cultivation (Guha, 1977).

After the early demise of Robert Bruce (an adventurer and trader), his brother Charles Alexander Bruce (who may be rightly called the father of the Indian tea industry) (1793-1871), an employee of the East India Company in the year 1831 had confirmed that tea plant was indeed indigenous to the areas of Assam which was growing in the wild at many places of the Brahmaputra Valley (Siddique, 1988). Later on, on 24th January 1834 a Tea Committee was appointed by Lord William Bentinck, then Governor General of India to investigate the possibility of introducing commercial tea cultivation in India. It was Dr. Wallich, a renowned and influential botanist member of the Tea Committee, who after careful re-examination of some seeds and leaves of indigenous tea confirmed it to be camellias in December 1834. As a consequence some experimental tea stations were set up by 1835 and the first experimental tea cultivation started in 1836 along with the establishment of the first English tea garden in 1837 at Chabua in Tinsukia district of Upper Assam. The first shipment of Assam tea was shipped to England in 1838.

In the initial years the cultivation of tea in Assam was in the hands of the Government as the individual Europeans, including those in the East India Company were considered to know nothing about the technique of growing tea as their main interest was limited only on trade. They believed that tea cultivation was possible in Assam only in a similar climate like China by using Chinese experts with Chinese seeds and cultivating techniques. It was evident that only Government can take the risk associated with such venture. Hence in the initial years tea cultivation in Assam was exclusively in the hands of the Government. But with the establishment of the Assam Company in 1839, a group of merchant capitalists in Calcutta and a similar group in London pooled their resources in the Assam Company and approached the Government to transfer to them the experimental gardens of indigenous teas in Assam. Consequently, keeping one-third of the gardens for future experimental purposes, the Government transferred the remaining tea gardens to the Assam Company (Siddique, 1988).

In 1840 the commercial production of tea started in the region and the tea industry started flourishing rapidly in the beginning of 1850. The Assam Company enjoyed a virtual monopoly of tea cultivation from its inception till 1850.

Table 1.1: Production of Tea in Assam: 1840-50

Year	Production (in lbs.)
1840	10,212
1841	29,267
1842	31,398
1843	87,705
1844	181,614
1845	194,800
1846	136,267
1847	160,334
1848	210,655
1849	214,817
1850	251,633

Source: Siddique (1988)

Table 1.1 shows an increase in tea cultivation with production rising from 10,212 lbs. in 1840 to 251,633 lbs. in 1850. In fact, the glory of the Assam Company attracted many private proprietors to start cultivating tea and during 1850-60 there was a vast expansion of tea cultivation in Assam and a considerable number of private tea gardens came into existence. In between the Wasteland Settlement Rule was implemented in 1854 whereby planters were awarded revenue-free land or were charged a rate which was a small fraction of what local peasants paid. As a result after twenty years of the establishment of the Assam Company, in 1859 the second important tea company, the Jorehaut Tea Company was established under the Chairmanship of William Roberts along with several other individual enterprises.

Table 1.2: Number, Area and Production of Tea in Assam: 1850-59

Year	No. of gardens	Area under cultivation (in acres)	Production of tea (in lbs.)
1850	1	1,876	251,633
1853	10	2,425	366,700
1859	51	7,599	1,205,689

Source: Siddique (1988)

As per Table 1.2 the increase in the number of tea gardens was from one in 1850 to 51 in 1859 along with increase in area from 1,876 acres in 1850 to 7,599 acres in 1859. As a result there was an increase in production from 251,633 lbs. in 1850 to 1,205,689 lbs. in 1859. After the ban of poppy cultivation, in 1861 the investors were allowed to own land in Assam and cultivate tea with new technologies. Thus to encourage the investors liberal provisions were made for the settlement of waste land for tea cultivation. Production received a further boost.

Table 1.3: Production of Tea in Assam: 1860-78

Year	Production (million lbs.)
1860-61	1.9
1865-66	4.03
1870	13.3
1878	28.5
Source: Siddique (1988)	

Table 1.3 shows the increase in production from 1.9 million lbs. in 1860-61 to 28.5 million lbs. in 1878. With the increase in the production and area under tea cultivation, there was high demand for labour. Due to shortage of labour availability in the tea gardens, in 1861 the planter community urged the Government to enhance the land revenue rates for ordinary peasants so that poor peasants could be flushed out of their villages to work for wages on the tea plantations. As a result there was a 15-20 per cent increase in the land revenue rates on some districts of Assam which was uniformly and arbitrarily doubled throughout Assam Proper by 1868. Along with the ban on poppy cultivation in 1860, the sale price of opium was increased from Rs. 14 per seer in 1860 to Rs. 20 in 1862 and Rs. 23 by 1873. People were forced to purchase high-priced Government opium, instead of growing it themselves. The poppy cultivators surrendered their lands to the Government and a large number of local peasants became landless. But these local labourers were not ready to work in the tea gardens. Even though importing Chinese labourors was more expensive than using the local labourers but the Company continued to import labour from China till 1841. Their work was dispensed in 1843 and the local people remained the sole source of labour for the industry till 1859. With the increase in the tea acreage local labour became insufficient, hence from 1860 onwards, inflow of labour from other Indian provinces, mainly from Chotanagpur plateau region, started in a significant way. Labourers were also recruited from other tribal tracts and even peasants from nearby villages were also recruited through contractors (Guha, 1977).

Siddique (1988) argued that the rapid expansion of the old gardens and the opening of the new gardens increased the demand for tea seed and rapidly raised its price. Hence during 1865-68 the Assam Company was unable to make any profits; in fact it recorded huge losses due to factors, like, inferior quality tea, shortage of labour, bad management, shortage of capital, extravagant expenses on land, labour and management, etc. But after 1870s a considerable change in the attitude of the tea planters towards tea cultivation can be recognized which turned around the loss making phase. It was realized that the tea culture was a long-term investment. In the meanwhile the Brahmaputra Tea Company Limited and the Scottish Assam Company Limited were formed in 1870 along with the initiation of many smaller private proprietors in the tea

cultivation. As a consequence during the period of 1870-77 the Assam tea industry enjoyed relatively good returns which it could maintain till the end of the century as a result of the expansion in the area under tea and an improvement in yield per acre. Table 1.4 depicts the increased area under tea cultivation from 1880 to 1900 resulting to a significant increase in the production.

Table 1.4: Area, Production, Yield and Average Price of Tea in Assam: 1880 - 1900

Year	Area (In Acres)	Production (In lbs.)	Yield (in lbs.)	Avg. Price of all Tea (in Rs.)
1880	153,657	34,013,583	282	105
1881	158.427	37,571,311	282	104
1882	178,851	45,472,941	290	102
1883	189,453	52,171,207	323	91
1884	189,852	51,126,199	323	84
1885	197,510	53,617,020	335	82
1886	203,993	61,719,678	363	93
1887	211,079	68,451,180	385	82
1888	216,678	72,677,982	386	79
1889	227,249	76,915,828	391	69
1890	231,038	82,191,252	409	75
1891	241,823	90,399,362	434	75
1892	249,192	84,221,133	394	63
1893	255,453	96,954,818	443	77
1894	268,796	94,829,059	414	66
1895	276,014	99,524,574	424	78
1896	291,909	109,727,359	443	72
1897	310,550	107,266,332	408	63
1898	325,813	109,071,367	396	65
1899	331,151	127,576,168	448	56
1900	337,327	141,118,644	468	61

Source: M.A.B. Siddique (1988)

Thus it can be seen from the above diacussions that the growth of the tea industry in nineteenth century Assam took place in four different phases: first 1834-1839, the experimental phase when tea was owned and controlled by the Government; second 1840-1860, when the industry

developed under private management; third the years 1861-1870, during which the industry was hit by major depression; and finally, the period of rapid expansion, 1871-1900.

In the year 1903 the Tea Board of India (TBI), was formed to regulate the tea cultivation and promotion of tea consumption both internally and internationally. Acute crisis was faced by the tea industries due to economic depression of 1930s. After that the tea industry has gone through a number of historical changes – notable among them are the independence movement of India, the Second World War (1939-45) and India's partition with the creation of Pakistan in 1947, which has not only changed the ownership of tea gardens, in fact, India has lost a considerable amount of tea area which is now in Bangladesh. After independence the domestic consumption of tea has increased. Tea has achieved widespread popularity in 1950s as a result of various factors like rise in tea consumption due to fall in the price of tea, factors like greater urbanization, increase in the income of the people and standard of their living, their rising preferences for tea etc. The successful advertising campaign initiated by the Indian Tea Board in 1950s also influenced the widespread popularity of tea. Tea is no more a luxurious product exclusively for the affluent. With the widespread popularity, tea consumption became a common habit of the general masses. After independence the British, the initiators of the tea gardens in Assam, sold the gardens to the Indian enterprises at high prices. By 1960s the position of ownership has changed from the British enterprises to the Indian enterprises. The abolition of the Managing Agency System in 1970 changed the face of the industry further (Goswami, 1988).

In the last few decades a structural change in the tea cultivation can be noticed when the small tea growers took initiative to cultivate tea in smallholdings in unutilized and underutilized uplands (Borah, 2013). The concept of growing tea in smallholdings was unknown in Assam till 1975. The concept of small tea cultivation came into existence in 1950s when Kenya decided to produce tea for export and experimented with the method of cultivating tea in small sized plots rather than in large estate gardens. The experiment made in Kenya in 1950s succeeded and a modern trend of small tea growers arose in countries like Nepal, India, Sri Lanka among other countries. Since then there has been a steady shift in tea cultivation from big plantation to small plantation. This is very clear from Table 1.5 and Table 1.6.

Table 1.5: Comparative Study of STGs in India and Assam

Year	No. of STGs in India	No. of STGs in Assam	Percentage increase over previous years in Assam
1978		16	
1983		279	
1988		875	
1993		4,594	
1994		6,300	31.85
1995		7,442	18.12
1996		9,155	23.01
1997		10,018	9.42
1998		16,759	56.19
1999		24,930	59.33
2000	1,10,396	30,607	22.77
2001		38,269	25.03
2002		41,548	8.57
2003	1,27,366	45,444	6.53
2004		46,949	6.07
2005	1,39,041	48,292	2.86
2006	1,41,544	50,795	5.18
2007	1,57,504	64,597	28.88
2008	1,57,504	67,463	3.05
2010		68,459	1.48
2011	1,57,504	68,465	0.01
2012		68,523	0.08
2013		78,350	14.34
2015		82,805	5.69
2016		84,577	2.14

Source: compiled from Hannan (2013), Borah (2013), Hazarika & Borah (2013), Mohan (2016), Statistical Handbook of Assam, various years, AASTGA

Table 1.6: Area Growth of Tea Plantations of Assam: 1971-2016

Year	Acreage under tea plantations (in hect.)	Extent of Smallholdings (in hect.)
1971	182,325	
1978		60.836
1981	203,038	
1983		1154.871
1988		3359.637
1991	233,284	10,853
1992	233,658	
1993		14051.84
1995	226,280	
1996	228,205	
1997	229,598	
1998	230,978	25,923
1999	258,455	30,707
2000	266,512	
2001	269,154	
2002	270,683	
2003	271,589	41,429
2004	271,768	
2005	300,502	67,911
2006	311,822	80,445
2007	321,319	88,674
2008	321,400	
2009	321,700	88674
2010	322,000	88674
2011	322,210	88674
2012	322,210	88674
2013	322,210	88674
2014	304,400	71871
2015	316,409	83880
2016	304,400	78203

Source: Das (2014), Hannan (2013), Borah (2013), Mohan (2016), Statistical Handbook of Assam, various years

There is an increase in the number of small tea growers from only 16 in 1978 to 84,577 in 2016 showing an increase of more than 5,28,506 per cent growth in the number of the small growers in Assam in this period (Table: 1.5). On the other hand, the acreage under small tea cultivation has shown an increase of more than 1,94,059 per cent in between 1978 to 2008. In the late 1980s the small tea plantation started spreading in Assam. It accounted for over 35 per cent of the tea produced in Assam along with an area under cultivation of 118,058.3 hectares by 2008 (Table:

1.6). Thus a drastic change in the pattern of the tea cultivation can be noticed. Tea business is no longer exclusively the big entrepreneurs' cup of tea. Thus after independence, the tea industry has witnessed many structural changes like change of ownership from British to the Indian entrepreneurs, emergence of Small Tea Growers (STGs) in place of big tea estates, Bought Leaf Tea Factories (BLFs), etc. Initially in Assam tea was grown by big British enterprises, now a significant acreage of tea land is in the hands of the small tea growers.

The economy of small tea grower is incomplete without clerity on the concepts of some emerging organizational innovations like, bought leaf tea factories, leaf agents and co-operative factories. Brief notes are given below to get a handle on these concepts.

1.2 Definitions

(a) Small Tea Growers: Definition

'Small Tea Growers' - the term itself denotes that the size is comparatively small than the traditional estate tea gardens as we know them. However, the word 'small' in the context of small tea growers has been interpreted differently by different scholars. Some have referred to small tea growers in the context of the size of land under cultivation; some have referred to planters who did not have the capacity to set up manufacturing units whereas some have also referred to it as a family plantation where there is no hired labourers from outside. Below we sift through the literature and look at the concept of small tea grower as defined on the basis of different categories. As will be clear the definitions are not only different, they are often contradictory.

According to de Silva (1982), tea cultivation in Kenya is based primarily on small sized plantations with an average holding of about two acres.

The Reserve Bank of India has classified small tea holders as those having plantation upto 2.02 hectares (5 acres) according to Goswami (2006).

To Kadavil (2008) small holdings are those which may be anything from one acre to twenty-five acres (10.12 ha) in land size, owned by the proprietors. On the other hand, small gardens, having a tea area below 200 hectares, are owned by a single proprietor or partnership firms, where tea is

cultivated and the green leaf is taken to a nearby factory for processing. He has also mentioned that FLO (Fair trade Labelling Organization), a publicly organized non-profit multi-stakeholder association defines small producers as those who are not structurally dependent on permanent hired labour, managing their farm mainly with their own and their families' labour force.

The term tea small holding is used in a wide context in "*Tea Small Holdings Development Authority Annual Report 2009*" under the Tea Small Holdings Development Act No. 35 of 1975. According to the Tea Control Act tea lands less than 10 acres are considered "Tea Small Holdings".

Sen and Nath (2012) noted that the Tea Board of India, the apex policy-making body for the development of tea, formally adopted the concept of small tea growers during the Eight Five Year Plan (1992-97). According to the Board, a small tea grower has been defined as a person or group having plantation area up to 10.12 hectares or 25 acres of land (75 bighas). The same definition of small tea grower has been accepted by the Small Tea Growers' Advisory Programme (STAP) of the Department of Tea Husbandry and Technology, Assam Agricultural University, Jorhat. The NABARD also follows the same definition as STAP.

According to the Government of Assam a person planting tea up to 10 acres (less than 30 bighas or 4 ha) of land is called a Small Tea Grower (Kakati, 2011).

According to Das (2014) in 1993 the All Assam Small Tea Growers Association (AASTGA) submitted a memorandum to the Government of Assam to increase the area norm under tea cultivation in small tea gardens from 30 bighas to 250 bighas. Thus the association demands that a person having upto 33.33 acres (250 bighas) of land tea plantation should be recognized as small tea grower. This demand is yet to be approved by the Government.

The average holding sizes in most countries tend to be on the lower side, for example, less than 0.4 hectares in Indonesia and between 0.7 to 4 hectares in different growing regions in India, with an average holding size of 1.6 hectares. More than 80 per cent of small-holders in Sri Lanka have less than 0.2 hectares land (Banerjee, 2011).

Some writers have interpreted the concept of small tea grower on the basis of absence of processing factories, instead of land size.

Banerjee (2011) said that in Kenya, a grower cultivating tea in a small piece or pieces of land who does not possess his own tea processing factory is termed as small tea grower.

Kakati (2011) has defined the concept in a broader context, using multiple dimentions of qualification. According to him small tea growers are those individuals who are engaged in tea cultivation with the following activities:-

- Planted tea plants
- Maintains the garden with or without employing labour
- Earning money by selling green leaf in the factory of a company having big tea estates.

Das (2012) has also explained the concept in a broader context. He reports that holdings are ideally called small if they are about two acres in size, manageable with two-three workers, and operated with family labour.

According to Ganguli (2013) the idea of small tea cultivation of Assam was for the first time discussed exclusively in the book titled *Problems of the Tea Industry in North-East India,* which is a collection of a number of papers on the tea industry presented at a seminar organized by North East India council for Social Science Research, Shillong in the year 1981. In this book it was stressed that if a green revolution of the kind that was brought about in Punjab through wheat cultivation was to be achieved in Assam, it could be done only through small tea cultivation. According to him the small tea cultivators are proprietors, managers and advisers rolled in one.

In the words of Tewari and Hiraizumi (2004), in general, the smallholder is small size family farm. In Nepal, farmers growing tea and selling green tea leaves to processing factories and/or plantations are called 'smallholders'.

Thus the concept of small tea grower has been defined by different writers using different parameters. Some interpreted smallness in the context on the size of the land holdings, some on the basis of unavailability of processing factories, and on the other hand, some on the basis of family labour. Without trying to reaching a concensus on the size of land, which seems impossible at this point given the plethora of benchmarks that have been applied in different contexts, we can have the following minimal working definition. Farming of tea on a small scale

for production and sale of green leaf to processing units is popularly known as 'small tea cultivation'. The smallholders, who are also the workers themselves, are basically the producers and sellers of green leaf, a perishable input that has to be processed in a tea factory to convert into 'made tea'.

(b) Bought Leaf Factories (BLFs):

In the words of Reddy and Bhowmik (1989) the tea industry had faced a severe slump in 1931 as a result of Great Depression. It was felt that an unrestricted supply of tea to the world market had caused a glut and subsequently a fall in prices. Hence, in order to control this situation, the Government decided to regulate exports by granting a quota of tea production to each registered tea estate. The estates were unable to expand their area under cultivation because each plantation was granted a specified area of land by the Government. They therefore encouraged peasants in the vicinity to take tea cultivation so that they could supply green leaves to the large plantations. However, after 1961 the Government decided to suspend the quota system and also agreed to allow large plantations to increase their area under tea. As a result, the larger plantations no longer needed the support of the small growers and their plight deteriorated. Around this time (1962-63) *bought leaf factories* came into existence in India in the Nilgiris district in South India. These are privately owned factories which purchase green leaves from the small growers and process them to made tea.

According to Kadavil (2008), some bought leaf factory (BLF) owners have maintained constant contact with the small tea growers so that they can maintain good quality of tea and get higher prices in auctions. The bought leaf factories in Assam on an average operate for nine months in a year from March to December for 13-14 hours a day. With the pre-monsoonal rain in late March or early April they start operating and the production declines in the post-monsoon period and virtually stop in December. They re-open in March again.

According to Gogoi (2012) with the emergence of small tea gardens, the produce of small tea gardens increased gradually and production augmented to such an extent that it was not possible for the existing commercial tea factories to take up the extra load of manufacturing tea. The

concept of bought leaf factory (BLF) became popular and it proliferated as a result. A bought leaf factory mainly depends on small farmers for continuous supply of green tea leaf to process.

According to Ganguli (2013) Bought Leaf Factories are an integral part of small tea cultivation. These are the factories that purchase green leaf from external sources to manufacture tea, the proprietor may not own any land to produce green leaves. According to the Tea Board, bought leaf factories are tea factories, which purchase 75 per cent of the green leaf requirements from sources other than their own. Apart from purchasing green leaves from the growers, they are also reported to have provided financial assistance in the form of advance payment in the beginning of the season to small growers.

Hazarika & Borah (2013) observed that Bought Leaf Factories do not have their own plantations and depend entirely on the small tea growers for green leaves to produce made tea. Thus bought leaf factory is an arrangement to manufacture tea bought from only small tea growers within a tea cluster.

Hannan (2013) defined Bought Leaf Factories as the specialized manufacturing units who produce made tea out of purchased leaves from the small tea holders. These bought leaf tea factories have direct linkage to the wholesalers, up country buyers and foreign market. In India the privately-owned bought leaf factories first came into existence in Nilgiries during 1962-63 and in Assam almost all the factories were established after 1995 except Upper Assam Industries in 1984.

According to Rasaily (2015) BLFs are an important segment in the small tea grower value chain. They have a crucial role to play in the lives of the small tea growers especially the small and marginal farmers.

Medhi (2016) observed that with the increase in the production of green leaf in the State, Bought Leaf Factories (BLFs) came to be set up to process green leaf especially of STGs. There are 177 BLFs with a total capacity of 261 million kgs. Out of these, 166 numbers are found functioning in 5 Upper Assam districts. BLFs produce 101 million kgs of made tea (TBI, 2011).

In short, the small tea growers, who are basically the green leaf producers, lack the necessary capital for producing processed tea, which compels them to depend mainly on the big gardens for selling their green leaves. As the green leaves are perishable by nature, they have to be sold soon

after they are plucked. Hence growers are not in a position to negotiate the price of their produce. In such a situation the idea of setting up of separate processing units to help the small growers started gaining ground. As a result a wealthy section came forward and set up some tea processing factories, popularly known as Bought Leaf Factories to cater to the requirements of the small growers.

The owners of these factories may not have enough tea plantation of their own. These factories are mainly located around the big established tea gardens in the tea districts of Assam.

Establishment of these factories is an example of forward linkage effects of small tea cultivation. Table 1.7 presents the number of bought leaf factories and production of tea in north India, (especially of Assam), south India and all India level. The number and quantity has risen steadily in Assam over the years to 163 bought leaf factories producing 77.67 million kg of tea in 2004 in Assam and 489 bought leaf factories producing 245.65 million kg of tea in 2007 at the all India level.

Table 1.7: Growth of BLFs in India (Production in Million Kgs)

Region	North India		Assam Alone		South India		All India	
Year	Nos.	Production	Nos.	Production	Nos.	Production	Nos.	Production
2001	163	67.5	119	43.00	168	67.6	331	135.1
2002	199	88.4	139	53.27	172	68.6	371	157
2003	228	105.8	152	65.28	200	78.19	428	183.99
2004	250	130.23	163	77.67	205	83.79	455	214.02
2005	306	150.52			170	72.3	476	222.81
2006	318	164.3			169	75.06	487	239.36
2007	320	172.75			169	72.9	489	245.65

Source: Tea Statistics (2010) Gogoi (2012)

Table 1.8 shows the district-wise number of bought leaf tea factories in Assam. Table 1.9 shows the number of bought leaf factories of different States/regions and their production contribution. From Table 1.9 it is clear that the numbers of bought leaf factories are increasing in all India level and their contribution is also increasing significantly. It is also clear that although Assam is a major producer, Tamil Nadu, the home of bought leaf factories in India, had more bought leaf factories than Assam in 2004.

Table 1.8: District-wise Number of BLFs of Assam

Name of the District	Total no. of BLFs
Karbi-Anglong	4
Darrang	
Dhemaji	
Dhubri	
Dibrugarh	58
Kokrajhar	
Lakhimpur	
Nagaon	1
Udalguri	1
Jorhat	17
Tinsukia	85
Golaghat	30
Sivsagar	22
Sonitpur	4
Cachar	3
Hailakandi	2
Goalpara	1
Total	**229**

Source: Tea Board (2014)

Table 1.9: Number of BLFs and Production Contribution (m kgs) by States/Region

States/Region	1998		1999		2000		2002		2003		2004	
	No. of BLFs	Prod	No. of BLFs	Prod	No. of BLFs	Prod	No. of BLFs	Prod	No. of BLFs	Prod	No. of BLFs	Prod
Assam	61	21.43	75	29.32	105	38.76	139	53.29	152	65.36	163	77.65
West Bengal	22	7.43	29	13.49	44	17.17	56	33.44	69	37.74	79	49.59
Tripura	9	0.6	10	0.7	11	1.67	2	1.58	2	1.51	2	1.47
Bihar							1	0.07	1	0.22	1	0.25
Uttaranchal							1	0.02	1	0.02	1	0.02
Himachal P	4	0.95	4	0.71	4	0.82	4	0.44	4	0.41	4	0.43
Arunachal P									4	1.03	5	1.3
North India	96	30.41	118	44.22	164	58.42	203	88.84	233	106.29	255	130.71
Tamil Nadu	168	59.3	168	65.5	173	76.55	175	78.62	197	89.86	200	94.84
Kerala	13	1.65	13	1.53	13	1.7	14	1.75	18	3.15	20	3.8
Karnakata							1	0.23	2	0.07	2	0.12
South India	181	60.95	181	67.03	186	78.25	190	80.6	217	93.08	222	98.76
All India	277	91.36	299	111.25	350	136.67	393	169.44	450	199.37	477	229.47

Source: Hannan (2013)

(c) Leaf Agents and Co-operative Factories:

According to Bhuyan *et al.* (2004) leaf agents, also known as **commission agents** are the persons who collect the green leaf from the sub-agents or small tea growers and sell the leaf to the tea factory. They generally do not handle the commodity physically and collect commission from both the groups.

According to Goswami *et al.* (2006) these agents/middlemen/traders generally enter into annual contract with Bought Leaf Factory and Large Tea Estates for supply of a specified quantity of green leaf at a mutually agreed upon price which may be revised from time to time in a year.

According to Sen and Nath (2012) as the small tea growers sell leaves to the middlemen or green leaf sellers who sell them to the factories of big gardens at a higher rate than at what rate they have purchased. These leaf sellers give cash advances to the small growers for meeting farm expenses in lean season and later buy their green leaves and charge a commission to sell them to the factories. These agents are generally found in areas having large number of small growers but where there is no co-operative tea factory.

Mansingh and Johnson (2012) similarly observed that the agents collect the green leaf from small tea cultivators and transport them to the processing factory. The agents are considered to be very powerful due to several factors. First, the agents are absorbing the risks. This means that any loss due to delay in transportation or the withering of the leaf does not fall on the farmers. Second, the farmers have taken an advance from the agents. Third, the agent is a trusted member of their own community, sometimes a small tea grower himself. All these factors end up creating a relationship of dependency between the small tea cultivator and the agent in which the agent has an upper hand and he uses this for fixing the green leaf price.

Ganguli (2013) observed that the intermediaries are a group of people called ‘agents’ by the small growers. They are supposed to register themselves with the AASTGA. These agents operate as contractors and sell the tea leaves to the processing factories at an agreed upon price. This two-way contract is renewed every year and the price is fixed accordingly. The agents are also found supplying manure and chemicals such as pesticides, herbicides etc. to the growers. At times they even provide loans to the growers. They earn a profit ranging from 0.15 paise to Rs. 2.00 per kilogram of green leaf.

Hannan (2013) explained that the dependency level of small tea growers on the leaf agents was 44.21 per cent in Assam in 2008 which means that 44.21 per cent green leaf of small tea growers are sold through leaf agents and the remaining portion is directly sold by them to the bought leaf factories or estates factories. According to him the bought leaf factories are dependent on agents and it appears that there are two major reasons for such dependency. First, small numbers of small cultivators are organized under the Primary Producing Societies (SHGs) in BLFs hinterland. Secondly, low volume of green leaf is supplied by these Societies. He also mentioned that the importance of middlemen to the farmer declines with farm size.

In the words of Medhi (2016) employment has also been generated through middlemen, i.e., agents. Till 2008, only 4920 STGs had direct linkage with the factories. Agents take an important role in collection and sale of green leaf. As mentioned above the dependency level of the STGs to the green leaf agents in Assam is 44.2 per cent whereas it is 26.1 per cent in Tamil Nadu, 18.3 per cent in West Bengal and 8.3 per cent in Kerala, which indicates that the dependency level of the small tea growers in leaf agents are very high in Assam.

Sub-Agent: The sub-agents are generally the persons who purchase the green tea leaf from the small tea growers near the small tea farm gate or village road junctions and sell them to the commission agents.

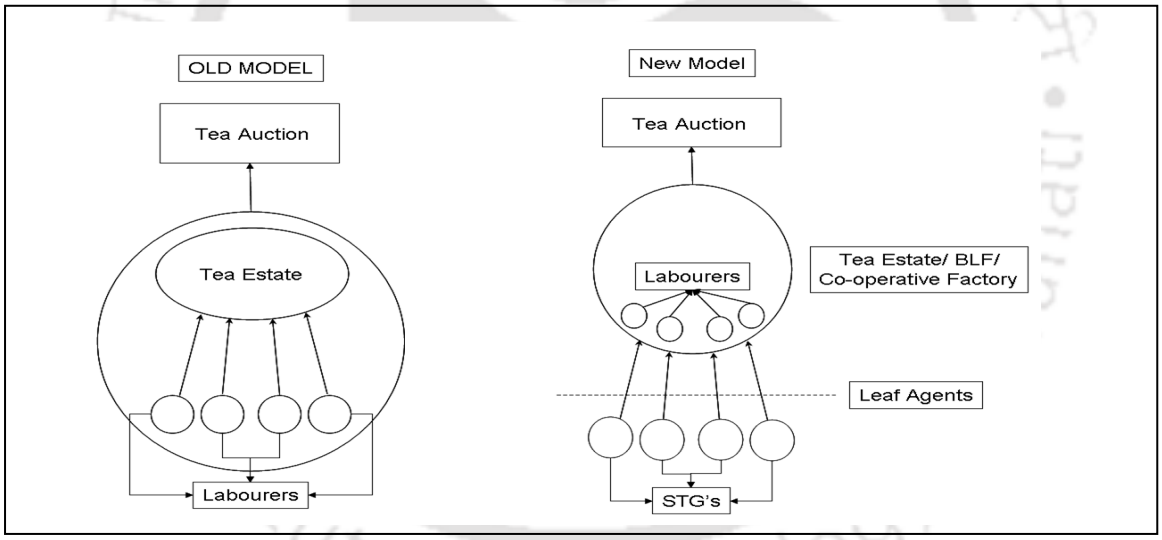
Co-operative factories were set up primarily to help the small growers to overcome the problems of marketing. Small growers receive low prices from the large estate growers and bought leaf factories for their green leaves. The basic objectives of the co-operative tea factories are to provide remunerative prices to small growers for their green leaves and to prevent middlemen from exploiting them. These co-operative factories do not fix the price of tea leaves on the basis of the existing market forces but by taking into account the cost of production, allocable surplus, etc. Such measures increase the revenue of the small tea growers. In Nilgiries these co-operative factories supply chemical fertilizers to the growers at subsidized rates. But the main drawback of the co-operative factories is that they have been consistently fetching low prices for their made tea which has to some extent affected the revenue of the small growers. The

need for establishing co-operative factories was first stressed by the Plantation Enquiry Commission in 1956 (Reddy & Bhowmik, 1989).

While corresponding with one of the Tea Board official, Guwahati, I found that in real sense currently there is no co-operative tea factory in Assam. According to him, two new co-operative factories are coming up in Assam, and that the Tea Board does not encourage the leaf agents. It discourages the role of leaf agents by informing the small growers to sell their green leaves to the bought leaf tea factories or estate gardens directly.

In summary, there has been a major change in the organizational structure of tea industries with the advent of small tea growers. The recent institutional innovations like bought leaf factories and leaf agents are playing vital role in this sector. This can be explained with the help of the following diagrams.

Figure 1.1: Comparison between Old and New Tea Production Models



Thus in the old model the tea estate labourers used to pluck tea leaves within the perimeters of tea estates. Estate factories would process the green leaf to made tea and the made tea was sent to the tea auction centre where the price of the tea was determined. But with the innovation of bought leaf tea factories, leaf agents, the structure of the tea sector has changed. Now the estate factories use their own tea leaves, but they also purchase tea leaves from other small tea growers through leaf agents. They convert the tea leaves into made tea and sell them to the tea auction, where the price of made tea is determined. With the innovation of BLFs, those factories which do not have their own plantations, purchase tea leaves from small tea growers and convert them

into made tea and the tea is sold in the tea auction centre where the price is determined. In the new scenario the small tea growers are playing a significant role in the tea sector. The job of producing the raw material of tea factory (tea leaves) used to be done within the same enterprise earlier. In the new model, that task is dispensed with. Relying on market channels, that task has been outsourced to small tea producers. In a sense this change is in line with the process of outsourcing going on in the rest of the economy. We shall come back to this interesting issue later on.

(d) Price Sharing Formula (PSF):

Price Sharing Formula was for the first time formulated in the year 2004 to solve the tussle between small tea growers and processing factories regarding the price received by the small tea growers. The PSF was formulated by the Tea Board of India with the aim of providing a remunerative price to the small tea growers as well as a fair return to bought leaf factories. To ensure that the small tea growers get a reasonable price for their green leaf this formula was notified under Tea Marketing Control Order (TMCO) in 2004. It provided for equitable sharing of the tea price between the growers and the manufacturers, as was claimed. It has been claimed further that the formula took into account the cost of production of green leaf in the small holdings and cost of manufacturing and marketing by the Bought Leaf Factories. To assist the small tea growers during unrealistic price fall a participatory scheme was created where a price band was constructed around the average domestic auction price of made tea, based on seven years moving average of prices in international market. But the improper and ineffective implementation of the formula made it defunct. It was not able to reach the targeted number of small tea growers, nor did it get popularity among small tea growers. As a result there was demand for a new one. Consequently the Union Government was directed in October 2012 by judiciary to fix a realistic price, uninfluenced by artificial market forces. This has finally given birth of the present PSF. According to the PSF, the price share ratio between tea growers and manufacturers needs to be 65:35 from the realization price of made tea at auction market (Chatterjee and John, 2012).

Ganguli (2013) has observed that on the advice of the Deputy Commissioner of Dibrugarh district, a Steering Committee was formed on 29th April 1999 to fix the price of green leaves. It

was decided that the Steering Committee would calculate the green leaf price for every quarter by applying the following formula and announce the same for that quarter. The average price will be decided on the basis of the Guwahati Tea Auction Centre's (GTAC) based price and it is described as:

(i) 65 per cent is payable to sellers (STGs or agents) immediately.

(ii) 35 per cent to be retained by the buyers (BLFs, factory owning large gardens).

(iii) The recovery percentage of green leaf is set at 22 per cent.

1.3 Different Aspects of Small Tea Growers in Assam

Studies pertaining to economic analysis of small tea growers of India, especially Assam, are meager. A review of studies relating to the emergence of small tea sector in Assam and the general problems faced by them is presented in this section, so as to develop a working model for the present study on the basis of the experience of earlier research efforts. We discuss them under the following heads.

(a) Emergence and Growing Strength of Small Tea Growers

(b) Challenges faced by Small Tea Growers

(a) Emergence and Growing Strength of Small Tea Growers

Regarding the emergence of small tea growers in Assam, scholars have given different viewpoints. Bhuyan *et al*. (1993) noted that tea crop is not only remunerative but is a relatively early income generating perennial crop with commercial importance and stability of income over the entire economic life period of its cultivation. The growing commercial importance as well as its stability in income of tea growers, unlike that of annual field crops along with higher status of tea farmers in the society, has attracted the attention of many farmers who have taken up small tea cultivation on a commercial basis.

In the words of Bhuyan *et al.* (2004) the high rate of growth of small tea cultivators in upper Assam is due to the available infrastructure like the presence of an organized market, availability of planting materials and skilled labour in the established big tea plantations.

Kadavil (2008) observes that to curtail the labour cost many big companies have withdrawn from production and are concentrating only on branding business. Big companies are becoming increasingly reluctant to operate in the old estate system of production because it is highly labour intensive - the bulk of cost for producing tea goes towards labour wages (in some cases as much as 60 per cent). Recent economic policies in India and opening up to the international market has been marked by the efforts by companies to slice up the value chain and break the production process into many steps. Tea industry is not exceptional in this context. They have also applied the practice of outsourcing a part of the function of producing made tea to the external party. In this way these major companies control the small tea growers by buying green leaves. It also helps them to improve operations and cut expenses.

Neog *et al.* (2010) in his research work discussed that the advent of the small tea growers in Assam started with the small tea plantation carried out in the district of Golaghat in 1978 heralding a new era in the plantation history of Assam. The abundance of uplands, availability of proven agro-technology, skilled labour, an established and assured green leaf market, advantages of a long term plantation crop over the other seasonal agricultural crops, blessings of suitable soil and climate were some of the factors that encouraged the small and marginal farmers as well as the unemployed to take up tea plantation.

Das (2010) echoes Neog when he mentions that in the year 1978 the then Agriculture Minister of State Soneswar Bora (fondly and lovingly remembered as the **"Father of the Small Tea Growers"** in Assam) declared at the State assembly that the State Government would like to encourage the peasantry to take up tea plantations in their homesteads and fallow lands. His intention was to utilize available fallow lands and attract young generation to agriculture sector and thereby address the unemployment problem of the State. This was an appeal to the peasantry to adopt the profitable venture in tea for their wellbeing. Success of this implementation in the early 1980s has attracted many people including the educated unemployed to start small tea cultivation in the front and back yards of their houses. According to the author the sector remained an unorganized one till 1987, when the All Assam Small Tea Growers' Association

was formed. Suitable soil and climate, some help extended by the local agriculture university and extension centers on agro-technology services, skilled surplus labour from the nearby tea estates, a convenient market to sell the green leaves in the estate factories, the advantage of plantation crops were the factors that encouraged the small and marginal farmers and even landowning people who were engaged in other economic activities to take up tea plantations. Consequently small tea cultivation got a boost in Assam.

Tea has a longer harvesting period. Harvesting/plucking of tea leaf starts from as early as February and continues to as late as December in Northeast India. This year-round harvesting attracts the farmers as they are able to sell their produce throughout the year almost and get a steady source of income. The continuous/regular flow of funds to the farmer is a welcome break who is faced with multitudes of risk and uncertainty. Another major reason as to why the farmers have chosen tea over other (even more) remunerative crops is the status associated with tea cultivation. The farmers have more often than not known about the commercial tea estates from direct first hand experience. They are impressed by the social status of the managerial cadres of these estates. The farmers enjoy the status of being referred to as a planter rather than simple cultivator. Besides, small tea growers have been recognized socially as successful entrepreneurs (Bordoloi *et al*. 2012).

Arya (2013) observes that the tea business as a profession has now shifted from the rich to the common man, as most of the unemployed youths have taken up it as a business enterprise which has given ready money to local Assamese youths for the first time. It eased the growing unemployment problem in the State.

After independence, during the successive five year plans the TBI (Tea Board of India) has spent all its resources in trying to mobilize big tea estates/plantations to increase production and expand area under tea cultivation (Borah, 2013). But the Tea Board of India's effort had not yielded the desired results to the optimum. Even with the Government investment through TBI and other agencies, there has been only a slow increase in production. From Eighth Five Year Plan (1992-97) the TBI laid down emphasis on the promotion of STGs. It decided on this plan because all other attempts to increase area under tea have failed. It proposed to encourage landless labourers and unemployed youths to take up tea cultivation in the tea growing areas of India. On the other hand, in Assam the traditional agriculture sector was underdeveloped and

subsistence in nature due to lack of irrigation and investment, small nature of the holdings, insufficient Government intervention etc. which compelled the agriculturists to look for alternative livelihood. Tea cultivation on small holding was one of the alternatives for the agriculturists to sustain their livelihood in the long run as cultivation of tea provides works and income throughout the year. According to the author this initiative by the TBI can be termed as the beginning of the small tea cultivation in Assam. The existing small and fragmented nature of Assam's agricultural sector has paved the way for growth and development of the small tea cultivation. According to Borah (2013) this initiative by the TBI can be termed as the beginning of the small tea cultivation in Assam.

Ganguli (2013) observes that the consumption of tea both domestically and abroad has grown steadily. Considering the trends in the demand for tea, the Tea Board set a target of producing 1000 million kilograms of made tea by the year 2000. For achieving the target, stress was put on productivity increase and expansion of tea acreage. It is in this context of achieving the targeted production that the emergence of small tea gardens had a special significance. They were doing fairly well till 1999 partly because of increasing domestic demand for made tea which could not be met by the larger gardens out of their own production. Growth of small tea gardens run as a family enterprise as a consequence grew well. Also, earlier the factories of large gardens could not utilize their installed capacity fully which encouraged the small gardens to increase their production which was purchased by these estate factories. The author has also shown that the tea cultivation is more profitable than raising field crops. Besides, other practical considerations such as the fact that tea bushes once planted would yield returns for the entire life time of the plants, that tea cultivation was less strenuous and demanding and more lucrative than paddy or vegetable cultivation, had motivated them to choose tea cultivation.

According to Hannan (2013) in Assam small farmers started taking up tea cultivation on a large scale during mid 1990s due to good prices that prevailed during 1996-98. As small tea growers emerged in the backward areas, transportation emerged as a major problem. Initially the small tea growers used to sell their green leaf to the estate factories, but later on Bought-Leaf Factories came up to meet the needs of the small tea growers. These BLFs generally purchase the green leafs of small tea growers from the middlemen, known as leaf agents or commission agents. But these leaf agents have only a limited capacity to purchase green leafs. The purchasing capacities

of the BLFs are much more than the leaf agents. Hence the BLFs depend on multiple leaf agents to have the raw leaves. Even though the growth of small tea growers has encouraged the emergence of BLFs but without the growth of BLFs, the development of these small growers would have been difficult.

According to Batabyal (2014) in the year 1978, when the then Agricultural Minister of Assam Soneswar Bora announced that anyone with ten bighas of land can start plantation, initially the announcement did not evoke response. But with the initiative of few Assamese middle class people there was a gradual but radical change in the tea plantation business. But lowering the limit of tea acreage, the coming of the International Monetary Fund (IMF) directed policies of liberalisation of production and structural adjustment of the economy in the early 1990s, liberalization of trade, business and industrial regulations have changed the tea economy. As trade has opened up, tea economy's growth became robust and everyone bet on tea. The high growth of initial years has changed the age-old scenario which now attracted many more planters to start small scale tea plantation in early 1990s in the State. Later on, there was fall in the prices and the supply became more than the demand.

According to Baruah (2015) one of the reasons of expansion of small tea plantations is the menace created by the animals in the agricultural pockets which focused on orchards. Growing pineapples on commercial basis became impossible with recurrent disturbances from the monkeys. This is precisely the reason that many people in the villages stopped growing vegetables also. Replacement or change in land use to tea became a viable alternative because of its long term income. In some pockets, elephant disturbances in the sugarcane fields compelled people to shift to tea plantation.

Medhi (2016) found that as the tea industry is labour intensive, major portion of cost goes towards labour wages. The large companies tried to fragment the value chain and break the production process. Small tea grower's role is limited in the value chain process and it is not without risk. They are with limited resources and therefore they are the most vulnerable group in the system. The enterprise faces multiple challenges viz, finance, land problems, labour supply, lack of training in tea culture and practices, marketing of green leaves, natural disasters like climate changes, poor infrastructural facilities etc. But these problems have not deterred the

growth of small tea growers in Assam. They have contributed significantly to the development of tea industry as a whole.

In sum, the availability of abundant fallow lands and support provided by the State Government to bring those unutilized lands under tea cultivation has encouraged the small tea growers to start tea cultivation in the State. To sort out the issue of labour cost the big estate factories decreased stake in their self production and have outsourced the production to small growers, which gave the small tea growers the opportunity to sell their produce. The nature of fragmented and small agricultural lands of Assam in general, the climate of Assam which was always favourable for the tea production, low capital investment requirement in tea cultivation, etc. have induced the growers to take the risk in the tea smallholdings. Similarly, with the emergence of BLFs, which acted as forward linkages, the small tea growers kept flourishing by selling their produce to these factories. Thus, there have been multiple factors which are responsible for the growth and development of the small tea growers in Assam. The positive effects of these factors have kept the State small tea sectors growing.

It is clear that the small tea cultivation belongs to informal sector of the economy, or what is known in India in the Government nomenclature as the "unorganized sector". Basole and Basu (2011) pointed out that according to the definition by the Government, an enterprise in the unorganized sector typically employs less than 10 workers (and in many instances only works with family labour), is not registered with the Government and usually does not pay any taxes, nor is required to abide by labour and other laws. Informal employment means that the work is not regular, secure, or governed by formal/written contracts, and usually no benefits (health, retirement, other social security) are paid. According to them the post-reform period has seen growing informalisation. One of the manifestations of this is that the formal manufacturing employment has been stagnant since 1980s, while the informal sector enterprises have flourished. The big traditional industries instead of manufacturing all parts that go into the product they manufacture have resorted to outsourcing portions of the supply chain to smaller sized ancillary industries. This is akin to what is happening in the tea sector: the traditional tea estates sought to reduce the labour cost by outsourcing the task of growing tea leaf to small growers. The ancillary industries are often informal in nature and depend on contractual labour. It is widely recognized that in the face of the failure of modern industry to expand satisfactorily,

the informal sector has acted as the "employer of the last resort" for surplus labour in the agricultural sector. The informal sector is marked by extremely low wages, abysmal conditions of work, self-exploitation, no social security, and no job security. Relations of dependency and lack of resources, as well as lack of incentives for technical change keep informal workers trapped in low productivity. We quote from Kar (2018) at length who makes some insightful observations on this matter:

"Actually with the program of globalization, international finance capital, with the aim of garnering huge profits, has created a new international division of labour. As a consequence, in countries like India with relatively backward production relations, there has been planned informalization of the formal sector workforce along with shifting a significant proportion of production processes to the informal sector thereby making windfall profits by exploiting the cheap labour (Kerswell and Pratap, 2016). The share of informal workers (those without employment stability and social security, such as "casual", "contract", "apprentice", etc.) in the organized sector rose to 58% in 2011-12 from 41% in 1999-2000. The workforce employed in the unorganized manufacturing sector works in primitive conditions, at very low wages, using very backward techniques. Of course, there had been an increase in the share of the work force in the service sector, up to 24% in 2004-2005 from 17.60% in 1983".

Some of these features are evident in the small tea growing sector of Assam.

(b) Challenges faced by Small Tea Growers

Existence as a small player in any industrial sector and the journey ahead is full of hurdles and struggle for survival, and so is the case in small tea growing sector. Studies pertaining to the difficulties faced by small tea growers sector are meagre. A review is provided in this section. As will be clear, topics listed below are linked to each other. Moreover, the dimension of a particular problem varied from farm to farm.

1. Cost Structure of Small Tea Growers: The objective of this part of study is to analyze the cost structure of the small tea growers which gives a clue to the level of profit. This is because,

profit depends upon several factors and one of them is the cost of cultivation. The lower the cost of cultivation, ceteris paribus, the higher is the general profit margin and vice versa. In this section of costs of both kinds, fixed and variable will be analyzed on the basis of secondary information.

According to Ganewatta (2000) high cost of production is perhaps one of the most critical issues for future performances of small growers as it has two types of impacts on future prospects. First, it makes the farms non-competitive in the market, as higher cost of production does not allow producers to bring down the prices to attract buyers in a competitive market. Second, it lowers the profitability for producer, which reduces the future investible funds with the producer thus stunting the future growth potential.

Bhuyan *et al*. (2004) worked out an economic analysis of green leaf production and concluded that higher quantum of cost is incurred in the lower size groups of tea farmers. According to him the operational and maintenance of small tea farms is not only costly, but highly labour intensive as well. Among the various items of cost, labour accounted for the largest share. Manures, fertilizers, pesticides, herbicides, fencing are the major items constituting other operational and maintenance cost per hectare. It is also observed that the relative share of labour has an increasing trend with the decrease in size of farms while those of manures and fertilizers, plant protection chemicals and herbicides have increasing trend with increase in farm size. The use of comparatively more labour per hectare in smaller farms is attributed to the availability or utilization of higher percentage of family labour. In the larger size groups, the percentage of hired labour increased while that of family labour declines gradually.

Rahman (2008) observes that in recent times the tea industry worldwide is experiencing reduced profits due to high cost of production and low prices. It is therefore important to identify the vital costs of cultivation and the ways to reduce them. According to him labour cost is the main factor determining cost of cultivation and plucking cost is the single most important factor determining labour cost. Labour cost and productivity per worker are major determinants of cost of cultivation. To him better management of inputs can achieve reduction in cost of cultivation. Higher yields reduce cost of inputs both directly and indirectly and as such any strategy that increases yield will reduce cost of cultivation. He also mentioned that mechanization of tea

harvesting can reduce not only cost of plucking, but it can also increase the welfare of the pluckers by giving higher productivity per labour.

In the words of Chatterjee and John (2012) there is no single estimate for cost of production and cost varies according to the farm size, variety used for cultivation, type of soil, region etc. A detailed exercise of cost of production and arriving at an average cost of production may not reflect the true cost, especially for a crop like tea where quality primarily depends on the plucking cycle and plucking quality. They also mentioned that small tea growers are vulnerable to the price shocks of made-tea as they get very poor price for their green leaf that sometimes does not cover their cost of production.

The cost of production of tea is increasing year by year as mentioned by Joseph (2002). The cost of fertilizer, a major input, is very high making the cost of production unmanageable. The cost of chemicals and other inputs are also rising disproportionately.

In a similar vain Sen (2008) observes that the rising cost of production, combined with falling prices has eroded sustainability of the small tea growers and led to an economic stagnation. They are experiencing reduced profits due to high costs of production and low prices.

Das (2010) mentions that the falling prices of tea in the post 1999 period and the declining rate of profit created difficulties for smallholders to raise their operational cost for the next production cycle. This could, in future, affect the accumulation which requires regular maintenance.

Ganguli (2013) has divided the different types of costs under the headings of fixed and variable costs. In Table 1.10 the different categories under fixed and variable costs are presented. The author has shown that a major portion of 30.21 per cent of the annual share of fixed cost was utilized for land development by the small growers. On the other hand, of the total variable cost 59.95 per cent was spent on labour wages. Expenditure on fertilizers and chemicals together constituted 26.90 per cent of the variable cost. His estimation was that the average cost of tea cultivation was Rs. 4,935.62 per bigha and the cost per kilogram of green leaf was Rs.3.41.

Table 1.10: Costs of Cultivation

Fixed Cost Items	Variable Cost Items
1. Land Development	1. Land Revenue
2. Fencing	2. Fertilizer (Inorganic + Organic)
3. Tools and Implements	3. Chemicals
4. Tea Plants	4. Transportation
5. Shade Trees	5. Medical
6. Soil Testing	6. Wages
7. Membership Fees	7. Quarter Repairing
8. Transport	8. *Japi* and Polythene
9. Construction	9. Bonus
	10. AASTGA's membership fee
	11. AASTGA's Welfare Contribution
	12. Ration

Source: Ganguli (2013)

While studying the entrepreneurship in small tea plantation in Assam, Borah (2013) observed that tea production involves three different costs – cost of cultivation, manufacturing and social costs. Small tea growers are however involved with cultivation only, manufacturing and social costs like education, health, housing, subsided food, fuel, pension, etc. for the labourers (under Plantation Labour Act, 1951) do not come under their cost of production.

During 2014 the Tea Board had fixed the price of green tea leaf at Rs. 19.54 per kg on August 14, on September 14 at Rs. 17.70 per kg and on October 14 at Rs. 16.50. But private tea factories had paid only Rs. 6-7 per kg. According to Assam Agricultural University, Jorhat, the cost of production per kg is Rs. 12.50. This shows that the small tea growers of Assam received much lower price of green leaves than its cost of production. In such a scenario future prospects of the small tea sector is bleak (The Telegraph, 2014).

Most of the studies mentioned that labour cost occupies the prime position in the cost of cultivation. Its high growth is one of the major problems faced by all small tea growers. Hence labour deserves a separate sub-section.

Labour: Shortage of labour is reported to be a major problem facing the tea industry. Tea industry is a labour-intensive enterprise in which both men and women workers play vital role at every stage, like plucking, pruning, cutting, spraying of pesticides and weedicides, etc. which

indeed require substantial labour. It has been observed that the task such as spraying of medicine, pruning, cutting, etc. are usually performed by men and plucking is generally done by women. Women workers are also engaged in manuring, cleaning of weeds, etc. Plucking cannot be done through machines because it damages the quality of pluck.

Guha (1977) has argued that from the very inception the tea gardens of Assam were facing the problem of labour availability. Due to labour shortage, the labour supply from outside Assam developed gradually. In 1884-85, 44.7 per cent of labours were recruited from Chotanagpur, 27.2 per cent from Bengal, 21.6 per cent from U.P. and Bihar, 0.7 per cent from Madras, 0.2 per cent from Bombay and only 5.5 per cent from within Assam. In 1889, half of the labours were found to have been recruited from Chotanagpur and about a quarter from Bengal and about 5 per cent only from Assam itself.

Chatterjee and Das Gupta (1981) expressed that even though the tea industry is facing many problems, labour is one of the most notable ones which is being faced since its inception. From the expansion of tea cultivation during the colonial period, dearth of tea labour has been there. Initially the British used to bring labour from China, and then in 1841 the Assam Company recruited labour from Chotanagpur division of Bihar to Assam. The industry continued importing labour since then. In 1890, almost 97 per cent of the colonial recruits came from Bihar, NW provinces and Oudh. Due to unhealthy environment of the gardens, labourers wanted to leave the gardens. The local labourers were not ready to work in the tea gardens. Labourers were being exploited. In several cases it is noticed that there was death of labour force in the tea gardens due to tough work culture and poor and unhygienic living conditions. Due to the commercial success of tea, the tea labourers continued to be massively exploited, there were not substantial improvement in their living conditions throughout the colonial period.

Coming to the small tea gardens of modern times, Bhuyan *et al*. (1993) reported that labour used in various operations by the small tea growers were mostly surplus labour from the existing nearby big tea estates and other unskilled labourers who worked on daily wage basis. The small tea growers which are situated far away from the large tea estates, thus, suffered more from labour problem. Small tea growers located near the larger tea estates also faced labour problems during the peak months of the annual field crops. The intensity of the labour problem was found

to increase with the increase in farm size. This is due to greater need of hired labour in larger size farms compared to small size farms.

Along with the increase in the number of small tea growers the total labour supply has decreased according to Bhuyan *et al.* (2004). With the increase in the size of small tea farm, the contribution of family labour declines indicating that along with upliftment in status of the small tea growers, emphasis on family labour decreased. The peak plucking season also coincides with rice transplantation which is the principal crop in Assam. Labourers are often found preoccupied in transplantation of rice during this period. Under such circumstances, the utilization of casual hired labour in the small tea farms assumes importance because plucking rounds have to be maintained. The authors categorised labour utilization in various size groups in tea in three periods, viz., January-April, May-August and September-December. During January-April, labour is needed to complete the pruning programme, prophylactic plant protection spraying on unpruned/skiffed teas irrigation, mulching, tipping and the start of plucking. There is moderate demand for labour during this period. May-August is the peak plucking season and also the peak period when a number of pests and diseases surfaces. Consequently, the demand for labour is likely to be the highest during this season. During September-December, there is a decline in yield of unpruned and skiffed tea sections and it culminates at the start of the pruning season. Particularly, no plucking is done during December. Accordingly the demand for labour is lowest during this part of the year.

Tea plantation is an agro-based enterprise in which large numbers of manual workers are required round the clock (Singh, 2006). It requires hardy workers to do work during rainy days as well as under the scorching sun. The workers both skilled and unskilled live near the plantation area. The success of the tea industry depends upon the labour whose strenuous efforts produce maximum green crop. Nearly half of the labour force is supplied by the women folk. The colonial rulers and European planters, imported labourers from neighbouring famine stricken States of Bihar mainly Chotanagpur, Bengal, UP, MP, Orissa and other places who could be made permanent settlers in tea estates. Those labourers were excessively exploited by the big landlords and Zamindars. The failure of subsistence economy in meeting the limited wants of the people due to occurrence of natural calamities like drought and flood accompanied with epidemics induced poor people who were ill-fed, ill-clothed and had no resources to

withstand such calamities, to migrate to Assam. The author mentioned that the Europeans, after the Sepoy Mutiny in 1857, wanted to invest money in tea plantation because Assam was a less disturbed place compared to the rest of India.

According to Sen (2008) one of the major inputs in most farming situations is labour. The composition of labour force on an individual farm varies according to the type, size and location of the farm. Major sources of labour on an individual farm include:

1. Family labour
2. Hired labour

Each of these could be subdivided into two categories:

i. Regular (all year round)
ii. Casual (occasional)

Tea cultivation on small holding is mainly a family run enterprise unless the land is too big. Family members are actively involved in maintaining the garden; only seasonal labours on temporary basis are engaged in these gardens. Plucking is conspicuously the single largest operation demanding maximum labour utilization (61.65%). In the lean period, there is less demand for labour.

Kadavil (2008) noted that majority of the workers in the small tea gardens are temporary and casual workers and most of them are migrants. The wage rate is below than the official minimum wage rate and payment is also irregular in many small tea gardens. In many regions, workers are appointed only during the peak season and family labour replaces hired labour in the off season or when the price of the green leaf is low. Workers do not have any common platform for collective bargaining/negotiations for their basic rights such as minimum wages, adequate working conditions and health care facilities and so on. No social-environmental benefits are allotted to workers at small tea gardens and in many cases workers receive only gifts other than the usual wages during the festival season. Inadequate working conditions and lack of training for the workers lead to low productivity of labour in small tea gardens. Lack of health care facilities make workers disease-prone, incompetent and affect their productivity. Unavailability of skilled labour and poor working conditions have major role in the low production and productivity in small tea segments as a whole.

Hazarika (2012) observed that traditionally the wages of workers in the plantation sector have continued to remain low. The wages they receive are among the lowest in the country, about Rs. 75 - 90 per day. In fact many workers are struggling to survive on less than a realistic living wage. Low wages were the first and the foremost reason for several strikes faced by the tea industry in different times. Low wages mean the tea industry is struggling to attract pickers.

Arya (2013) reported that in Assam, a majority of the workers in small tea gardens are either ex-tea garden workers or their kin/relatives. During the peak plucking season most of these workers are engaged in estate gardens and the small tea growers face severe problem of skilled labour shortage at the same period. Due to lack of experienced and trained workers, small tea growers face difficulties as most of the workers engaged in small tea gardens are unskilled and inexperienced local surplus labour. Prospects for substitute jobs are limited in the remote areas of Assam.

Ganguli (2013) observed that various operations in tea cultivation require some specific skills. Labourers not having the requisite skills are incapable of performing these activities. The small growers have to get the cultivation done with the unskilled and rejected labourers. These labourers are also in great demand during the plucking seasons by the larger tea estates where they get better facilities than the small tea growers can offer. This adversely affects the plucking cycle of the small tea gardens and their production. The author noted that the labourers used to get wages ranging from Rs. 28.00- 40.00 for adult labourers irrespective of their sex and status of employment. The non-adult labourers were paid wages ranging from Rs. 15.00-25.00.

According to Das (2013) several factors could explain the decline in labour supply in this unorganized sector. Growing economy has created opportunities in certain sectors (transportation, construction as well as opportunities offered by the flagships development programmes of the State) and relative high wages in these sectors have pulled the youth from plantation workers' community.

Das (2014) commented that the condition of the workers engaged in the smallholdings, which does not come under labour regulations, is satisfactory. They are mostly hired to clear the seasonal flush and very few are employed on a regular basis. Thus most of the workers in small tea gardens are temporary. The author has also estimated that the male workers are paid around Rs. 75-80 and female workers are paid Rs. 50-60 a day without any other additional benefits

against the minimum wage of Rs. 136 as prescribed by the State wage rate policy. An addition of 8 to 10 percent rise of wage can be noticed in case of permanent workers. Workers engaged on rate basis are paid Rs. 1.5- 2.0 for every kg of tea leaves plucked, which indicates a wage half the wage received by the estate workers.

According to Baishya (2016) at the initial stages of tea cultivation in Assam the tea planters had to face many problems, as the local people were greatly depopulated due to Burmese incursions perpetrated several times and the remaining people being agriculturists were unwilling to work in tea gardens. The rural economy was primarily agricultural economy. The tea garden workers of Assam are a mixture of both tribals and backward caste Hindus who were brought by the British colonial planters as labourers from predominantly Tribal and backward castes dominated regions of present day Jharkhand, Odissa, West Bengal, Telengana and Chhattisgarh to Assam during 1860-90s in multiple phases for the purpose of being employed in the tea gardens industry as labourers. The people working in the tea gardens live a life full of misery and sufferings. Except a handful who works in the tea processing, all workers are considered as unskilled. The tea industries prefer to employ casual labourers and they are paid far less. Women workers are paid '*chukri hazira*' (girl wages) which are less than the wages paid to men workers. According to the author no industry can florish if the engine that fuels its growth is not nourished.

Mohan (2016) observed that the most dominant problem that is faced by the small tea growers is the problem of labour. The frequent fluctuation in the labour price is the main problem in this cultivation. The labours are demanding daily wages above two hundred rupee (Rs.200 and above) but the small tea growers are not giving in to this demand. It is significant that the selling price of green tea leaf rises up and down season wise. In March to August, the price rate rises to Rs. 17-25. After the month of October to November, the price rate comes down to Rs. 7-15. The demand of hike in labour price is not justifiable with such fluctuating price of tea leaves.

Tea industry has been facing the problem of labour shortage from its very inception. The living condition of the workers is not hygienic and the wages received by them are insufficient compared to living expenditure. As a result the tea industry is unable to attract labour resulting in labour shortage. So there are mainly two problems related to labour in small tea cultivation. First labour supply is not adequate which affects all growers including the small growers, and secondly, wages, benefits and working conditions of the labourers are poor. Why the shortage of

labour does not lead to rise in wages which could attract more labour is an obvious question. But there does not exist any study to answer this.

2. Price: A major problem faced by the small tea growers is the price received by them for their green leaves. According to Bhuyan *et al.* (1993) price is generally fixed through mutual agreement between the factories and the growers, or the commission agent and the growers. Despite this fact, the price is often not fair. Prices received by the growers are same for all the qualities of green leaves they offer for sale as there is no appropriate measure of grading the green leaves. In the absence of grading, sometimes disputes occur in price negotiation. At the end, price offered by the buyers (factories/commission agents) would stand as there was no effective mechanism to decide the disputes impartially. As the small tea growers have no other alternatives than to sell their green leaves to the nearby factory or commission agent they are at the mercy of these buyers for the price of their produce. The problem is more severe in the lower size groups of farms than the higher size groups. Small quantity of the produce of the small farms puts limit on their bargaining power.

In the words of Bhuyan *et al*. (2004) price of green tea leaf, as fixed by the bought leaf factories or estate gardens was the major determinant of the economic viability of small tea gardens. The authors have identified that the grower's share in the price paid by the processing units depends upon the type of channel of sale that the grower has used. The difference between the prices paid by the processing unit and the price received by the small tea grower is directly related to the total marketing costs and total marketing margins. As the green tea leaf moves closer to the tea-processing unit, the price per kilogram of green leaf increases in order to provide margins to the various intermediaries and to provide auxiliary services as well. The three major marketing channels as identified in their study through which the small tea growers market their green leaf are:

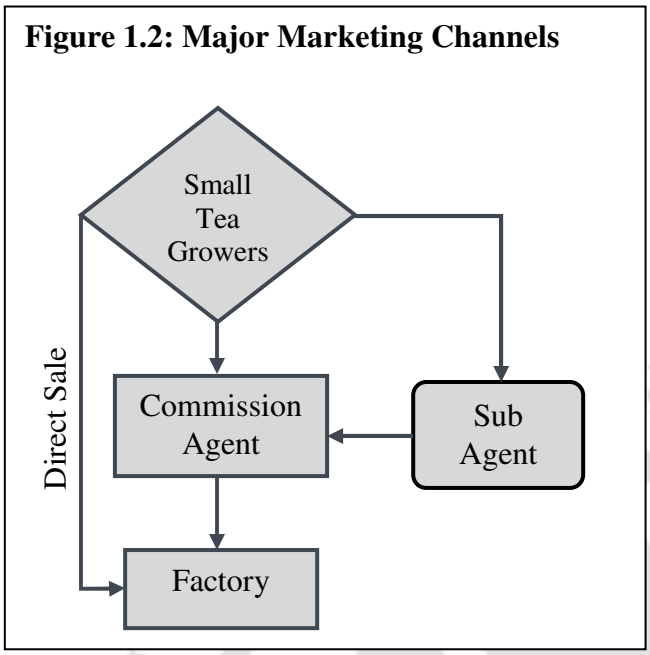
Channel I: Small Tea Grower → Factory (Direct sale).

Channel II: Small Tea Grower → Commission Agent → Factory.

Channel III: Small Tea Grower→ Sub Agent → Commission Agent → Factory.

The authors analyzed the channels of marketing in the following way.

Figure 1.2: Major Marketing Channels



According to the authors the STGs sell their produce in three different ways. They can either sell it directly to factory (Channel I). They could do so through a commission agent (Channel II). Another way of selling their produce to the factories is via sub-agents who approach the STGs and initiate the process. The sub-agents then sell the produce to the commission agents who in turn sell it to the factory (Channel III). Though Channel I was more efficient, Channel II was found to the more prevalent. Out of 68,465 numbers of small growers in 2011 only 4920 numbers (7.19 per cent) have direct linkage with the factories. Channel II was found to be the most effective channel through which about 56.69 per cent of the total green leaf productions were transported. The marketing costs are directly related to the length of the channel. The more the number of intermediaries in the channel, the higher is the marketing costs, lower is the price received by the small tea growers. One of the reasons behind selling the tea leaves to the commission agents is that most of the small tea growers borrow money from the agent and consequently the grower does not have direct access to the factory. The agents take a vital role in collection and sale of green leaf. The authors Bhuyan *et al.* (2004) also mentioned that the remoteness of the small tea farms may be the reason for low effectiveness of channel I. The farmers hesitate to sell the green leaf to the factory directly due to the high cost of transportation, although factories offer better price. The factories do not opt to buy small quantities of leaf from individual growers. They enter into contracts with leaf collection agents as a result. In their study it is found that more than 80 per cent of the small tea growers are paid by commission agents. The authors have also mentioned that despite tea being a commercial crop, the possibility of responding to price incentives was very poor and severely limited, mainly because of the lengthy gestation period from 0 year to 5+ year, the period that is required in bringing up of young tea plants. The plucking standards were arbitrary, as a result of which the small tea growers received non-remunerative price of green leaf. Due to non-availability of adequate marketing infrastructure like public buying agency and

transportation, small tea growers in the study area are deprived of getting remunerative price for their small produce (green leaf).

Tewari, Amrit and Hiraizumi (2004) mentioned that the main constraint to growth and expansion of tea farming in small gardens is decreasing prices of green tea leaves, against which the smallholders sell to the processing factories. With the low price of green tea leaves, the smallholders could barely meet the cost of production.

Singh (2006) observed that the price of tea is decided not by the producers or buyers but by the bidders in the auction markets. The price fluctuates according to quality. According to him the cost of production of tea in Cachar is much higher than the Assam valley. The difference lies in its uneven topography, climate, soil condition, transportation and lastly the work culture.

Goswami *et al*. (2006) in their research explained that one of the crucial problems the small tea growers of Assam face is the un-remunerative price of green leaf. Since the year 1999, the small tea growers of Assam are suffering from fall in price of green leaf resulting in the fall in their profit margin. According to the writers the main reason behind this fall in green leaf price is fall in price of made tea in the auction market. The Government has no control over price of made tea or green tea. On the other hand, the cost of production of green leaf is increasing each year. It is a labour intensive activity and the cost of labour accounts for more than 55 per cent of the total cost of production. According to the authors as the small tea growers do not manufacture made tea, they are more concerned with the quantity of green leaf. But on the other hand, the buyers of green leaf are more concerned about the quality of green leaf. These opposite interests have resulted in deterioration in the quality of made tea and lesser price for green leaf. The authors also observed that the market for green leaf produced by small tea growers is 'buyers' market' i.e., dominated by the buyers who are either Bought Leaf Tea Manufacturers or Large Tea Estates or both. In their study it is found that three factors have contributed to this situation. One is that the produce, i.e., green leaf is perishable and another is the weak financial condition of the small tea growers. The third factor and this is considered as the most important, is lack of unity and organizing ability among the growers to form co-operative factories. All these have contributed to the weak bargaining power. The small tea growers are compelled to abide by the terms and conditions laid down by the buyers which may not be favourable to them. A small tea grower generally does not argue with a buyer for fear of denial to accept green leaf by the buyer

which will cause further trouble in selling grower's produce. But this situation is not the same in all places. The gravity of the problem depends on other factors, such as, number of buyers and sellers, demand and supply of green leaf, organization of small tea growers etc.

Banerjee and Banerji (2008) reported that Assam teas are not poor in quality but they are relatively high priced - because of the inbuilt high cost at which they are produced. According to them India's cost of production is higher than that of Kenya and Sri Lanka due to higher production overheads besides labour costs. To combat the spiraling costs of production, a few tea estate owners and some newcomers set up bought leaf factories, which induced the mushrooming of small tea growers in all regions of the State.

On the basis of his survey Kakati (2011) concluded that sometimes the small tea growers sell their green leaf to the factory at very low price because the factory authority has the dominant role in fixing the price of green leaf. According to the small tea growers, the Monitoring Committee constituted by the State Government at District level with Deputy Commissioner as its chairman has failed to stabilize the price of green leaf due to unfair practice of the big Tea Estate and corrupt bureaucrats.

Banerjee (2011) opined that the major risk factor in smallholder cultivation is price volatility and the occasional crash in the price of green leaf due to sudden drop in primary price of 'made tea', which induce them to sell the raw leaves even at a price lower than the cost of production due to its perishable nature. They face a high level of transaction cost. They lack bargaining power which is also one of the reasons for low prices. Thus a fair price is not ensured to the tea smallholders and remunerative or decent wage is not given to the workers engaged in the smallholdings. Such factors kept the smallholding in an immature stage even after 30 years of its existence.

Chaterjee and John (2012) classified the years as boom, normal and distress years. If the average domestic price in a year crosses the upper band of international price (seven year moving average), the year is termed as **Boom** year. If the average domestic price in a year is within the Price Spectrum Band, the year is termed as **Normal** year. But if the average domestic price in a year goes below the lower range of the Price Spectrum Band, it is known as **Distress** year. In case of distress year, Rs. 1000 is paid to the PSF (Price Sharing Formula) account of the grower by the Government and the grower can withdraw the amount. In case of boom year, similarly,

the grower contributes Rs. 1000 to the fund and he is not permitted to withdraw any amount. In case of normal year, Government and grower contribute equally (Rs. 500 each) and grower is not permitted to withdraw any amount. Thus the growers are not permitted to withdraw any amount during boom and normal years. The following table shows that so far no year has been categorized as distressed year, nationally tea has only experienced normal and boom years. But the authors also mentioned that most of the growers are unaware about the PSF and that those who are aware they may have no PSF account.

Table 1.11: Construction of Price Spectrum Band, based on International Tea Price

Year	Seven Year Moving Average of International Price	Upper Band	Lower Band	Average Domestic Price	Type of Year
2003	66.40	79.96	53.12	54.89	Normal
2004	66.14	79.36	52.91	62.42	Normal
2005	63.97	76.76	51.18	56.50	Normal
2006	64.02	76.83	51.22	63.62	Normal
2007	63.55	76.26	50.84	64.66	Normal
2008	66.85	80.22	53.48	84.35	Boom
2009	72.83	87.40	58.26	102.82	Boom
2010	79.70	95.64	63.76	100.31	Boom

Source: Chaterjee and John (2012)

Table 1.11 captures seven years moving average of international price of tea. The upper and lower band is calculated on the basis of the range of +/- 40% (range, 20% each way). Average domestic price is the weighted average of auction price of CTC tea in auction centers.

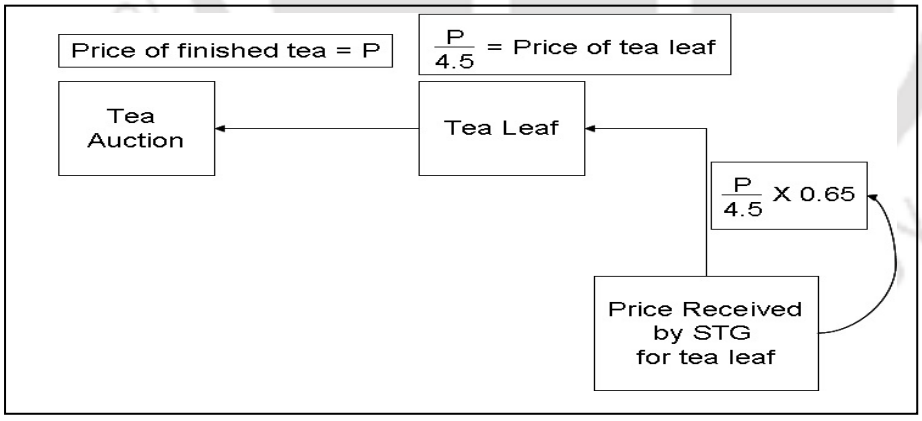
In the study of Gogoi (2012) it is found that the price of green tea leaf, as fixed by the bought leaf factories is a major determinant of the economic viability of small tea gardens. The small growers take financial help from these bought-leaf factories, as they are not able to finance their farms wholly from their savings. In return the growers are requested to sell their crop to the factories at prices fixed by them which is much lower than prevailing market price. It is reported that the reason behind this is that the bought leaf factories do not fetch good price in auction mainly due to the buyers' perception that the tea produced by the bought leaf factories is of inferior quality. It has been noticed that many small growers have failed to maintain a proper plucking cycle. Quality plucking ("two-leaves with one bud") has been replaced by "six-inch plucking". The quality of made tea has thus been compromised. Moreover, the bought leaf

factories are small in size, ill-equipped with machinery, mostly bought second hand, resulting low quality of made tea and hence, low price of produce in the market.

Arya (2013) commented that the tea industry had faced the problem of steep decline in prices during 1999 to 2006. This caused the close down of nearly 130 tea gardens in the country which have again reopened with the gradual improvement in tea prices from 2008 onwards. The decline in the prices of tea leaves was mainly due to strong growth in supply in the face of sluggish demand. As reported by the author that the TBI has also mentioned that the surplus supply is mainly because of the increased contribution of the tea leaves by the small tea growers which has resulted decline in the price of the tea leaves.

Das (2014) noted that the price of tea leaves is calculated on the basis of the auction prices as prescribed by the price sharing formula (PSF). The auction price of per kg made tea is first divided by 4.5, since on an average 4.5 kg of green tea leaves are required to produce one kg of made tea. Then the result is multiplied by 65 per cent (i.e, 0.65) as prescribed by the price sharing formula. The idea is that the small growers should receive 65 per cent of the auction price of made tea. Thus the price payable for one kg of green leaves is = net sale average of processed tea at auction × (1/4.5) × 0.65. This is shown diagrammatically in Figure 1.3.

Figure 1.3: Price Determination on the basis of PSF



Generally the price to be paid to the small growers is fixed before the auction. Hence there is a general difference between the actual price received by the small growers and the price prescribed by the formula. The author has also noted that the price of green tea leaf is, in fact,

fixed by the factory, so smallholders and leaf agents are mere price takers. It is usually low and is highly unstable and volatile. This is clear from Table 1.12 which shows an unstable price.

Table 1.12: Price Variation of Green Leaves

Year	**Average Price** (Rs. per Kg.)
1995-96	8.25
1996-97	9.45
1997-98	10.52
1999	14.50
2000	4
2004	10
2005	9
2006	9
2007	11
2008	13
2009	14.8
2010	16.05
2011	13.9
2013	10

According to Das (2010) production by small tea plantations in Assam is being carried out without any proper planning. The average price of green leaf which was Rs. 8.25 in 1995-96 increased to an average price of Rs. 14.50 in 1999, fell to Rs. 4 per kg in the year 2000 which is much less than the cost of production of Rs. 8 per kg. Regarding this the State Government commented that due to mushrooming of tea smallholdings and due to the consequent overproduction there is a fall in the price of green tea leaves. Good prices had attracted many small farmers to take up tea cultivation, but they are not getting a remunerative price in recent years. BLFs have a major role in controlling the mechanism of price determination.The agents also keep extra Rs. 2 for every kg of tea leaves supplied to meet their transportation and handling costs, which directly reduce the price of leaves received by the small tea growers. This squeezes their profit margin and directly affects the capacity to invest in maintenance of the holdings. The author (Das, 2013) has also reported that the rising number of supply days and quantum of supply made by the smallholders indicate that 2011 was a better year production-wise, which certainly influenced the fall in the price of green tea leaves. The decline of price of green tea leaves was so fast during 2011 that the price offered by the tea factories had come down from Rs. 21 per kg in August 2011 to Rs. 3 in October 2011. According to his survey an average price of Rs. 15 was considered profitable, which provided a margin of Rs. 2-3 over costs of production per kg of green tea leaves. The author has also explained that as there is mismatch between area under tea and seasonal boom, with the capacity of processing factories, so the processing factories take advantages of such situations by paying low prices for the green tea leaves to the small tea growers. According to the author (Das, 2014) the small tea growers generally receive a good price if there is a good relationship between them and the BLFs. They receive different prices on the basis of season and per day supply of green leaves. Before the flush the prices are moderately good as the production of green leaf is comparatively less. In the month of June-July there is a significant flush which helps to increase

the leaf production and as a consequence the supply increases. But the BLFs have a limited capacity to purchase green leaves which discouraged the small tea growers to bring extra amount of green leaves to the factories even though there is a huge increase in the production. It indicates that the industry is facing capacity deficiency in the tea. If the small tea growers bring more than the prescribed amount they generally send the produce back. As a result in many cases a certain portion of green tea leaves remain un-plucked or the surplus leaves are sold to sub-agents or even to large agents at a very low price, who explore the possibilities to sell them at places wherever they have contacts. The ultimate result is that a fair price for tea leaves is not ensured to the smallholders. The monthly price fluctuation of the tea leaves can be better understood from Table 1.13. It is also observed that due to the monsoon floods, there is bad road communications, which has increased the transport cost. As the leaf agents bear the transport cost hence as a consequence they pay low price to the small tea growers.

Table 1.13: Prices for tea leaves received by the Smallholders (2012)

Month	Average Maximum Price (in Rs. per kg)	Average Minimum Price (in Rs. per kg)
March	22.3	22.0
April	21.5	20.7
May	21.9	20.8
June	22.5	20.0
July	20.1	19.3
August	19.4	17.9
September	18.3	16.7
October	18.3	17.4
November	20.2	19.1
Average	**20.5**	**19.2**

Source: Das (2014)

The tussle between small tea growers and bought leaf factories over the price of green leaf has always remained an isssue which induced the need of a Price Sharing Formula (PSF). In 2013 the Tea Board announced a minimum benchmark price for green leaf payable by bought leaf factories to small tea growers in Assam for various districts in the following way: Udalguri Rs. 18.41, Darrang Rs.17.68, Nagaon Rs.17.09, Sonitpur Rs. 16.77, Karbi Anglong Rs. 16.27,

Sivsagar Rs.16.26, Goalpara Rs.15.67, Golaghat and Jorhat Rs. 15.57 each, Dibrugarh Rs.15.44, Tinsukia Rs.15.13 and Cachar Rs.13.28 (The Hindu, 2013).

Das (2013) noted that for three years (2009-12), the State Government had put a hold on the issue of fresh registration of the bought leaf factories. It is clear from Table 1.8 that the concentration of bought leaf factories is more in Upper Assam districts of Tinsukia and Dibrugarh. Whereas districts like Darrang, Dhemaji, Dhubri, Kokrajhar, Lakhimpur have many small tea growers but there are not any bought leaf factories, which shows the transit of green tea leaves to other neighbouring districts. The tea planters of lower Assam used to carry their green tea leaves to the neighbouring State of West Bengal. The lack of processing factories in optimum number has an influence on the price of the tea leaves. On the demand of tea planters Assam restarted providing registration of bought leaf factories on the basis of concentration of small tea growers and non availability of factories in the districts later on (The Economic Times, 2012).

Regarding this Dev (2012) has remarked that the most important problem for the small farmers is output price fluctuations. There is also a big gap between producer prices and consumer prices.

According to Mansingh and Johnson (2012) as the auction price of tea declined from 1998 to 2003, green leaf prices witnessed a sharp decline during that period. As the income of the small tea growers fell, they cut on the cost of production by not using fertilizers and manure, not pruning the bushes and sticking to long plucking cycles. By 2003 a large number of small tea growers were in debt, mostly to BLFs, leaf agents and local moneylenders. Unfair prices pushed growers to the verge of poverty and starvation.

Borah (2013) also opined that in present scenario, the most important problem of the small tea growers of Assam is the absence of fair price for the green leaves produced by the growers. Green leaf is a perishable product which needs to be processed within twelve hours of plucking. The absence of proper marketing channel of green leaf, lack of market information, absence of proper storage facilities, transportation problem etc. ultimately bring down the price of green leaf. As small tea growers are scattered and the amount of production also heterogeneous in quality, it becomes very difficult to set up a common price for the product of small tea gardens. The author reported that sometimes big estate factories simply return raw leaves, citing inferior quality or compel small holders to accept the un-remunerative price. Therefore they are bound to

sell their produce at whatever the price offered by the estate factories or the BLFs. Table 1.12 has shown that there was a drastic fall in the price of green leaves in 2000 and 2013.

Hannan (2013) commented that in most of the cases the small tea growers have emerged in the remote areas. Hence they are not able to get remunerative price for their green leaf as it gets damaged during the transit to the factories located in far off places. Carrying green leaf to other places is not only difficult and time consuming but it is equally a crude process which adversely affects the overall quality of the tea. The author also expressed that the bought leaf factories are better organized and can manage the terms and conditions while purchasing green tea leaves. Since growers are not well organized within a locality there may be *depressed price zone* and *stable price zone* within a distance 15-20 kms during the same period of time. The area where Primary Producing Societies (SHGs) are properly functional and growers are aware of the local market price, they receive better deal and price for green leaf.

Ganguli (2013) agrees that the prices of green leaves are generally fixed by the BLFs and factory owning large gardens. The agents too play an important part in fixing the price of green leaves. The prices of green leaves are found to be affected by factors at the macro level and also influenced by the local market forces at the micro level that the slightest variation in the price of made tea may bring down the prices of green leaves. They are dependent on the forces of demand and supply and are subjected to both the vagaries of the market forces at the international, national and local levels. This has left the growers in the lurch and placed them squarely at the mercy of the buyers. On a sudden slump in the auction market price in the middle of the season, the prices of green leaves have fallen despite the fact that price was agreed upon at the beginning of the season. The price of green leaves may differ within the same size class and the district itself. There is no uniform formula on the basis of which the price of green leaves is determined. The author commented that on the recommendation of the Deputy Commissioner of Dibrugarh district, a Steering Committee was formed on the 29th of April 1999 to fix the prices of green leaves. The Steering Committee approved the formula for calculating the green leaf each year taking into account the interest of both buyers and sellers. According to the formula 65 per cent is payable to sellers (green leaf growers or agents) immediately and 35 per cent to be retained by the buyers (BLFs, Factory owning large gardens). It was decided that the Committee would calculate the green leaf price for every quarter by applying the formula and announce the

same for that quarter. But the formula failed to work and lasted only for a year. The prices have been found to vary in different financial years, from block to block and even within the size classes. The author suggested the development of a new marketing strategy which is a must for the survival of the small growers.

The tea industry in India has been going through a crisis since the early 1990s, primarily because of fall in tea prices according to Sarkar (2015). Other manifestations of this crisis include decline in exports, closure and abandonment of tea gardens, increasing labour unrest at times leading to violent protest and confrontations, non-payment and curtailment of wages and other statutory benefits of workers, declining labour standards in plantation economy. Relations between tea garden employers and labourers have deteriorated over the past decades and the crisis in the industry has aggravated it (Sarkar, 2015)

Medhi (2016) observed that the small tea growers are not well organized, therefore, the bought leaf factories refuse to give higher price for the green leaf. The price sharing under Tea Marketing Control Order (TMCO) guidelines is not implemented. On the other hand, District Level Monitoring Committee's initiation in fixation of price of green leaf has not given any support to the small tea growers.

Mohan (2016) concurs with other studies that the selling price is a major problem of small tea growers. The low quality of tea leaves is a cause of decreasing selling price according to him.

In sum the prices of green leaves are generally fixed by the bought leaf factories and estate factories. The agents too play an important part in fixing the price of green leaves. The small growers generally have to accept the prices so fixed by them. Tea prices show great differences due to enormous diversity in quality and varying bargaining power. The low price is either due to the shortage of processing factories or weak bargaining position of the small tea growers. The exploitation of the small tea growers is due to the lax administration of the Tea Board as well.

3. Infrastructure: Communication is the harbinger of modern civilization. The economic prosperity of any nation depends upon a well developed communication network. In most studies on small tea growers poor infrastructure is found to be one of the hindrances the small tea growers are facing.

According to Bhuyan *et al.* (1993) due to perishable nature of the green leaves, the small tea growers are compelled to sell their produce immediately after plucking. This is because of the non-availability of marketing society, or the non availability of transportation facilities. In their study it is mentioned that as the small tea growers are generally located in rural areas which either lack good roads or means of transportation, hence they generally use bullock carts, mini trucks and even bi-cycles to transport their green leaves to the nearby factory. From their study it is observed that small tea growers from higher farm sizes would consider it as a major problem in comparison to small size groups.

Goswami *et al.* (2006) have similarly mentioned that majority of the small tea gardens are located in remote villages. The condition of the roads leading to rural areas is very bad. It becomes worse during the rainy season. The peak season of tea cultivation ranges from May to October, when the rainfall is highest in Assam. Therefore during the harvesting season due to very poor road conditions the small tea growers of Assam face massive difficulty in transportation. They carry their green leaf by bi-cycles, hand-carts or bullock-carts to the motorable roads. The agents collect the green leaf from collection centers by the side of motorable roads and deliver the same to factories. The condition of motorable roads and bridges is bad. According to the authors the transportation problem of small tea growers reduces the profitability in two ways:

(i) If the green leaf is delivered by the growers themselves to the factories, it increases the cost of production of the growers.

(ii) In case the green leaf is delivered through the agents, the growers get a lower price, since the agents deduct the cost of delivery from the due payable to the growers apart from his commission.

Singh (2006) observed that green leaves from the field must reach to the factory without loss of time, and in unbroken condition. The quality of made tea depends upon freshness of the tender leaves. But due to bad road condition and infrastructural deficiencies it takes more than the required time to reach to the factories.

Banerjee and Banerji (2008) agree that poor infrastructure in the tea areas is a major problem. Maintenance of roads and bridges and all other public utilities such as power and

telecommunications is abysmally poor. Load shedding, low voltage and line tripping are regular features in the rural area of Assam. The gardens have to run their stand-by generator for long periods and this adds to costs. All these points stated are a direct result of apathy towards the fate of this industry and a mistaken belief in Government circles is that growers are rich or capable enough to look after themselves. May be this state of affairs has been brought on by the insular and highbrow attitude of the earlier British and Indian planters.

Sen and Nath (2012) commented that there is shortage of bought leaf factories in the different districts of the State and as a consequence the local small tea growers sell their raw leaves to neighbouring districts. This not only results in the rise in the cost due to transportation but also deteriorates the quality in the transition which directly affects the price of the green leaves. In many tea growing areas there is scarcity of factories and industries are reluctant to set up factory in remote tea growing areas. As a result, green leaves are transported by some agents and in this process growers are completely dependent on agents and they are deprived of proper leaf price (The Sentinel, 2014).

Ganguli (2013) observed that low distance between the gardens and the nearest town is important for regular transportation of their requirements. More important than this is the distance between the sample gardens and the factories where they sell their green leaves for regular transportation of quality leaves. The condition of the link roads being deplorable, the small growers had to face a number of transportation problems especially during monsoon, which is their peak plucking season before the emergence of a class of intermediaries in the recent years that collect green leaves from the gardens and sell the same to the factories. The author has also expressed that most of the growers are indignant about the extremely poor road conditions. For a major part of the season, the roads remain incommunicable. The cost of transport increases considerably due to the poor condition of the roads, which increases their cost of production.

Das (2014) concurs with the above authors that one of the problems faced by the small tea growers is the non-availability of good infrastructural facilities like road connectivity, power supply etc. The road connectivity of the remote areas of Assam is not only poor but in certain areas there is no motor-able connection between the tea gardens and the processing factories. Another factor of increasing cost of production is the inadequate power supply to the processing

factories. Serious problem of power supply forces the plantations to rely even on diesel, which increases the cost of production.

4. Finance: The next serious problem that the small tea growers are facing is related to finance. Due to lack of finance small tea growers cannot afford to extend the area under tea. Since tea processing plants are highly capital intensive and require external borrowing, small tea growers even cannot afford to produce made tea of their own. Bhuyan *et al.* (1993) have reported that green tea leaf production requires considerable amount of fund for its establishment, as well as operation and maintenance cost every year during its entire economic life. Financing of this crop wholly from small growers' own saving seems to be quite impossible. Many small growers at one time had been the farmers dealing with seasonal annual field crops. The savings of these farmers were hardly enough either to start the business like small tea cultivation or to expand the existing plantation to new area. Hence, the growers had no other alternative than to take recourse to external borrowing both institutional as well as non-institutional. The main sources of institutional borrowings are commercial banks, Government, Co-operatives and others, while non-institutional sources may include money lenders, friends, relatives and others. He has shown in his study that the intensity of the problem increased with the decrease in farm size. The investment was more profitable in the larger farm size in comparison to the lower size groups of farm because of lower cost of cultivation in the larger farm sizes. The sources of term finance for development of Tea Industry are the Tea Board, Industrial Development Bank of India, State Financial Corporations, and National Bank for Agriculture and Rural Development (NABARD). Lack of finance, particularly term finance for investment stands as a problem for the growers of small tea cultivation. He recommended the setting up of a separate finance corporation and also suggested the amalgamation of the various Small Financial Institutions under the co-operative management for helping the tea industry.

Bhuyan *et al*. (2004) observed that most of the problems of small tea growers arose from the fact that they are too small in size and their resources are also meagre. Because of the smallness, most of the small growers are indebted to bought-leaf factories. He also pointed out that the small growers because of lack of finance did not follow the standard practices. External finance although available is not always adequate in quantity and is not received at the right time.

Banerjee and Banerji (2008) underlined the trouble of small growers when they metioned that due to unscientific cultivation, price fluctuations, etc. small tea growers are facing difficulty in repayment of loans.

Ganguli (2013) observed that tea cultivation requires finance right from the purchase of land, leveling of land, drainage, planting, weeding, providing fertilizers, pesticides, insecticides, purchasing small equipments, fencing etc. Tea cultivation requires both fixed and working capital finances. But the facilities which are usually made available by the Tea Board and financial institutions (including NABARD refinance) to big growers are not available to the small growers since the annual *patta* land on which the tea cultivation is carried on by the small growers is not eligible for institutional finance. In fact, they are unable to use subsidies and other welfare schemes from the Tea Board effectively. Thus the small growers are compelled to find alternative ways. There are instances where at the beginning of the plucking season, some bought leaf factories and agents offer money in advance to the small growers on the basis of their previous year's production of green leaves. The author has also shown various policies, such as *Special Area Development Scheme, District Rural Development Agency, Prime Minister Rojgar Yojana*, etc. which are available to promote the small growers, but due to non availability of land documents, they are unable to avail the facilities. The small growers therefore prefer to arrange their own finance through other means. The author has also commented that the small growers are not attracted by the incentives made available by the Tea Board to its registered gardens. They prefer to make their own arrangements rather than depend upon institutional finance.

Borah (2013) mentioned that due to lack of financial availability small tea growers are unable to increase their area under cultivation and cannot open up their own factories. Most of the growers are cultivating tea on Government lands without having formal ownership. The land regulation of Assam restricts the transfer of ownership right to the growers. This restricts the growers to qualify for registration under the Tea Board, and consequently they are unable to avail the advantages of various schemes of Government and other financial intermediaries.

Earlier the Tea Board had the provision of supporting small tea growers by providing a subsidy of Rs. 60,000 per bigha of land-holding. However, such provisions failed to address the issues of a number of small growers, since only those farmers having permanent land *patta* were entitled to avail the subsidy. Due to non-availability of land documents most of the small tea growers are

not registered with the Tea Board, which further restricts their options (The Assam Tribune, 2014).

Borah (2016) likewise found that most of the small tea growers have not got any financial help from the Tea Board and other financial institution. The factors identified are lack of registration, poor communication link, lack of having periodic *patta*, lack of education etc. In such a situation most of the small tea gardeners raised plantation with own funds or they borrowed from relatives.

Dutta Saikia (2016) mentioned that the State Government is yet to formulate and implement suitable financial scheme for catering the financial needs of the small tea growers. Although various financial institutions are available for disbursement of agricultural finance to the cultivators, only the Tea Board of India and the commercial banks have shown some initiatives in this respect in case of cultivation of tea in small holdings.

5. Quality: Singh (2006) points out that shade provided to the tea bushes is one of the important aspects which determine the quality of tea. Shade trees act as the life blood to the tea leaves. It is the shade which ensures natural resistance against pests and infections and also reduces transpiration and evaporation rate. The quality of tea is the summation of the desirable attributes comprising of internal and external things like aroma, flavour, strength, colour and briskness and character of infused leaf. The quality of tea varies from garden to garden and time to time. Although, the quality of second flush (after first rainfall) is still the best quality, however, it cannot be made or maintained overnight. The deciding factors of high quality tea are the fine plucking, quick spread in the withering trough, proper rolling, fermentation and firing carefully under controlled temperature. Tea quality is also determined by the genetic properties of the plant coupled with climate and soil condition (presence of pH value to the desired extent). Field operations like plucking standard, pruning, use of fertilizer dose and shading are also deciding factors.

As Kadavil (2008) mentions, the term ‘quality’ in its broadest sense is used as a description of all the characters of tea by which it is judged on its market value. So quality means the summation of the desirable attributes comprising internal and external characters like aroma/flavor, strength,

colour, briskness and character of infused leaf. According to him the quality of tea is a highly variable attribute. It plays a major role in determining the price. The factors affecting the quality of tea can be distinguished into three groups, viz; genetic, environmental and cultural:

(i) Tea quality is primarily determined by the genetic properties of the tea planted and those of the tea bush in particular.

(ii) Both soil and climate influence the quality of tea. Climatic condition including temperature, humidity, sunshine duration, rainfall, north-south facing gardens are important in determining quality.

(iii) Field operation like pruning, fertilizing, shading, plucking round and plucking standard also play a major role in determining the quality of tea.

According to the author there are no measures to maintain high quality leaf in small tea segments. Leaf agents still play a major role in determining the acceptable quality of green leaves. It has been observed that the leaf agents often mix various quality leaves together before selling it to the BLFs. This is mainly to maintain minimum quality of leaves because it contains a high share of low quality leaves. The price fixation is based on overall leaf quality though some of BLFs have their own grading system based on quality. Lack of quality reduces the price of leaves. In many regions, especially in Dibrugarh, lack of transport facilities and long distance from gardens to factory are also deciding factors in determining the quality of leaves.

Sen (2008), while studying the impact of oversupply and low quality on tea prices opined that in northeast India, by and large the quality of raw material is very poor and so is the quality of finished product. Most factories have been built with second-hand or old machinery, with the objective of churning out black CTC teas to join the herd at the domestic markets. He also mentioned that fine plucking enhances the quality of tea.

Another problem of low quality tea as mentioned by Mansingh and Johnson (2012) is the time interval between plucking and processing of leaf. It should be ideally about three hours to produce good quality made tea as tea leaf cannot be stored for more than six hours without damaging its quality. But in most of the cases it is seen that the transit of tea leaves from one district to another takes more than three hours, which directly degrades the quality of tea.

Ganguli (2013) mentions that the age of tea bushes also plays an important role in determining the production of good quality green leaves. Generally tea bushes in the age group below 50 years are considered to be economically viable, yield rate normally declines after 50 years. Tea bushes usually attain maturity after five years. Mature tea bushes have a stable productivity, which continues till 50 years. The small tea growers of Assam are of a more recent origin, they are facing the problem of maintaining the quality of tea. The BLFs, estate owners, leaf agents generally refuse to purchase such poor quality green leaves which have led to conflict between the buyers and sellers. While being transported to factories, the tea leaves from small tea gardens are subjected to multiple handling, leading to inferior quality. The ideal distance from the factory to the carrying point should not exceed 10 km to ensure that the leaves do not get fermented. In case of 17,277 small growers the distance exceeds 10 km. During the hot summer days the leaves lose their moisture content very fast. The resultant loss of weight of the leaves adds to the disadvantage of the growers.

One of the reasons for the low quality as mentioned by Batabyal (2014) is the indiscriminate use of pesticides, which even though has helped in the growth of the product but its use threatens to devalue Assam tea as a brand.

6. Productivity: Productivity variation has a significant impact on the production of tea. Productivity is defined as yield of tea grown per hectare. Age of the tea plant is one of the important factors which influence productivity. Saikia *et al.* (1994) described that production of tea in Assam is highest in India. But it occupies the forth place in India in respect of yield per hectare. According to him the average yield per hectare for Assam is lower because of low rate of production in the Barak valley. Yield or productivity per hectare mainly depends upon climate, soil, topography, cultivation, plucking practices, etc. According to him fragmentation of holding, scattered location, non-adoption of improve and inadequate input facilities etc. are the main factors of low yield of small tea growers. He also mentioned that productivity cannot be raised without improving the efficiency of the labour and the efficiency cannot be achieved without uplifting the socio-economic and cultural standards of the labourers.

According to Bhuyan *et al*. (2004) most of the factors contributing to low productivity is man-made and can be minimized by proper policy intervention and implementation. He also mentioned that there is a positive correlation between area and green leaf production but the same is reverse in case of area of the farm and productivity.

According to Karmakar and Banerjee (2005) in many cases, unsuitable land and marginal lands were utilized for cultivation of tea affecting the quality as well as the productivity of the plantations adversely.

According to Goswami *et al.* (2006) higher productivity from tea cultivation depends on a number of factors, such as agro-climatic condition, suitability of soil, quality of planting materials, proper use of factor inputs, cultural practices, efficiency of management, skill of labour force, bush population, bush age, maintenance of proper plucking and pruning circle, improvement of drains etc. But most of the small tea growers of Assam had started planting tea in a haphazard manner. Therefore, these gardens are suffering from low productivity. Depending upon the characteristics of soil, climate, topography etc. different varieties of planting materials are prescribed by the Toklai Tea Research Station, Jorhat to increase the productivity of land. A large number of small tea growers were not aware of the technique and those who were aware found it either difficult to collect or due to high price were not able to collect it. Therefore, owing to lack of knowledge, financial constraints or non-availability of planting materials, many small tea growers have planted whatever planting materials were locally available at that time. According to the authors most of the workers in small tea cultivation are either semi-skilled or unskilled and, plucking by an inexperienced person without proper plucking technique is sure to reduce the productivity of the tea bushes.

As mentioned by Kadavil (2008) productivity is highly related to the age of tea bushes, temperature, drought and changes in rainfall. Productivity varies in plantations from region to region and even within one plantation. According to him productivity patterns in the small tea gardens and large-estate sectors vary and productivity is seen to be high in the small tea sectors.

According to Das (2010), productivity is influenced by factors such as infilling, re-planting and fertilizer use. Moreover, guidance from the experienced personnel or from the institutions in matters like soil conservation, drainage maintenance, soil and nutrients analysis, fertilizer application, pruning and harvesting are crucial determinants of productivity. Productivity in the

small tea holdings is to a large extent dependent on how the plantation is maintained and maintenance involves the application of fertilizer to keep the land productivity intact.

Arya (2013) observed that despite of increase in the area of tea plantations, the productivity of tea under small growers is less in comparison to the big growers. The reasons behind low productivity and substandard quality of tea are the aging plantations, un-utilization of the total area, lack of technical know-how, lack of accessibility of planting materials, non applicability of fertilizer and manure. He also mentioned that productivity of tea begins to decline after 30 years of age.

According to Ganguli (2013) along with agro climatic condition, the production of leaves depends upon factor inputs, cultural practices, efficiency management, skill of its labour force, bush population, bush age, quality of planting material etc. Amongst all these factors the quality of planting material used may determine the level of production of green leaves in the long run. Tea productivity is also influenced by rainfall since tea crop depends mostly on a well distributed rainfall. Hence climate could be one of the reasons of low productivity of tea in Assam. Another reason of low productivity is the less number of bushes per hectare in comparison to big estates.

In summary, the small tea sector of Assam has been growing. But the small tea growers are often exploited by the large tea estates, bought leaf factories and agents. The Tea Board has also not been providing financial assistance. The smallholding sector of Assam is undergoing several other difficulties like labour shortage, poor working conditions, lack of financial assistance, lack of quality, un-remunerative price, infrastructural deficiencies, low productivity etc.

Below we turn to the identification of the gaps that have remained in the existing body of research. These can be examined in our own study.

1.4 GAPS IN THE EXISTING RESEARCH

The review of the relevant literature conducted above helps the identification of areas where future research could be centered.

The small tea growing sector is a relatively new sector. It has attracted plenty of small peasants from the Indian agrarian economy which is itself undergoing a crisis (Das, 2016). Will the small

tea growing sector be sustainable in the long run? This is a crucial question, whose answer depends on,

(i) If the prices that small garden owners receive are remunerative, and

(ii) If there exists scope of improving production.

We propose to examine the question of remunerative price through the idea of exploitation. We seek to examine the monopsonistic exploitation of small tea garden owners by the tea leaf buyers. According to the microeconomic theory in a monopsonistic market the degree of exploitation by the monopsonist depends on the price elasticity of supply. Thus we need to estimate the price elasticity of supply in order to estimate the extent of monopsonistic exploitation. There have been some work on small tea growers which estimated the supply function and price elasticity of supply (Bhuyan *et al*., 2004). But, to the best of our knowledge, they have not taken into account the endogeneity problem while estimating the supply function. Hence, these studies may have given incorrect estimations of price elasticity. Our study will correct the deficiency in this nascent literature on small tea growers. Also we are not aware of any previous research which estimated the degree of exploitation of small tea growers. This again will be our contribution to the literature.

The second question of improvement of production of tea will be dealt with by estimating the production function of small tea growers. Estimation of production function will be done both in the deterministic production function set up and in the stochastic production function set up. This exercise will give us a clue to (a) if technical inefficiency is present in tea production and (b) which factor(s) are needed to be paid attention to in order to raise the production to the optimum level. Bhuyan *et al*. (2004) in his study of small tea growers estimated whether *individual* small tea growers are technically efficient or not. Along with estimating the technical efficiency of the small tea growers at *individual level* as Bhuyan *et al*. (2004) has estimated, we are planning to estimate if the small tea growers of our sample are technically efficient or not *as a whole* also. We observe that in his model specification Bhuyan *et al*. (2004) did not include capital as an element of the production function. In contrast, we seek to include capital, an important element of production, in the estimated production function. This way we plan to contribute to the research of small tea cultivation of Assam.

On the basis of the above two answers we may be able to make inferences regarding which policies the Government needs to focus on. This is our third research objective.

Another way to look at the question of exploitation of the small tea growers is the following. In the large estate tea gardens, which were the old model of tea production in Assam, there was rampant exploitation of labourers by the tea producers. Lack of alternative avenues of employment of migrant tea labourers was also evident (Guha, 1977; Kadavil, 2008; Das, 2014; Das and Saikia, 2011). One way to stop the exploitation of workers by the producer is to have tea gardens which are controlled by the workers themselves. It would appear that the small tea garden model seems to provide a way out of exploitation by the producer. This is because in the small tea gardens the owner himself/herself is often a worker, although he may employ some workers from occassionally.

Even though in the small tea gardens the exploitation of the workers by the owners may be less, yet another kind of exploitation may surface which was unimportant in case of large estate gardens. This is the issue of monopsonistic exploitation. The small tea growers are many in numbers and buyers of tea leaves are very few. As small tea growers are small in size and many in numbers, they have little influence over the selling price. Being the producer of the product, they are price takers as they cannot influence the price of their tea leaves. Thus the small tea growers are powerless in comparison to the buyers of tea leaves. Typically bought leaf tea factories or large tea estates buy tea leaves from the small tea growers either directly or through agents. Since there is an asymmetry in the bargaining position between the seller and the buyer, exploitation takes the shape of monopsonistic exploitation (Bhuyan *et. al*, 1993; Goswami *et.al,* 2006; Kadavil, 2008; Banerjee, 2011).

In the first part of research we are trying to estimate the monopsonistic exploitation. In the second part we go one step further and try to look at the nature of the response from the inputs to the output in small tea gardens and possibilities of technical inefficiency. In other words, in the second part we are *not* focusing on exploitation of the small tea. Instead, we are asking if the price is given, is there a way in which the profit of the small tea grower can be boosted by raising the output to an optimal level.

METHODOLOGICAL GAP

Ambiguities around the concept of evaluation combined with the things that the evaluator purports to do lead to a series of methodological gaps. In the literature certain gaps have been observed. As mentioned in the previous section Bhuyan *et al.* (2004) used the supply function but without considering the endogeneity problem. Hence the estimation of elasticitity of supply is not valid. On the contrary, we want to resolve this problem by the use of instrumental variable (IV) and using two-stage least square (2SLS) techniques.

Another methodological gap which is observed in his (Bhuyan *et al.*, 2004) study is that he has not included capital as an independent variable in his production function which is an important input of production. Similar methodological gap can be noticed in the study of Lama *et al.* (2016) where capital is not included as an independent variable in the production function. In contrast, we tried to incorporate capital cost in our production function.

Again in the study of Lama *et al.* (2016) it is observed that they have not included Tea Board registration as an important factor of technical efficiency/inefficiency. We considered TB registration is an important factor as from the literature study it is observed that the growers who are registered with the TB are able to avail the facilities provided by the TB which includes technical training also. Higher the technical training to the growers, higher is the efficiency and vice versa. Hence in our estimation of technical efficiency, we have included dummy for TB registration as an independent factor of inefficiency.

Thus the present study has been conducted on the basis of the following objectives:

A. To investigate the possible monopsonistic exploitation of small tea growers by the buyers of tea leaves, and to investigate the production conditions of the small tea growers.

B. To frame policy prescriptions to enable the survival of small tea growers in the long run.

For the first research objective following questions can be formulated.

A(1). What is the degree of exploitation of the small tea growers by buyers of tea leaves?

A(2). What does the production of small tea grower depend on? Is there presence of technical inefficiency?

Both these are empirical questions. For A(1), we estimate degree of exploitation by estimating price elasticity of supply.

We estimate the production function (deterministic and stochastic) for A(2).

For the second research objective the following question can be formulated.

B. What steps are warranted from the side of Government and other agencies for the long run sustainability of small tea growers?

To realize the first objective primary survey of small tea growers has been conducted. Answers to the research question (A) helps us to address the second research question (B), which pertains to the policy implications of our study.

1.5 DATA SOURCE

Following secondary sources of data published by different organizations were consulted.

- Review of other works,
- Published data by the Tea Board of India,
- Statistical Handbook of Assam,
- NSSO Reports.

1.6 RESEARCH METHODOLOGY

The choice of research methodology and various tools of analysis are based on the specific objectives of the study. Data pertaining to the study have been collected both from the primary and secondary sources.

Firstly, secondary data have been collected from books, annual reports of the companies and various other publications of the Government of India and Government of Assam, published literature of the plantation companies, unpublished dissertations and thesis from Indian universities (Assam Agricultural University, Gauhati University, Dibrugarh University and University of North Bengal), Omeo Kumar Das Institute of Social Change and Development, Guwahati, associations, journals, magazines, newspapers, handouts, Tea Board, Statistical Handbook of Assam, NSSO reports and company websites. Besides these, various publications such as Indian Tea Research, Tea Industry in Assam have been conducted as secondary source.

Secondly, primary data have been collected by direct contact method. We prepared questionnaires to carry out the investigation. All the information based on primary sources have been collected from the personnel departments of the selected tea estates of Assam and through personal interviews with the stakeholders (small tea growers, workers, managers of tea estates, union leaders, owners of bought leaf factories, Government officials etc.) from different districts of Assam on a number of major aspects like factors of production and its cost, price of the green tea leaves, Government subsidy, extended help by the Tea Board, bought leaf tea factories, leaf agents, number of tea bushes per acre, distance between the tea garden and the BLFs, etc. Finally, all the information and collected data have been analyzed and important inferences have been drawn from them to arrive at conclusions.

Chapter II

PRODUCTION CONDITIONS IN SMALL TEA GARDENS IN ASSAM

In this chapter we try to assess the production condition of the small tea growers of Assam from secondary literature and secondary aggregative data. The growth of small tea growers in terms of their number, area under cultivation, production of tea leaves will be examined. Growth of bought leaf factories will also be discussed. In the second part of the chapter factors affecting tea cultivation in small gardens will be studied in detail with the help of available data.

2.1 Production Conditions

Tea is one of the most important plantation crops of India where production takes place in both large plantation and small gardens. The production of tea in India and the contribution of small growers and big plantations in it can be seen from the works of Hannan (2013) and Hazarika and Borah (2013), which have been compiled in Table 2.1. Even though there is an increase in the total production of tea from 2003 onwards in big gardens, the data reveals a continuous decrease in the percentage share in the production contribution of the big growers (Hannan, 2013; Hazarika and Borah, 2013). In contrast, small growers have shown increase in the total production as well as in percentage share in the total production.

Table 2.1: Production of Tea in India (million kg)

Year	Small Growers (Area upto 10.12 hectares)	Big Plantation (Area above 10.12 hectares)	Total Production
2003	180.66 (20.57)	697.47 (79.43)	878.13
2005	231.29 (24.45)	714.68 (75.55)	945.97
2007	257.46 (26.10)	728.97 (73.90)	986.43
2008	257.46 (26.24)	723.36 (73.76)	980.82
2011	260.00 (26.31)	728.00 (73.68)	988.00
2012			1135.07
2013			1208.78

Source: Hannan (2013), Hazarika & Borah (2013), TBI

(Figures within parentheses indicate percentage to national total)

Available data indicates that at the national level, there is an absolute increase in the number of small tea gardens across India from 1,10,396 in 2000 to 1,57,504 in 2007 (Table 1.5 of Chapter I). The area under tea cultivation has gone up from 1,09,189 hectares in 2003 to 1,62,431 hectares in 2007 which is depicted in Table 2.2. During the same period, the area under estate gardens/big growers seem to be almost constant. The percentage share of area under cultivation for tea shows that the small growers constituted 21.02 percent in 2003 and increased to 28.08 percent in 2007. In contrast land share of estate gardens/big growers have rather shown a declining trend from 78.98 percent to 71.92 percent during the same period. The share of tea production of the small-holders has also increased substantially from 20.57 percent to 26.31 percent during the period between 2003 and 2011 (Hannan, 2013).

Table 2.2: Area of Tea in India (hectares)

Year	Small Growers (Area upto 10.12 hectares)	Big Plantation (Area above 10.12 hectares)
2003	1,09,189 (21.02)	4,10,400 (78.98)
2005	1,42,985 (25.73)	4,12,626 (74.27)
2007	1,62,431 (28.08)	4,16,027 (71.92)

Source: Hannan (2013)

(Figures within parentheses indicate percentage to national total)

Table 2.3 shows the distribution of area and production by small holders and estate gardens in each State of 2003.

Table 2.3: Share of Small and Estate Tea Gardens in India (2003)

(Figures show the percentage share)

Region	Small Growers			Big Growers		
	No. of Estates	Area in Ha	Production	No. of Estates	Area in Ha	Production
Assam	98.2	15.2	14.5	1.8	84.8	85.5
W. Bengal	96.5	8.4	17.1	3.5	91.6	82.9
Others	98.0	42.5	20.3	2.0	57.5	79.7
Northern India	97.9	14.5	15.4	2.1	85.5	84.6
Tamil Nadu	99.6	57.1	55.0	0.4	42.9	45.0
Kerela	97.5	13.0	3.4	2.5	87.0	96.6
Karnataka	50.0	3.9	4.0	50.0	96.1	96.0
Southern India	99.4	41.9	39.2	0.6	58.1	60.8
All India	98.7	20.6	21.2	1.3	79.4	78.8

Source: Kadavil (2008)

The contribution of big growers was noteworthy in 2003 and it accounted for 78.8 per cent. Out of the tea produced in India, small tea growers of Assam constituted the major share, both in the number of estates as well as in the production (Kadavil, 2008). But compared to the national average small tea gardens' share in terms of number, area and production was low in Assam in 2003. In other words, although small tea growers picked up in a big way in Assam, it was yet to reach the all-India average, let alone being more than the average.

With the expansion of the smallholdings by the late 1990s, a favourable recourse of the estate sector to procure green leaves from the tea smallholdings could be noticed. The period also experienced dwindling productivity of the tea acreage under the estate sector. The reason behind this was considered to be old plantation led stagnant or declining productivity, rising cost of production, taxation burden and stiff challenge in the market, particularly from newly emerged tea producing countries. And in a labour-intensive sector like tea a cut in labour costs obviously reduces the cost of production to a significant extent. On the other hand, re-plantations and maintenance – which are crucial to sustain field productivity, have emerged as prime and common issues in tea sector of India. Tea production has been slowly moving from estate sector to smallholdings plantations (Das, 2014).

Table 2.4: Production and Share of Small Sector in India

Year	Production Million Kg	% Share in Total Production
2011	316.73	28.39%
2012	363.09	32.24%
2013	374.91	31.23%

Source: Tea Board of India

According to the latest report of Tea Board of India, Development of small tea holdings in India, the contribution from small sector has gone up from 5% in early 1990s to more than 31% in 2013 which is shown in Table 2.4.

Table 2.5 depicts that there is a continuous increase in the number of STGs in the region from 2007 to 2016 whereas there is a slight decrease in the number of big tea gardens over the same time period. The area under cultivation by both small and big growers has decreased with variations in between 2007 to 2016 implying the size of the gardens are becoming smaller. Though there is a decreasing trend of the area under cultivation, the STGs have shown a

substantial increase in the production implying improvement in the yield of land whereas the contribution of the big growers has oscillating trend with slight variations. As such the effect on the total number of tea gardens has shown an increasing nature but the area under cultivation have remained almost same. And production in total has grown steadily during this period.

Table 2.5: Tea Gardens, Area and Production by type of tea gardens in Assam 2007 to 2016

Year	Small Growers (upto 10.12 hect.)			Big Growers (above 10.12 hect)			Total		
	No. of Tea Gardens	Area	Production	No. of Tea Gardens	Area	Production	No. of Tea Gardens	Area	Production
2007	64597	88674	106881	825	232645	405004	65422	321319	511885
2008	NA	88674	NA	760	230113	437810	760	321437	487497
2009	NA	88674	NA	760	230060	451970	760	321687	499997
2010	NA	88674	NA	760	229790	450100	760	322222	480286
2011	78091	88674	NA	760	229140	476767	78856	322210	589110
2012	68459	88674	NA	761	233536	590120	69220	322210	590120
2013	68459	88674	NA	761	233536	629050	69220	322210	629050
2014	76949	71871	144254	761	232529	466716	77710	304400	610970
2015	82805	83880	139491	761	232529	386694	83566	316409	526185
2016	84577	78203	NA	767	226197	NA	85344	314400	642180

Source: Tea Board of India, Regional Office, Guwahati, Assam

Even though small tea cultivation is practiced in all the districts of Assam, but Tinsukia, Dibrugarh, Sibsagar, Jorhat and Golaghat districts of Upper Assam have the largest area under small tea cultivation with highest production of tea leaves. The production of tea leaf of Assam is influenced by several factors, viz., agro-climatic factors like climate, rainfall and soil type and economic factors such as labour use, infrastructure facilities like transport and communication, cost of cultivation, price received by the growers, credit facilities, etc. During the last four decades the number of small tea growers of the State has increased many times which was discussed in Chapter I Table: 1.5 and the proportion of area under cultivation has also gone up

significantly which is shown in Table: 1.6 of Chapter I and Table 2.2 of the present chapter. Growth of small tea growers has led to major changes in the structure of the economy of Assam. Changes that the growth of small tea growers prompted are four-fold. First, with the introduction of small tea cultivation in Assam, activities related to small tea garden production became economically attractive which brought waste lands into small tea cultivation (Das, 2014). Secondly, progress of small tea cultivation created additional employment opportunities (Ganguli, 2013). Thirdly, the bought leaf factories and the leaf agents were the new actors in the tea sector. Additionally, they have created non-farm employment opportunities also (Hannan, 2013). Finally, the establishment of AASTGA, STAP, and the assistance of the Tea Board has brought the changes in the small tea cultivation (Ganguli, 2013). However the small tea growers have faced several problems starting from the availability of labour to credit facilities including the communication problems and the un-remunerative price of their tea leaves, which we have discussed in the last chapter. These factors have affected the small tea growers adversely. This chapter proposes to critically examine the production conditions of small tea gardens of Assam at a greater depth. While the previous chapter introduced the themes, this chapter will dwell on them with supporting secondary data and preliminary analysis. This will set the stage for our own primary data collection and analysis of the data, which will be taken up in the subsequent chapters.

At the outset we take a stock of tea leaf production by the small tea growers. The growth of small tea growers in terms of their number, area under cultivation and production of tea leaves will be examined along with the growth of bought leaf factories. The nature of the small tea cultivation will also be discussed in this part. The analysis will be carried out on the basis of the secondary data. In the second part of the chapter factors affecting tea cultivation in small gardens will be studied in detail. This will be based on the previous research conducted by other researchers.

2.2 Small-scale Tea Productions as Informal Sector

As discussed in Chapter one it can be seen that the nature of the small tea cultivation is that of unorganized or informal economy.

Employment of less than ten persons in an enterprise should be considered a criteria for classifying the enterprise under informal sector according to Gerxhani (2004). A main feature of the informal sector activities is the small-scale of the operation. Informal workers are defined as the sum of the self-employed people, unremunerated family workers and domestic servants. Informal sector activities are usually labour intensive. One of the main advantages of the informal sector is of easy entry. There is freedom of operating one's own businesses. It is most likely a consequence of the fact that small-scale activities dominate in the informal sector of less developed countries. The sector generates low income, little of any accumulation and it is just a means of bare survival. Work in the informal sector is often characterized by low productivity and low incomes. Informal sector has its own dynamics, it promotes small business and it checks open unemployment.

Garcia (2006) observes that informal business can be defined as the one in which the common traits are easy entry, low-resource base, family ownership, labour intensiveness, adapted technology, informal processes for acquiring skills, low capital requirements, simple division of labour and little differentiation of ownership of means of production. It can be defined in a broad sense as referring to the portion of commercial activity that is either unregulated or insufficiently regulated by the State. In this sense, informal economic activities are those productive activities that are unrecorded or insufficiently accounted for in a country's national income account. In such a sector there is no formal wage policy set by the Government. According to him small farmers come under the informal economy.

In the words of Chen (2007) the informal economy is comprised of all forms of 'informal employment'- that is, employment without labour laws or social protection- both inside and outside informal enterprises, including both self-employment in small unregistered enterprises and wage employment in unprotected jobs. In his words the informal economy is linked to the formal economy- it produces for, trades with, distributes for and provides services to the formal economy. In fact, many formal firms prefer informal employment relationships, in the interest of flexible specialized production, global competition, or simply reduced labour costs. Formal firms choose these types of informal employment relationships as a means to avoid their formal obligations as employers to provide the social security schemes.

Kadavil (2008) likewise observed that the current trends show that many of the big companies are withdrawing from production and concentrating only on brand business. Recent economic policies in India and opening up to the international market have been marked by the efforts by companies to slice up the production process. Multinational companies (like Hindustan Lever, Tata Tea, Goodricke Groups Ltd. etc.) are no longer as keen on production processes as they are on organizing and managing commodities and diversifying the production with various other agricultural and commercial crops like garments, footwear, consumer electronics or big brands of tea. This restructuring process has changed the orientation: away from producing tea and towards being sellers of tea products. These major companies have sub-contracted or outsourced the production of tea leaves, an effective cost-saving strategy and control the small tea growers by controlling only the packet tea segments. And in this process they have realized that their level of profits have been greatly increased by selling branded and processed tea products rather than owning plantations.

As per Indian context the criteria for informal sector is (i) **legal status**, since proprietary and partnership firms in India do not have any separate legal status other than that of the owners i.e., the liabilities of the enterprise fall entirely on the owners. Thus such units are considered as un-incorporated, (ii) the second criteria employed for the identification for informal sector was **employment size** which has to be below a specific threshold to be determined according to national circumstances. The size criteria was decided after analyzing the threshold limits of various labour laws, productivity differentials of establishments with different employment sizes and development policies and in the context of India it is decided as fewer than 10 workers. (iii) **Non-registration** under specific forms of national legislation is another characteristic which is used for identifying informal enterprise (Raveendran, 2015).

As per international guidelines non-registration under specific forms of national legislation is one of the characteristics which is used to identify informal enterprise. The non-maintenance of complete accounts that would permit a financial separation of production activities of the enterprise is generally satisfied in the case of proprietary and partnership enterprises employing less than ten workers as those enterprises are not under any legal obligation to maintain separate accounts. An enterprise is classified as proprietary if an individual is its sole owner and as partnership if there are two or more owners on the partnership basis with or without formal

registration. According to Naik (2009), the estimated number of informal sector workers in 2004-05 was 394.90 million in India contributing 86 per cent of total workers. In rural areas the share of informal sector workers in each population segment recorded more than 90 per cent and the share of female workers (94.50 per cent) is more than male workers (90.34 per cent). The share of agriculture sector is more in informal sector workers and it is about 68 per cent. During the same period the highest growth rate in informal sector workers was recorded in Assam (7.17 per cent). According to him this indicates that casualisation or the amount of contractual labour increased in the formal sector (Naik, 2009).

Basole and Basu (2011) noted that the Sengupta Commission formulated the unorganized sector as:

The unorganized sector consists of all unincorporated private enterprises owned by individuals or households engaged in the sale and production of goods and services operated on a proprietary or partnership basis and with less than ten total workers.

According to them the post-reform period has seen growing 'informalisation'. The persistence and ever proliferation of small-scale industry on the one hand and continued support by the large-scale modern industry on the other have paved the way for outsourcing or sub-contracting. In the tea industry of Assam, to cut down the expenditure and to overcome the problem of labour scarcity, outsourcing or sub-contracting to small growers was initiated. Outsourcing to small growers instead of centralizing production in factory is mainly because of profit motive. High exploitation has been noticed in case of informal sector not via increased productivity of labour but via lowering the price of labour power or by increasing the intensity of work. The informal sector is plagued with extremely low wages. The production relations created the conditions for unequal exchange, as a result of which the small cultivators are exploited by the intermediaries. As per NSSO data small-scale enterprises are characterized by piece-wages, which achieved an increased rate of exploitation via increasing intensity of labour and a lengthened working day. In fact, exploitation of unpaid domestic labour especially of women and children is ubiquitous in household enterprises. This low wages and exploitation over prices, in fact, has been behind the growth of the small-scale enterprises. In case of small tea growers it is noticed that they are not only exploited in terms of price received for their product but also the labours working under

small tea cultivation receive wage rate which is below the official minimum wage rate and payment is also irregular in many small tea gardens (Kadavil, 2008).

Goswami *et al.* (2006) have also reported that the small tea sector of Assam is expanding in an unorganized manner. Most of the small tea gardens are one man enterprise or family business. The Government virtually has no control over them. No statement is required to be submitted to any Government Department by small tea growers. Except land revenue and personal income tax (if any), they need not pay any tax to Government up to 4 hectares of plantation. Large tea estates have to pay a minimum wage to labourers along with a number of other facilities as per Labour Plantation Act. Therefore, production cost of green leaf produced by them is higher than that of the small tea growers. Large tea estates are likely to be benefited by outsourcing the production of green leaf to small tea growers, which acts as a boost to the growth of small tea growers. The Tea Board of India, Development of Small Tea Holdings in India (2014) has also opined that because of their scattered small size holdings, small tea growers are by and large unorganized.

Das (2012) notes that outsourcing to the small holdings by the estate sector has two repercussions. On one hand, it restricts the opportunities for work in the estate sector and on the other, limits the burden of providing the workers compulsory pecuniary and non pecuniary benefits set by the Plantation Labour Act.

Hannan (2013) observed that the unorganized sector tea industry is also an outcome of the survival and sustainability of the thousands of unemployed youths in the backward pockets of the country.

From the above definitions and traits given by the different writers, it is clear that the three major criteria - legal status, participation in the market, and the firm size (number of workers) are used to define an informal firm or enterprise. It can be further concluded that the nature of the small tea cultivation is that of unorganized/informal sector. Since many of the features of informal sector are found in small tea cultivation, the reasons for growth and the problems faced by small tea cultivation are similar to those faced by the informal sector in general.

2.3 Growth of STGs in Assam

Though the tea industry of Assam is more than 185 years old, the concept of small tea cultivation is a recent phenomenon. The 2008 data shows that in Assam, tea cultivation occupied more than 3.2 lakh hectares, out of which nearly 1.18 lakh hectares (36 per cent) were occupied by small tea growers. This signifies a considerable growth in the number of small tea sector in a very short time considering small tea growers hardly existed in the State forty years ago. The growth of small tea cultivators can be expressed in terms of numerical growth, area-wise growth and production growth. Table 1.5 is reproduced here to justify the statement.

Table 1.5: Comparative Study of STGs in India and Assam

Year	No. of STGs in India	No. of STGs in Assam	Percentage increase over previous years in Assam
1978		16	
1983		279	
1988		875	
1993		4,594	
1994		6,300	31.85
1995		7,442	18.12
1996		9,155	23.01
1997		10,018	9.42
1998		16,759	56.19
1999		24,930	59.33
2000	1,10,396	30,607	22.77
2001		38,269	25.03
2002		41,548	8.57
2003	1,27,366	45,444	6.53
2004		46,949	6.07
2005	1,39,041	48,292	2.86
2006	1,41,544	50,795	5.18
2007	1,57,504	64,597	28.88
2008	1,57,504	67,463	3.05
2010		68,459	1.48
2011	1,57,504	68,465	0.01
2012		68,523	0.08
2013		78,350	14.34
2015		82,805	5.69
2016		84,577	2.14

Source: compiled from Hannan (2013), Borah (2013), Hazarika & Borah (2013), Mohan (2016), Statistical Handbook of Assam, various years, AASTGA

Table 1.5 in Chapter I showed the actual number growth of the small tea holdings in Assam and a comparative picture with the all India level was presented. As per the table both nationally as well as in the State there is a substantial increase in the number of small tea growers. Since the introduction of small tea cultivation, the sector has witnessed significant changes. In the first phase (from the emergence till 2001) the growth rate was comparatively higher than the growth rate of the later phase (from 2002 onwards). It has grown from mere 16 small tea gardens in the year 1978 to 38,269 in 2001 to 84,577 in 2016 (the phases were demarcated on the basis of the percentage growth of number of STGs). The growth of initial stages has attracted a large number of farms to start small tea cultivation.

Table 2.6: District-wise Number of Small Tea Growers of Assam (2012-2013)

Name of the District	No of Small Growers (2012)	No of Small Growers (2013)
Karbi-Anglong	241	321
Darrang	06	08
Dhemaji	206	257
Dhubri	04	15
Dibrugarh	19,160	22,719
Kokrajhar	122	280
Lakhimpur	482	530
Nagaon	449	-
Udalguri	1,094	2,662
Jorhat	5,889	6,406
Tinsukia	18,595	21,006
Golaghat	11,287	11,344
Sivsagar	9,600	10,142
Sonitpur	1,357	1,499
Cachar	31	-
Baksa	-	78
Others	-	1083
Total	**68,523**	**78,350**

Source: Das (2014), Government of Assam (2013)

Tea is produced in almost all the districts of Assam. Table 2.6 shows the strength of small tea growers in the different major districts of Assam. Thus Table 2.6 reveals that Dibrugarh and Tinsukia districts of upper Assam have high numbers of small growers. In 2012 in these two districts alone the number of small tea growers was 37,755 (55% of the total). In 2013 in these two districts the number of small tea growers is 43,725 (again 55% of the total). Udalguri, Sonitpur, Nagaon and Karbi Anglong districts have a rising trend as far as the number of small gardens is concerned. The rest of the districts other than upper Assam districts seem to be steady in terms of number of small tea growers.

Along with the increase in the number of small tea holdings there is a phenomenal increase in their area. Table 1.6 of Chapter I showed the growing trend of small tea holdings in Assam and a comparative study has been conducted with the total acreage under tea plantation.

Saikia *et al.* (1994) noted that the production of tea plantation is directly related with the management of labour. According to them productivity cannot be raised without improving the efficiency of labour and the efficiency of labour cannot be achieved without uplifting the socio-economic and cultural standards of the labourers. The small-scale farming of tea (green leaf) was gaining popularity in Assam in the late 1980s. The Government showed sympathetic attitude towards this farming system by providing plots of land to the unemployed youths.

The sudden rise in the number of small tea gardens of Assam and the increased area under tea cultivation particularly since the latter half of 1990s can be attributed to the unemployed youths who took small scale tea production as their profession (Das, 2014). The small tea growers covered around 65,000 hectares of land in which only 12,590 hectares were registered by 2012 and they produced more than 100 million tones of tea leaf annually, contributing more than 50 million kg of tea to State's total production. But, since they grow in small scale, they cannot go for factory manufacturing and, hence, have to sell green leaves to the large estates or bought leaf factories which often subject them to exploitation (Das, 2014).

Reliable secondary data on small tea growers are limited and one of the reasons is that most of the growers are not registered with the Tea Board. Along with the increase in the number of small tea growers and their spread to various districts, the All Assam Small Tea Growers Association (AASTGA) was formed in 1987 to take up different issues of the growers. But such provisions failed to address the issues of the growing number of small tea growers, since only those having permanent Land Ownership Document were entitled to avail the facilities. A large number of small tea growers who do not have their land holding certificates were unable to register themselves under the Tea Board. According to Kadavil (2008) as per the membership of various small growers' associations in different States, the number of small holdings in 2006 stands at 1,26,256. Only 56.8 per cent (71,676) of these small growers have so far registered with the Tea Board, owing to the reason that small tea growers, particularly in the north-eastern region, do not possess documents for the land they possess. Below data of district-wise growing trend of registered small tea growers in Assam over the years is presented.

Table 2.7: District-Wise Registered Number of Small Tea Growers in Assam

District	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	2	3	4	5	6	7	8	9	10	11	12
Dhubri	1	1	1	1	2	2	2	3	3	11	13
Kokrajhar	7	8	9	9	9	26	61	95	115	280	335
Bongaigaon	7	7	23	35	36	36	36	29	52	530	696
Baksa				1	6	6	6	17	21	204	257
Goalpara	1	1	1	1	2	2	2	6	13	64	154
Barpeta	1	1	1	1	1	1	1	1	1	0	0
Nalbari	5	8	8	8	8	8	8	8	8	0	0
Kamrup (R+M)	7	7	7	7	7	7	7	8	8	8	11
Darrang	35	35	162	162	162	162	162	163	165	1	4
Udalguri				7	12	22	47	64	77	3583	4773
Sonitpur	207	208	493	604	674	784	878	976	1073	4651	8750
Lakhimpur	21	21	183	185	185	191	231	239	266	1489	1815
Dhemaji	1	1	54	58	60	61	67	79	80	566	536
Morigaon	7	7	7	7	7	7	7	7	7	7	7
Nagaon	49	53	119	122	126	131	134	136	145	643	1032
Golaghat	300	304	868	938	985	1039	1141	1232	1387	11286	9503
Jorhat	90	90	133	147	150	161	177	180	194	5879	6366
Sivsagar	89	89	121	127	139	228	236	239	290	9590	10868
Dibrugarh	115	115	190	199	200	202	202	204	208	19160	19160
Tinsukia	99	99	218	223	230	241	243	255	265	18595	18595
Karbi-Alglong	130	135	286	302	331	391	445	451	489	489	1520
N.C. Hills	1	1	1	1	1	1	1	1	1	2	2
Karimganj	7	7	7	7	7	7	7	8	9	10	10
Hailakandi	4	4	4	4	4	4	4	4	4	4	4
Cachar	27	27	31	31	31	47	98	165	172	172	172
Assam	**1211**	**1229**	**2927**	**3187**	**3375**	**3767**	**4203**	**4570**	**5053**	**77229**	**84591**

Source: Statistical Handbook of Assam, various years

Table 2.8: District-Wise Registered Area (in Hectare) of Small Tea Holdings in Assam

District	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	2	3	4	5	6	7	8	9	10	11	12
Dhubri	1.04	1.04	1.04	1.04	11.07	11.07	11.07	13.07	13.07	26.7	28.7
Kokrajhar	37.04	44.77	46.65	46.65	46.65	108.98	229.43	352.52	417.33	644.78	998.81
Bongaigaon	29.33	29.33	60.3	93.01	94.28	94.28	94.28	80.09	121.76	365.47	595.9
Baksa				3.22	31.05	31.05	31.05	61.49	75.6	186.72	339.56
Goalpara	6.25	6.25	6.25	6.25	7.44	7.44	7.44	15.35	31.54	121.85	154.22
Barpeta	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	0	0
Nalbari	22.57	29.42	29.42	29.42	29.42	29.42	29.42	29.42	29.42	0	0
Kamrup (R+M)	26.95	26.95	26.95	26.95	26.95	26.95	26.96	30.55	30.55	29.42	31.82
Darrang	129.43	129.43	476.07	476.07	476.07	476.07	476.07	476.73	502.05	2.83	2.83
Udalguri				16.39	27.44	39.13	88.34	114.37	121.27	4223.15	5029.63
Sonitpur	497.57	498.34	1047.06	1209.93	1308.73	1496.9	1641.27	1771.61	1896.96	4728.64	8677.09
Lakhimpur	75.24	75.24	349.15	351.45	351.45	362.06	469.3	479.61	511.89	1474.85	1649.22
Dhemaji	8.95	8.95	111.42	117.16	118.52	119.96	136.34	166.35	168.06	472.38	447.74
Morigaon	7.35	7.35	7.35	7.35	7.35	127.7	127.7	127.7	127.7	127.7	127.7
Nagaon	135.16	151.94	300.17	305.32	312.02	321.44	326.76	330.74	345.13	1180.55	1659.19
Golaghat	957.99	987.98	1905	2102.31	2168.11	2251.54	2394.12	2510.7	2715.62	7485.04	9160.06
Jorhat	186.08	186.08	247.87	296.93	306.01	327.84	343.76	346.92	365.51	6066.27	6158.83
Sivsagar	261.05	261.05	332.01	347.41	360.52	546.53	569.37	581.08	676.21	9942.69	11149.42
Dibrugarh	358.94	358.94	490.05	501.17	503.2	505.73	505.73	514.15	528.98	15433.77	15433.42
Tinsukia	367.53	367.53	496.52	502.99	532.41	549.47	560.6	585.01	605.29	16674.24	16674.24
Karbi-Alglong	1107.71	1139.82	1961.68	2058.39	2198.43	2350.65	2501.87	2524.54	2627.29	2627.29	3345.43
N.C. Hills	4.68	4.68	4.68	4.68	4.68	4.68	4.68	4.68	4.68	10.22	1.022
Karimganj	36.28	36.28	36.28	36.28	36.28	36.28	36.28	40.28	44.17	57.5	57.5
Hailakandi	23.84	23.84	23.84	23.84	23.84	23.84	23.84	23.84	23.84	23.84	23.84
Cachar	114.15	114.15	127.7	127.7	127.7	183.47	338.32	574.43	604.97	604.97	604.97
Assam	**4396.64**	**4490.87**	**8088.97**	**8693.42**	**9111.13**	**10033.99**	**10975.5**	**11,756.74**	**12590.4**	**72400.65**	**82250.47**

Source: Statistical Handbook of Assam, various years

As per Table 2.7, over the years the number of registered small tea growers is increasing resulting to an increase in the registered area under small tea cultivation which is shown in Table 2.8. The number of registered small tea growers which was only 1211 in 2004 has increased to 5053 in 2012, showing an increase of more than 317 per cent, and further increased to 84591 in 2014, showing an increase of 1574 per cent. Dhemaji district has shown the highest percentage increase in the number of registered small tea growers from 1 to 536 (53500 per cent) from 2004 to 2014. The increase in the registered number of growers in Kokrajhar district is also remarkable from 7 to 335, an increase of more than 4686 per cent. The increase in the number of growers in districts like Goalpara, Lakhimpur, Bongaigaon, Udalguri, Cachar, Golaghat, Sivsagar, Tinsukia, Sonitpur, Jorhat and Dirbugarh are also noteworthy in this period. Comparatively lower increase can be noticed in the districts like Darrang, Karbi-Anglong and Nagaon. On the other hand, districts like Dhubri, Barpeta, Nalbari, Kamrup, Morigaon, N.C.Hills, Karimganj and Hailakandi show negligible or no increase in the registered number of small tea growers per district.

The registered area under cultivation has increased from 4396.64 hectares to 12590.4 hectares, from 2004 to 2012 showing an increase of more than 186 per cent, to 82250.47 hectares to 2014, showing an increase of more than 553 per cent. Districts like Dhemaji, Morigaon, Kokrajhar, Udalguri, Lakhimpur, Sonitpur have shown significant increase (more than 1000 per cent in each district) in the registered area under small tea cultivation from 2004 to 2014. Again small increase in area can be noticed in the districts like Cachar, Darrang and Districts like Golaghat, Sivsagar, Nagaon, Karbi-Anglong, Jorhat, Tinsukia and Dibrugarh have shown comparatively slim increase in the registered area under small tea cultivation (less than 200 per cent). On the other hand, Dhubri, Goalpara, Barpeta, Nalbari, Kamrup, N.C. Hills, Karimganj and Hailakandi have shown negligible or no change in the registered area.

As per Gazetteer of India, Assam State (1999) the districts of Assam have been divided into three regions: Upper Assam (comprising Sonitpur, Nagaon, N.C. Hills, Golaghat, Lakhimpur, Jorhat, Dhemaji, Dibrugarh, Sivsagar, Tinsukia and Karbi-Anglong); Lower Assam (Comprising Dhubri, Kokrajhar, Bongaigaon, Goalpara, Barpeta, Kamrup, Nalbari, Darrang, Morigaon, Baksa and Udalguri) and Barak Valley (comprising Cachar, Hailakandi and Karimganj). To see the growth of registered number of STGs in Assam from 2004 to 2014 two pie charts have been constructed in Figure 2.1 which clearly shows that the concentration of the STGs in the upper Assam districts is comparatively much more than the lower Assam or Barak Valley districts. But

a slight increase can be noticed in the growth of the registered number of STGs in the Upper Assam districts. Their share went up from 91 per cent to 92 per cent. Same is the case in case of Lower Assam districts where a small increase in share from 6 per cent to 8 per cent can be noticed. The share of Barak Valley districts is observed to be negligible during 2004 to 2014. Same is the case in case of registered area of STGs which is shown in Figure 2.2. The share of registered area in case of Upper Assam districts is found to be same. Their share is 90 per cent. Whereas a significant increase in the registered area can be observed in case of Lower Assam districts, the share increased from 6 per cent to 9 per cent and Barak Valley districts have shown a slim decrease in share from 4 per cent to 1 per cent in case of the registered area.

Figure 2.1: Comparison of Number of Registered STGs of Assam

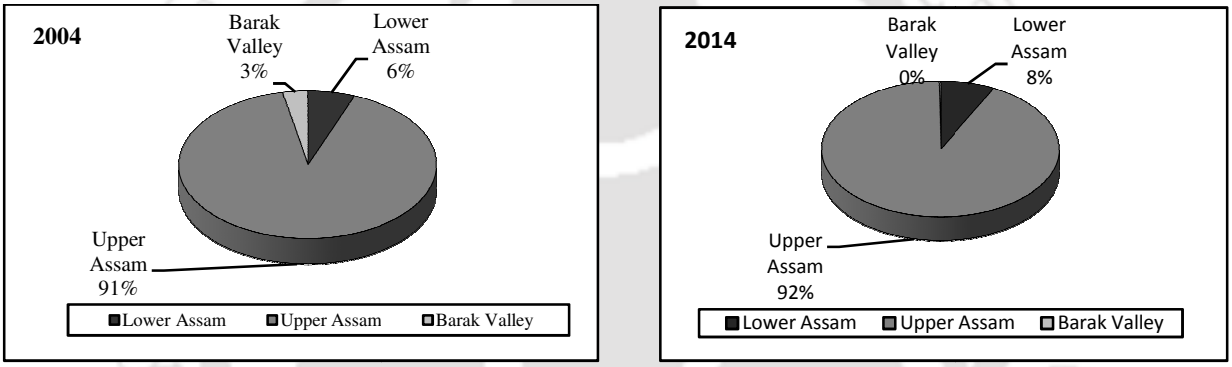
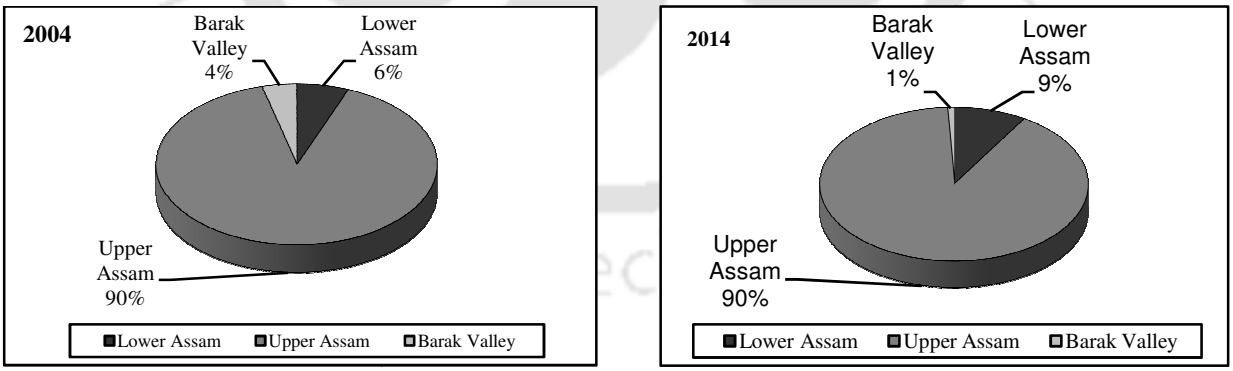


Figure 2.2: Comparison of Registered Area of STGs of Assam



For each of the three regions growth rate is assessed with the help of compound annual growth rate (CAGR) of number and area of registered STGs over the ten years from 2004 to 2014. The growth of the three regions is shown through bar diagrams in Figure 2.3 and Figure 2.4 respectively and it is observed that the compound growth rate of number of registered STGs in the lower Assam districts are comparatively more (56.50 per cent) than upper Assam (53.13 per cent) and Barak Valley (17.21 per cent) districts. In case of area also lower Assam districts show

a higher growth rate of 39.30 per cent than upper Assam districts with 34.08 per cent and Barak Valley districts with 14.69 per cent. In case of all the divisions it can be observed that the growth rate of numbers is more than the growth rate of area which shows that the number growth is more than the area growth. It also signifies that the size of the small tea growers is becoming smaller over the time. Growth rate of number as well as area of small tea growers is more in case of lower Assam districts.

Figure 2.3: Growth Rate of No. of STGs from 2004 to 2014

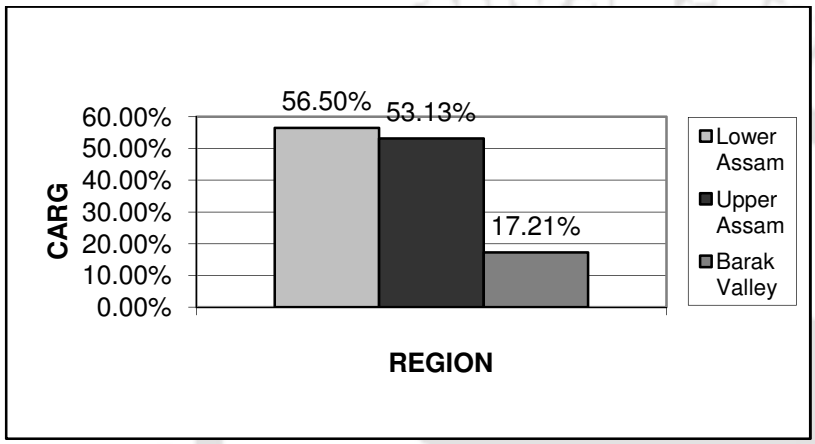
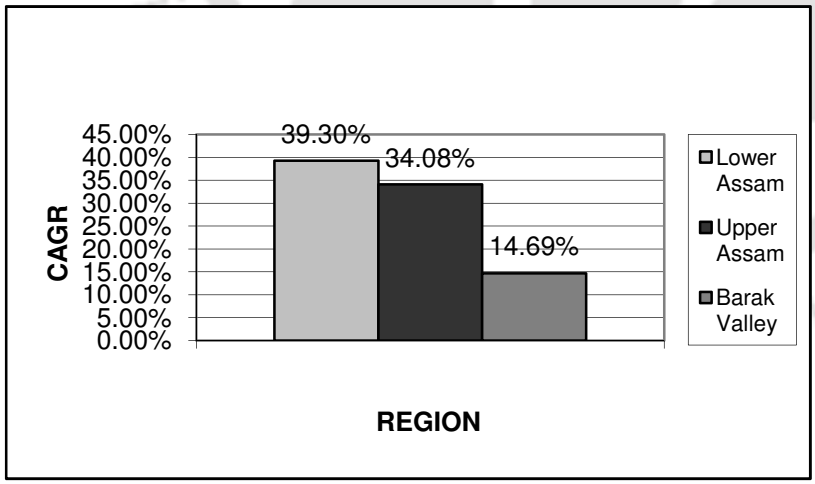


Figure 2.4: Growth Rate of Area of STGs from 2004 to 2014



But this is not the accurate picture of the tea small sector in Assam. As the Tea Board itself admits, there is no record of the actual number of small growers since most of them are registered as agriculturists and not as tea growers. If we compare the real growth of small tea holders (Registered + Non-Registered), the scenario will be different and the number of STGs would be approximately 90,000 (Hazarika and Borah, 2013). As per the Tea Board of India

statistics there are around 68,465 small tea gardens in Assam by the end of 2011 out of which only 4570 were registered with the TBI, which indicates nearly 7 per cent of the small tea growers in the State is registered. In the study of Bhuyan *et al.* (2004) it has been observed that majority of the small tea growers prefer to be registered themselves with AASTGA in comparison to STAP or TBI. Ganguli (2013) observed that registration with the Tea Board is important for identification of units and for compiling area, production and other data. It is also necessary for planning any programme for the benefit of the small tea growers. But there are wide variations in the statistics for total number of small tea growers and their area in Assam.

Neog (2010) has put forward the following data to explain the present condition of the small tea growers of Assam.

Table 2.9: Tea Statistics of Small Tea Growers of Assam

Year	No. of STGs	Area under Tea (in 1000 hectare)	Production of Tea (in 1000 tone)	Average yield per hectare (in kg)
1	2	3	4	5
2001	40,795	269	454	1686
2002	43,272	271	433	1601
2003	43,293	272	435	1601
2004	43,293	272	436	1603
2005	48,292	272 (E)	474 (E)	1743 (E)

Source: Tea Board of India, E: Estimated, Neog (2010)

Statistics of the Table 2.9 shows that the number of STGs and area under tea cultivation had been increasing from 2001 to 2005. Regarding the production and average yield of tea, an increase can be noticed during this period.

District-wise distribution of the small tea cultivators of Assam can be understood with the help of the following table prepared by Goswami (2013):

Table 2.10: District-Wise Number of Small Tea Cultivators in Assam

District	1993	2004	2010
Golaghat	64	8,450	11,287
Sivasagar	32	7,047	9,600
Dibrugarh	23	11,722	19,160
Jorhat	19	3,320	5,889
Tinsukia	18	13,612	18,595
Sonitpur	10	1,412	1,357
Darrang	3		6
Cachar	3		31
Karbi Anglong	2	380	241
Lakhimpur	1	448	482
Dhemaji	1		206
Nagaon		321	449
Udalguri		118	1,094
Kokrajhar		32	122
Bongaigaon		42	
Morigaon		20	
Dhurbi			4
Kamrup		25	
Total	**181**	**46,949**	**68,523**

Source: Goswami (2013)

Along with the increase in the number of small tea growers (Registered + Non-registered) and their area (Registered + Non-registered), there is a significant increase in the production of tea over the years. Table 2.11 shows the growing trend of tea production in Assam and the share of small tea cultivators in it.

As is evident from Table 2.11 the total production of tea in Assam has increased over the years and the contribution of the tea smallholdings is noteworthy. On the other hand, along with outsourcing of production of leaves there has been a falling trend in the production of tea leaves by the estate factories which may have paved the way for the tea smallholdings: the proportion of tea produced by small gardens has been rising. In the Table 1.6 of Chapter one it is already shown that the area of tea cultivation has increased over the years and a major portion is cultivated by the small tea growers.

Table 2.11: Production Growth of Tea Plantations of Assam: 1971-2016

Year	Total Production (in thousand kg)	Production by STGs (in thousand kg)
1971	224,653	
1981	305,130	
1991	396,604	
1995	402,617	
1996	423,900	
1997	425,146	
1998	432,925	24,718
1999	437,324	49,485
2000	449,219	
2001	453,587	
2002	433,327	
2003	434,759	55,285
2004	453,649	62,630
2005	487,487	
2006	502,041	99,511
2007	511,885	1,06,881
2008	487,497	
2009	499,990	
2010	480,280	
2011	508,740	
2012	590,120	
2013	629,050	
2014	610,970	144,254
2015	526,185	139,491
2016	642,180	

Source: Statistical Handbook of Assam, various years, Tea Board, Borah (2013), Das (2014), Hannan (2013), Barua (2015)

* Sources of production in figure are different. There could be inconsistency in their values.

Tea production has two components: yield rate and acreage. Total production of tea can be influenced by varying either of these two components. In the context of the present study an attempt has been taken to examine the growth performance in terms of trends in output, area and yield.

Since tea is a location specific crop, the area is more or less restricted to a few favourable agro-climatic zones and also there is dearth of land to expand production. Hence small tea growers are more dependent on improving yield than acreage. From Ganguli (2013), Hannan (2013), Borah (2013) we get some idea of how area, production and yield have been changing over the years.

From 1998 to 2007 production by small growers went by more than four times. There has been a rising trend in tea acreage, but it is erratic in case of the yield per hectare. In 2004, the yield in

the tea smallholdings of Assam was 1518.34 kg/ha, it reduced to 1332 kg/ha in 2005. It further reduced to 1237 kg/ha in 2006. This is significantly low by any standard of tea plantations. Data of recent years do not reveal an encouraging trend in expansion of productivity in the smallholdings of Assam. The reason for a low yield could be due to the fact that the new tea smallholdings were still at an immature stage to reap a harvest or the use of outdated cultivation techniques. According to Joseph *et al.* (2002) there is a positive correlation between the age of plantation and the yield. To him 21 to 30 years of age group appear to have a positive impact and 31 to 40 years age groups have negative impacts. He also mentioned that as the size of the holding increases productivity decreases. This is similar to the contention of A.K.Sen in the farm-size productivity debate A.K. Sen (Kapila, 2008).

Thus there is a remarkable expansion in the number of small tea gardens along with their area under cultivation, as well as the total production of tea. Below a table has been prepared regarding the production of green leaf of the nation as a whole.

Table 2.12: Growth of Green Leaf Production by STGs (in million kgs)

Year	Green Leaf Production in India (million kg)
2003	180.66
2004	218.41
2005	231.29
2007	257.46
2009	396.574
2013	629.05

Source: Borah (2013) & Hannan (2013)

The data shows that there has been a continuous increase in the green tea leaves production in the country as a whole, Assam is not an exception to this trend. The compound growth rate of the tea leaves over the ten years from 2003 to 2013 is 13.29 per cent. If the growth rate of tea leaves of the country is compared with the growth rate of Assam (Table 2.11), it is calculated to be 13.52 per cent. The compound growth rate of Assam from 1998 to 2013 is slightly more than the all India level during 2003-2013.

Table 2.13 shows the district-wise distribution of tea smallholdings, their area under cultivation, production of tea and its productivity and their percentage distribution.

Table 2.13: Distribution of tea small holdings in Assam: Area and Productivity (2010)

Districts	No. of small-holding	Distribution in %	Area in acres	Area in %	Total green leaf production/ kg	Production %	Productivity green leaf kg/ acre	Avg. productivity made tea kg/ha
1	2	3	4	5	6	7	8	9
Dibrugarh	19160	27.99	28189.98	23.49	129858815	32.75	4607	2537
Tinsukia	18595	27.16	33621.91	28.02	133998526	33.79	3985	2195
Golghat	11286	16.49	16581.59	13.82	35977270	9.07	2170	1195
Sibsagar	9590	14.01	16354.71	13.63	54305797	13.69	3320	1828
Jorhat	5889	8.60	6113.00	5.09	21689010	5.47	3548	1954
Sonitpur	1356	1.98	5446.19	4.54	6136532	1.55	1127	620
Udalguri	1093	1.60	6097.73	5.08	3173445	0.80	520	287
Lakhimpure	482	0.70	1924.38	1.60	1894066	0.48	984	542
Nagaon	449	0.66	2372.14	1.98	4667402	1.18	1968	1083
Karbi Anglong	241	0.35	1258.67	1.05	1680479	0.42	1335	735
Dhemaji	186	0.27	549.53	0.46	701621	0.18	1277	703
Kokrajhar	122	0.18	1465.25	1.22	2406554	0.61	1642	904
Darrang	6	0.01	9.10	0.01	58900	0.01	6473	3564
Dhubri	4	0.01	16.57	0.01	26000	0.01	1569	864
	68459		120000.75		396574417		3305	1820

Source: Das (2014)

Table 2.13 reveals that the average productivity of made tea by the smallholding sector was 1820 kg/hectare, whereas the total green leaf production is of 396.6 million kg which is equivalent to 88.1 million kg of made tea, considering 4.5 kg of tea leaf is required to make one kg of made tea (Das, 2014).

We have the data of the number of smallholdings of different districts of Assam (Column 2) and their productivity (Column 8). This shows that these two characteristics are positively related but degree of correlation is not high (0.37). Districts with higher productivity perhaps attracted more small tea growers.

The small tea growers depend largely on the bought leaf factories for sale of their produce. But in Assam the bought leaf factories are established in twelve districts of Tinsukia, Dibrugarh, Golaghat, Jorhat, Sivsagar, Cachar, Sonitpur, Karbi-Anglong, Nagaon, Udalguri, Hailakandi and Goalpara, whereas the small tea growers are scattered in all the districts. This shows a mismatch of production of green tea leaves and the processing factories to accommodate them. According to the Tea Board of India (2014), there are 229 registered bought leaf factories in Assam and out of which Tinsukia district has the highest number of bought leaf factories with total of 85, followed by Dibrugarh with 58 factories. Total annual capacity of bought leaf factories was 261

million kg against the production of 400 million kg of green leaf of small growers. Dhemaji, Lakhimpur, Darrang, Kokrajhar and Dhubri have no bought leaf factory (Table 1.8). However, as per Table 2.14 there is considerable increase in the number of bought leaf factories over the years and its contribution to total production. The number and quantity has risen steadily over the years to 213 bought leaf factories producing 140 million kg of tea in 2011. The major concentration of bought leaf tea factories are mainly in Dibrugarh, Golaghat, Jorhat, Sibsagar and Tinsukia. The growth of these factories over the years is shown in Table 2.15.

Table 2.14: Number and Production of Bought Leaf Factories in Assam (1998-2012)

Year	No. of BLFs in Assam	Growth rate of BLFs (in %)	Production by BLF (in Mn. Kg.)	Growth rate of Production by BLFs (in %)
1998	61		21.43	
1999	75	22.95	29.32	36.82
2000	105	40.00	38.76	32.20
2001	119	13.33	42.60	10.94
2002	139	16.81	53.40	24.19
2003	152	9.35	65.40	22.47
2004	163	7.24	77.65	18.73
2006	178	9.20		
2008	177	-0.56	94.45	
2009	220	24.29	130	37.64
2011	213	-3.18	140	7.69
2012	229	7.04		

Source: 2001-2004 Indian Tea Research, Hannan (2013), Das (2013, 2014), Hazarika & Borah (2013), Tea Board (2014)

Table: 2.15: District-wise Distributions of BLFs in 5 Major Districts of Assam

Sl. No.	Name of Districts	2000	2001	2005	2012
1	Dibrugarh	30	29	44	58
2	Golaghat	8	10	19	30
3	Jorhat	4	10	16	17
4	Sivasagar	14	15	16	22
5	Tinsukia	49	46	73	85
	Total	**105**	**110**	**168**	**212**

Source: Goswami (2006), Various Articles

The increasing number of bought leaf tea factories is also playing a major role to encourage the production of small tea growers for it guarantees processing of the output which is perishable in nature.

As mentioned by Borah and Das (2015) there are reasons for the growth of small tea cultivation in the form of technology, processing factory, skilled workers and market for promoting small tea cultivation. People are taking up tea cultivation because it provides sustainable income for a long period with comparatively less investment, use of unutilized or underutilized land gives long time employment opportunities, etc.

In the recent years, some big tea estates/planters have started to lose competitiveness due to - imbalance in demand and supply, old bushes, negligence in maintenance, quality degradation, lack of investment, high cost of production, increase in social costs like – health care, education, housing etc., failure to place tea in upper-end markets, labour unrest, inexperienced management, etc. (Kadavil, 2008). At the same time, increase in competition in the global market due to inclusion of many new producers in the list of tea producing countries, Indian tea industry lost its position substantially in the export market. Scarcity of labour is one of the major problems to the tea industry. Implementation of Government policies like NREGA and other employment generation and social security schemes has created acute shortage of labourer in the gardens as these schemes provide higher wages to the labourers compared to the tea garden wages (Kadavil, 2008).

A brief discussion on the factors affecting small-scale tea cultivation is given below.

2.4 Factors of Tea Cultivation in Small Gardens

The section is based on the research by scholars probing the various factors affecting the small tea cultivation.

Cost of Production: The cost of cultivation is divided as variable costs (cost of labour, material cost, land revenue, etc.) and fixed costs. The cost incurred by the small tea farms on labour and materials expenditure is considered as operational and maintenance cost to carry out day-to-day operations (variable cost). In the study of Bhuyan *et al.* (2004) the composition of operational and maintenance cost is found to be high in lower size groups (below 2 ha.) in comparison to higher size (2 ha – less than 10.12 ha). In his study it is revealed that among the various items of costs, labour is the dominating component accounting significantly largest share of 62.85 per cent of the total expenses, of which 42.64 per cent is the cost on hired labour and the remaining

is family labour. In the larger size groups, the percentage of hired labour increases while that of family labour declines gradually. The study of Bhuyan *et al.* (2004) indicated the fact that the operational and maintenance activities of small tea farms is not only costly, but highly labour intensive as well. Share of expenditure on labour cost shows an increasing trend with decrease in farm size while those of manures and fertilizers, plant protection chemicals and herbicides shows an increasing trend with increase in farm size.

Goswami *et al.* (2006) maintain that various expenses incurred in a small tea plantation are clustered into two broad heads of expenditure, i.e., 'Investment/Establishment Cost' and 'Operating and Maintenance Cost'. The expenditure incurred by growers for establishing tea plantation during the period from planting to first bearing stage is regarded as initial investment cost or establishment cost. As the small tea growers receive returns in the form of green leaves from the third year onwards, when tea bushes start producing, hence, the expenditure incurred by the growers during the first two years of their tea cultivation is considered as establishment cost (and after **five** years tea bushes attain maturity and give a steady production for about 40 years) (Goswami *et al.*, 2006). Fencing, agricultural implements, labour, manures and chemical fertilizers, planting material (tea), planting material (shade) and plant protection chemicals are the major items which constituted the establishment cost of tea. The establishment costs show that 30.9 per cent of the total cost is labour cost and 69.1 per cent consists of other costs. Planting material (tea seedlings) is the other dominating cost component. A major portion of the investment/establishment cost is incurred in the first year of planting followed by the second year. In the study the relative share of labour and agricultural implements showed an increasing trend with the decrease in farm size while that of planting materials (both tea seedlings and shade tree seedlings), manures and chemicals fertilizers and plant protection chemicals maintained an increasing trend with the increase in farm size. The cost incurred in small tea cultivation after the gestation period of planting upto the end of its economic life of 40 years is considered as operation and maintenance cost. The operation and maintenance cost is necessary for carrying out day to day operation of the small tea cultivation round the year. Labour, fertilizer, weedicide, plant protection chemical, fencing, drain repairing and agricultural implements are the major items constituting the operation and maintenance cost of small tea cultivation. These are the expenditures which are recurring in nature. Plucking of green leaf is a major operating cost. About 63 per cent of the total operating and maintenance cost is comprised

of labour cost and the proportional share of fertilizer (12.98 per cent), plant protection chemical (7.33 per cent), weedicide (3.89 per cent) and fencing (3.57 per cent) are relatively less.

Ganguli (2013) has also described the cost of production in terms of fixed costs and variable costs. Fixed costs are incurred only once during several years. Therefore only a percentage of the actual cost incurred on them is included in the cost of production of a particular year. It is observed from his study that the lowest percentage (0.12 per cent) of fixed cost is utilized in soil testing and highest percentage of fixed cost was incurred in land development (30.21 per cent). Among the variable costs more than 50 per cent is spent on labour wages. It is found that the proportion of variable and annual share of fixed cost to the total cost works out to 88.07 and 11.93 per cent respectively. Even though there is a significant contribution of the family labour in the small tea cultivation, but in the cost of tea cultivation the imputed value of family labour has not been included in his study.

In the words of Saikia *et al.* (1994) the cost of production is mainly influenced by the non-geographical factors. During 1989-92 the cost of production of tea has increased by 50 per cent but there was insignificant increase in the selling prices of tea. There is a gulf of difference between the auction price and the consumer price of tea. The middlemen account for a substantial absorption of the difference in price between that paid by the ultimate consumers and that realized by the producers.

According to Goswami *et al.* (2006) among the variable costs, wages and salaries account for more than 55 percent of the total costs. With the increase in the rate of wages in large tea estates, the rate of wages of small tea cultivation is also increasing almost at the same rate each year. However, the rate of wages paid to labourer is not uniform all over the State. It depends on demand and supply of labour and efficiency of labourer. In the study of five districts the rate of wages varied from Rs. 35 to Rs. 50 per day. The rate of increase of labour cost during last five years is around 30 percent, the study reported. Similarly, the prices of fertilizers, pesticides and other inputs like sprayer machines, baskets, small tools etc. increased fast. Higher transportation cost and temporary scarcity of fertilizers and pesticides lead to increase their prices. The increase in the cost of production is bound to occur due to inflationary trend of the economy. But reduction in price of the produce makes it difficult for small tea growers to meet the increasing cost of production. The labourers working in a small tea garden did not get the minimum wages fixed by the Government. They are also not entitled to the benefits under Plantation Labour Act.

A demand for higher rate of wages is likely to create more problems for small tea growers in the days to come according to the authors.

Composition of Labour: Tea is a labour intensive enterprise. It requires labour at every stage of its work right from clearance of jungle, making the land suitable for plantation, work for the nursery giving manure both in the nursery and in the plantation area, spraying of pesticides, drain cutting, path making, plucking, manufacturing and then finally dispatching it to different destinations. Hence labour is the heart and soul of tea plantation. But unfortunately as far as living conditions of the tea labours are concerned, things are not ideal as it should be in our country and especially in Assam. As described by Saikia *et al.* (1994), the tea tribes of Assam are among the backward and most exploited tribes in India. Low wages, poor housing and lack of avenues for social mobility have been a recurring theme since the inception of the plantation complex in North East India in the early 19th century. With the establishment of tea gardens in Assam, the tea companies were in great need of a huge labour force for the growth of tea industries, which they could not manage locally. This necessitated importation of labour from different parts of India. To establish plantations in Colonial Assam, land and capital - the two factors of production also presented some difficulty, but the mobilization of labour for the growth and development of the tea plantations was the most crucial problem. Firstly, as Assam was thinly populated, a substantial landless agricultural labour class and a large labour market were absent. Secondly, comparatively high wages demanded by local labourers was a problem which led to the search for a source of labour outside the province from hundreds of miles away. During the colonial period in respect of labour employment, Assam employed more than 52 per cent of the total labour employed in tea plantations of India. Thousands of labourers began to be imported from India's remote tracts. In 1928-29, out of the total adult labourers, only 9 per cent were indigenous (local labour) people of Assam, the remaining 91 per cent being migrants. In the teething period of development of tea plantations, migrant labourers were recruited under the indenture system. The percentage of indentured labourers to the total adult labourers was 46 in 1884, but decreased to 37 per cent in 1897 and to 8 per cent in 1915-16, whereas the percentage of local labourers was increasing over the years. One of the most important features of tea plantations is that it requires a large number of female and child labour. In 1987, the percentage of female and child labour to the total labour force was about 43 and 9 per cent respectively. An additional important characteristic of the tea plantations is that both the wages and salary system

are prevalent in the tea gardens. In simple term 'wage' means a daily rate of pay fixed for a labour and a 'salary' means monthly rate of pay. Both the systems are prevalent in the tea estates, but the payment for the wages of the labourers is made on weekly basis instead of daily payment. The two systems are prevalent in the tea estates for wage payment to labourers, i.e., (1) time rate system and (2) piece rate system. The vast majority of the labour force in the tea gardens is employed on the piece rate system on the plucking system and time rate system on the rest of the year. Similar trend can even be seen in case of hired labour in small tea gardens.

Bhuyan *et al.* (2004) conducted a survey in the five major tea growing districts of Assam, *viz*., Tinsukia, Dibrugarh, Sibsagar, Jorhat and Golaghat which constitute 89.44 per cent of the total number of small tea growers of the State. The distribution of small tea growers in these districts are given in the following table.

Table 2.16: District-wise Distribution of sample based on Registered STGs with Small Tea Growers' Advisory Programme, 2000

Sl. No.	District	Total STGs	Sample Size
1	Tinsukia	1118 (13.91)	56
2	Dibrugarh	2663 (33.13)	133
3	Sibsagar	1192 (14.83)	60
4	Jorhat	1271 (15.81)	64
5	Golaghat	945 (11.76)	47
	Total	7189 (89.44)	360
	State Total	8038 (100.00)	

Source: Bhuyan *et al.* (2004)

They observed that the composition of labour force on any individual farm varies according to the type, size and location of the farm. The labour utilization in various size groups has been explained in terms of season wise utilization, per ha utilization and per farm utilization. Utilization of labour, in terms of family labour and hired labour (regular and casual) has been worked out separately. According to the survey 32.15 per cent of the total labour force is comprised of family labour, of which 78.27 per cent was male family labour and 21.73 per cent was female family labour. On the other hand, only 15.14 per cent of the total labour force was regular hired labour, of which 44.03 per cent were male and 55.97 per cent were female labour. 52.71 per cent of the labour force was casual hired labour, of which 44.73 per cent were male and 55.27 per cent were female. Like many others they mentioned that as the size of small tea farms increases, the contribution of family labour declines. They found there is no contribution of female family labour in the larger farms.

The operation-wise composition of labour utilization shows that 61.65 per cent of the labour is utilized in plucking, 17.33 per cent in weed control, 8.41 per cent in pruning, 2.75 per cent in plant protection, 2.68 per cent in manuing, 2.38 per cent in drainage, 2.25 per cent in fencing work, 2.08 per cent in shade maintenance and 0.47 per cent in other works. The utilization of female pluckers increases with increase in farm size (Bhuyan *et al.,* 2004).

Kadavil (2008) also noted that the majority of the workers in tea gardens in Assam are from tribal communities and other marginalized communities.

Infrastructure: The cultivation and management of tea is considered to be one of the most organized agricultural sectors. The tea plantation industry of North East India has developed over a century and a half to become one of the most organized business sectors of the region. According to Bordoloi *et al*. (2012) the infrastructure needed for starting a small tea growing enterprise already existed in upper Assam owing to the fact that the tea industry in this region is now over 150 years old. The small tea growers thus only had to grow tea and the post-harvest movement of the produce (green leaf) followed in a relatively smooth organized manner. The management of commercial tea estates has since the early fifties of the last century, procured inputs from various input dealers scattered in the urban and sub-urban areas of upper Assam. Timely availability of inputs plays a vital role in any kind of agricultural production. Inputs for tea cultivation area are readily available in most tea farmer's localities. For the success of any commercial crop, plant protection is one of the most important aspects. Up till now tea has mostly been grown by the farmers as a monoculture as a result of which a number of insect, pests and disease affect the crop. However, owing to the presence of agro-chemical retail outlets in the proximity of these tea farmers, most of the pesticides and implements required for management of these pests are readily available. The availability of technical know-how and timely availability of plant protection agrochemicals helps in easy detection of pests and their management.

The Small Tea Growers Advisory Programme in the Assam Agricultural University, funded by the Tea Board, impart training and provide technical inputs free of cost (Karmakar and Banerjee, 2005). The Tea Board has recently sanctioned another Small Tea Advisory Cell at Tocklai Experimental Station for the benefit of small tea growers. Further, small tea growers have informal access of information from the big gardens.

Goswami *et al.* (2006) observed that majority of the small tea gardens are located in remote villages and the condition of the roads leading to rural areas is very bad and the situation becomes grave during the days of heavy shower and flood. If the green leaf carrying vehicle (truck) of the trader (middleman/agent) fails to come for any reason, the small tea growers are sure to suffer losses. Because, from a remote place with poor road conditions is not possible to make an alternative arrangement to deliver green leaves to the factory. Moreover, many small tea growers do not know where their green leaves are delivered by the agents for processing.

According to Ganguli (2013) the infrastructural facilities, like cooperative factories, strong Government supported marketing system, tea nurseries, training institutions, very powerful tea growers' lobby operating in South India and more importantly, the positive attitude of the Central and State Governments has clearly put these growers in a more advantageous position than the small tea growers of Assam. As the small tea holdings of Assam are located in remote areas, mostly they face extremely poor road conditions. For a major part of the season, the roads remain incommunicable.

Marketing Green Tea Leaves: As the small tea growers are the mere sellers of green leaves, they sell their produce to the buyers i.e. intermediaries such as agents, bought leaf factories and factory owning large gardens at low prices (Ganguli, 2013).

Bhuyan *el al.* (2004) mentioned that the marketing channels of the small tea growers are – (i) directly to factory, (ii) through commission agents to factory and (iii) through sub agents to commission agents to factory. From their study it is clear that a major portion (48.89 per cent) of the green leaves are marketed through the commission agents to factory. Only 18.89 per cent of the small tea growers transacted their green leaves directly to the factory.

According to Goswami *et al.* (2006) agents exploit the small growers by not paying proper price for their produce by citing low quality of tea leaves due to loss of moisture in summer season and extra rain water during rainy season. As a step to solve this problem of marketing some small tea growers have made an effort to eliminate the agents by forming Self Help Groups who deliver their produce directly to the manufacturers by arranging transport vehicles. But because of location of gardens at remote places and lack of unity among the growers, the growth of

SHGs was found to be very slow. The role of traders and agents is still the most prominent in this regard.

Borah (2016) found that all the small tea growers sell their green leaf either to nearby big gardens or to bought leaf factories. They face problems in selling green leaf at reasonable price. The factory owners buy on 'first come first served' basis or at competitive price and growers had to be at the receiving end. The reasons identified are lack of tea processing factory, competition from other big gardens/growers selling green leaf through agents, poor support from Government etc. As far the Government support in marketing is concerned small tea growers have not received any marketing support from the Government.

Price: Price received by any sector for their product is definitely one of the factors governing the profitability and survival of that sector. In case of price of green leaves it is generally fixed by the BLFs and factory owning large gardens taking the demand factor into consideration. Agents too play an important role in fixing the price of green leaves.

Goswami *et al.* (2006) reported that since the year 1999, the small tea growers of Assam are suffering from fall in price of green leaf. The profitability of small tea growers of Assam is much reduced due to fall in price during these years.

The average price realized by small tea growers in different years are shown in Table 2.17. From the schedule it cannot be clearly commented about the trend of price over the years. The price of green leaf is going up and down in different districts of Assam over the period.

Table 2.17: Average Green Leaf Price in Different Districts of Assam (in Rs./Kg)

District	1996	1997	1998	1999	2000	2001	2002	2003	C.V.
Tinsukia	6.5	7.2	10.15	10.75	8.0	6.8	6.7	6.7	0.1999
Dibrugarh	7.0	7.25	10.25	11.5	7.1	6.9	6.9	6.7	0.2021
Sibsagar	7.0	7.25	10.5	11.0	7.25	7.0	7.0	7.1	0.1982
Jorhat	6.5	7.15	10.7	12.0	8.0	7.75	7.5	7.35	0.2150
Golaghat	7.0	7.65	11.4	12.0	8.25	8.10	8.00	7.75	0.1937
Nagaon	7.1	7.85	10.5	11.5	10.1	9.5	9.1	9.3	0.1407
Lakhimpur	7.15	8.0	11.5	12.1	10.5	10.0	9.5	9.35	0.1589
State Average	6.79	7.5	10.71	11.61	8.46	8.1	7.81	7.75	0.1823

Source: Small Tea Growers' Advisory Programme, AAU

The coefficient of variation (CV) in Table 2.17 is calculated to check the oscillation in the average prices of tea leaves of different districts of Assam over the period of eight years. Higher

the coefficient of variation, higher is the fluctuation and vice versa. From our estimates a comparative low level of variation can be noticed in case of Nagaon district, whereas Jorhat district shows a comparative high degree of variation in the prices of tea leaves over the years.

In the study of Goswami *et al.* (2006) it was found that the un-remunerative price of green leaf was a problem faced by almost all the growers. Green leaf price received by small tea growers is only slightly higher than cost of production of green leaf. According to the authors this slender margin of profit is not enough for the growth of the small tea cultivation. On the basis of the pilot study in the Tinsukia district they commented on the changing pattern of the average price of green leaves and the wage rate of tea workers working in small tea plantations from 1978 to 2004. From Table 2.18 it is revealed that in Tinsukia district the price of green leaf was steadily increasing from 1978 to 1999 and from 2000 onwards, the price was falling steadily till 2003. A comparison of green leaf price and wage rate of the years 1999 and 2003 shows that average wage rate is increased by 27.6 percent and on the contrary, green leaf price is decreased by 33.25 percent. This is one great source of decline of profits of small tea growers.

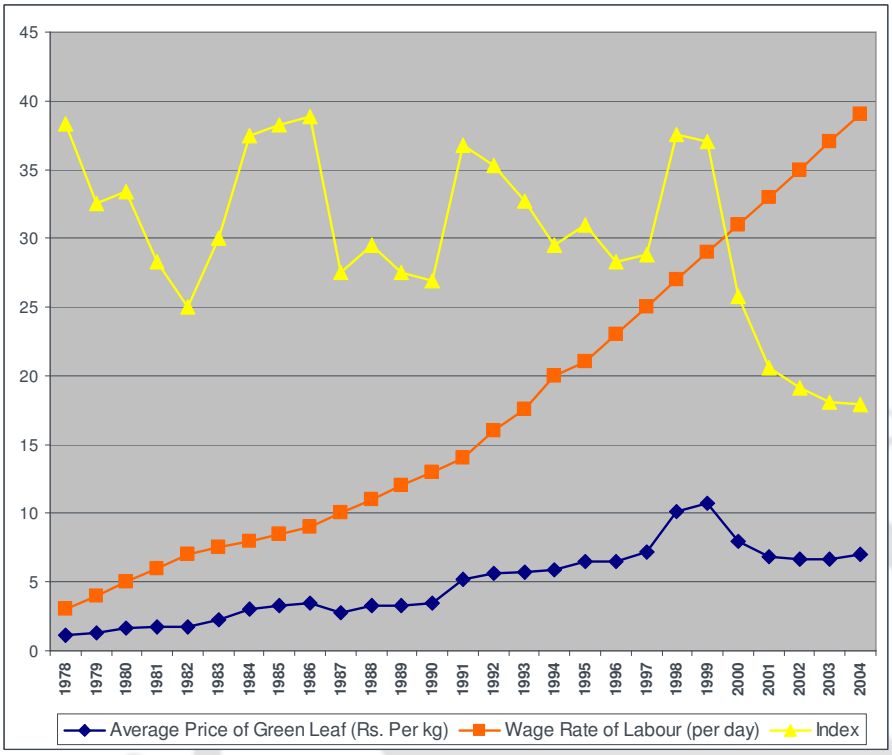
An index in column 4 of Table 2.18 is calculated by dividing average price of green leaves by wage rate of labourers. The index is prepared to understand how much in a relative sense the small tea growers are getting affected when the input cost (wage rate of the labours) is changed in terms of output price (average price of green tea leaves). A decreasing trend of the index indicates the increasing cost of cultivation in comparison to revenue received. Even though the index is erratic in nature, but it shows a severe fall after 1998 which indicates that the small tea growers are adversely affected by the unremunerative price received by them.

Table 2.18: Green Leaf Price and Wage Rate in Tinsukia District

	Avg Price of Green Leaf (Rs. Per kg)	Wage Rate of Labour (per day)	**Index {(2) ÷ (3)} × 100**
(1)	(2)	(3)	(4)
1978	1.15	3	38.33
1979	1.3	4	32.5
1980	1.67	5	33.4
1981	1.7	6	28.33
1982	1.75	7	25
1983	2.25	7.5	30
1984	3	8	37.5
1985	3.25	8.5	38.24
1986	3.5	9	38.89
1987	2.75	10	27.5
1988	3.25	11	29.55
1989	3.3	12	27.5
1990	3.5	13	26.92
1991	5.15	14	36.79
1992	5.65	16	35.31
1993	5.75	17.6	32.67
1994	5.9	20	29.5
1995	6.5	21	30.95
1996	6.5	23	28.26
1997	7.2	25	28.8
1998	10.15	27	37.59
1999	10.75	29	37.07
2000	8	31	25.81
2001	6.8	33	20.61
2002	6.7	35	19.14
2003	6.7	37	18.11
2004	7	39	17.95

Source: Pilot Study conducted in Tinsukia District by Goswami (2006)

Figure 2.5: Green Leaf Price and Wage Rate in Tinsukia District



The low price of green tea leaves received by growers has led to serious problems of law and order in the past. In the first fortnight in August 2000 a few large tea estates of Hindustan Lever Limited in Tinsukia district suddenly refused to purchase green leaf from small tea growers (Goswami *et al.*, 2006). As a result, several trucks loads of green leaf were destroyed in protest. This unexpected move of buyers had agitated small tea growers and caused much resentment. Small tea growers had taken the path of agitation like National Highway Blockade, *Dharna* at the State Capital etc. The effect of fall in price of green leaf spread to all other places of Assam very soon. Later on, the large tea estates started buying green leaf at a price lower than the price expected by the growers.This move was also followed by the bought leaf factories. Thus green leaf price had come down by even 50 percent or more. It halted the pace of growth of small tea cultivation in the entire State. The main reason behind this fall in green leaf price was fall in price of made tea in the auction market. The Government had no control over the price of made tea or green leaf.

Minimum wage is essentially the basic subsistence wage below it ought not to fall. In Assam wage determination is left to collective bargaining mechanism in a tripartite forum. Representatives of planters, representatives of workers' union and Government representatives sit together through a series of negotiations to determine daily wage in an industry wise manner

for a specified period. Even in such an environment the bargaining power is overwhelmingly in favour of employers and the workers' representatives have comparatively less bargaining power. The prevailing average daily wages in the tea plantations of Assam is Rs. 170 only, whereas prescribed minimum wages for even unskilled agricultural workers for the year 2017 is Rs. 341. Tea plucking which involves at least some amount of skill and hence should be treated at least in the semi-skilled category and for the semi-skilled agricultural activities the prevailing prescribed minimum wage is Rs. 373 (Government of India, Ministry of Labour and Employment, 2017). Thus plantation workers of Assam are getting not even half of minimum wage prescribed for them in similar kind of work. But there are few non-statutory benefits offered to plantation workers in Assam apart from the statutory benefits as per the Plantation Labour Act which are universally applicable throughout India. However, even if one adds the monetary equivalent of such welfare provisions, wages as received by plantations workers stand significantly below that of wages in similar employment category. The daily rate of wages for tea plantation workers in Assam is significantly low, not even 50 per cent of the wages that prevail in the tea plantations of Southern States which is shown in Table 2.19. In 2012 the nominal wage in Assam was only Rs. 84 per day, which in 2014 it was determined to be Rs. 94 per day (Sarkar, 2015).

Table 2.19: Daily Wage Rate in Major Tea Producing States 2014

Name of the State	Daily Rate of Wages (in Rs.)
Assam	94
West Bengal	95
Tamil Nadu	209.27
Kerala	216.53
Karnataka	228.35

Source: Sarkar (2015)

In the words of Das (2013) in the new plantations of tea smallholdings productivity was high and the supply of green tea leaves has increased more at the processing market compared to the capacity to process it. This has resulted fall in the price of tea leaves. From the time series data plotted in Figure 2.5 we find that the average price of tea leaves has increased over the period 1978 to 2004. However, we also find that average price of tea leaves compared to wage rate of labourers has fallen over the same period. So in a relative sense the profitability of small tea growers may have been adversely affected.

Growers have also reported high oscillation of the prices of leaves supplied to the factories. This is shown in Table 2.20 (Baruah, 2015).

Table 2.20: Average Price of Green Leaves (2009-2013)

Year	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	CV
2009	15.5	15.8	15.8	18.3	13.8	12.8	12.3	13.8	14.1	14.1	11.4
2010	15.8	15.8	15.8	15.8	16.3	16.3	14.8	14.8	14.8	14.8	3.9
2011	18.4	18.8	18.8	18.8	6.0	14.3	12.0	11.5	10.8	10.8	30.5
2012	17.8	18.5	19.8	21.8	19.8	18.8	17.8	16.8	16.8	16.8	8.9
2013	18.8	18.5	22.8	19.8	15.3	15.3	15.3	14.5	14.0	14.0	0.2

Source: Baruah (2015)

Table 2.21: Statistical Analysis of Table 2.20

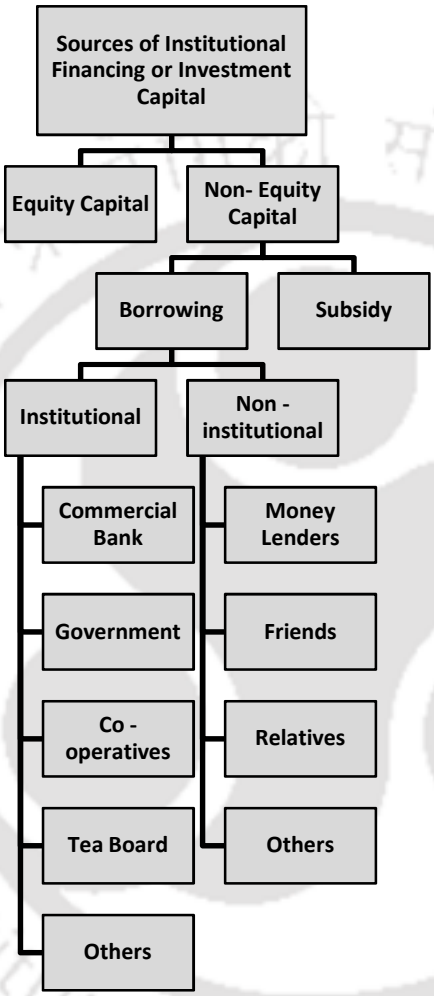
Variable	Observations	Mean	SD	CV
March	5	17.26	1.51592	0.09
April	5	17.48	1.53851	0.09
May	5	18.60	2.94958	0.16
June	5	18.90	2.19089	0.12
July	5	14.24	5.10813	0.36
August	5	15.50	2.25776	0.15
September	5	14.44	2.38181	0.16
October	5	14.28	1.91233	0.13
November	5	14.10	2.16102	0.15
December	5	14.10	2.16102	0.15

The coefficient of variation (CV) of prices in Table 2.20 is calculated to check the oscillation in the prices of the green leaves of different years. Higher the coefficient of variation, higher is the fluctuation and vice versa. From the figures in the table it can be reported that there is no regular trend of their variation. There is a significant fall in the variation of the prices from 11.4 in 2009 to 3.9 in 2010. But a major rise can be noticed to 30.5 in 2011. The next two years have shown a decreasing trend of the price fluctuation.

On the other hand, if month-wise fluctuation is checked highest mean (18.9) can be observed in the month of June and lowest (14.1) in the month of November and December, which indicates that the small growers receive a comparative good price in the month of June whereas a low price is received in the months of November and December. From the studies it is also clear that after the flush small tea growers receive a good price whereas at the end of the session price received is very low. The coefficient of variation (CV) in Table 2.21 shows that the highest amount of price fluctuation can be noticed in the month of July and March and April show the lowest price fluctuation.

Finance: Small tea growers who are basically the seasonal crop farmers with very little savings cannot afford to go for tea cultivation without recourse to borrowing. Bhuyan *et al.* (1993) analyzed the sources of investment financing in the following way.

Figure 2.6: Sources of Institutional Financing



The authors mentioned that the producers can raise their investment capital both from equity capital and non-equity capital of both institutional as well as non-institutional sources. Capital raised from own source has been termed as equity capital while capital raised from sources other than own source is called non-equity capital. It is found from their study that own fund, friends and relatives, money-lenders, commercial bank and the Tea Board are the main sources of investment capital for small tea growers. According to them about 64 per cent of their investment capital came from own fund (equity source), 33.43 per cent from non-institutional sources of friends and relatives (23.54 per cent) and moneylenders (9.89 per cent) and only 2.99 per cent from institutional sources of Tea Board (2.22 per cent) and commercial bank (0.71 per

cent only). Thus the equity capital remained as the dominant source of investment capital of the small tea growers, but the importance of non-equity capital is also significant as about one third of the total investment capital came from this source and that too also mainly from non-institutional sources.

Tewari, Amrit and Hiraizumi (2004) emphasized the importance of credit as tea cultivation requires long-term loan due to its long gestation period (5 to 7 years depending on the type). The money needed to grow tea is substantially large compared to other crops due to long gap between investment and the beginning of the cash flow. The first few years consists of expenses only. Private commercial banks are reluctant to finance tea cultivation due to many factors such as long gestation period, market instability, no presence of bank branches in rural areas and higher overhead costs. On the other hand, informal credit is not used due to rigid terms of payment, shorter credit duration, and high interest rates (about three times the formal interest rate). In many instances it is noticed that a majority of small tea growers are not fully aware of the credit facilities available for tea developments. According to the authors the ability of the smallholders to enter and expand tea cultivation is highly correlated to availability of credit. Its role and effect on the growth of smallholders is very significant and positive.

In the words of Goswami *et al.* (2006) cultivation of tea is not treated as agriculture. It comes under the Ministry of Commerce and controlled by the Tea Board of India. Therefore, a small tea grower fails to get any facility provided by the State Agriculture Department. At the same time, small tea cultivation is not considered small scale industry as no processing is done by the small tea growers. So it is neither agricultural activity nor an industry in official parlance. It does not qualify for assistance either from Agriculture or Industry Department.

To get any loan or financial assistance, small tea cultivation must be registered with the Tea Board. But, a large number of small tea growers do not have proper ownership title of the land (periodic *patta*) for which they could not register their plantation with the Tea Board of India. As a result they are not entitled to get institutional finance or assistance. When enquired with bank officials in this regard, it is revealed that the recovery of loans advanced to small tea growers is not encouraging. Many beneficiaries have failed to repay the loans provided to them by commercial banks at the initiative of the State Government. As a result the genuinely interested entrepreneurs of small tea sector are finding it difficult to get a loan sanctioned by any financial institution. In the absence of institutional finance, small tea growers have started their plantation

with whatever fund they could manage from parents, friends and relatives and from private money lenders at a very high rate of interest.

This low dependence on institutional borrowing depicts that the STGs are like other small farmers who depend little on institutional borrowings. There are wide variations in the availability of institutional credit per hectare of grossed cropped area in different States during 2001-02. It was as high as Rs. 9,403 in Tamil Nadu and Rs. 7,666 in Kerala, while it was as low as Rs. 311 in Assam. In fact, the banking system is still hesitant on various grounds to purvey credit to small and marginal farmers especially in Assam. Less availability of credit influences adversely the adoption of modern technology and private capital investments, which in turn lowers the productive capacity of the agricultural sector and results in lower productivity and production, and also pushes the farmers to borrow from non-institutional sources (Devaraja, 2011).

Ganguli (2013) also notes that the facilities usually made available by the Tea Board and financial institutions to big growers are not available to the small growers since the annual *patta* land on which the tea cultivation is carried on by the small growers are not eligible for institutional finance. Thus the small growers are compelled to find other alternative finance. There are instances where at the beginning of the plucking season, some bought leaf factories and agents offer money in advance to the small growers on the basis of their last year's production of green leaves. Small tea growers can also avail finance for starting tea cultivation from Prime Minister Rojgar Yojana but not without periodic *patta* of land. The District Rural Development Agency (DRDA) also provides loan for setting up tea nurseries. But in reality in spite of the existence of all these schemes, the small growers have failed to get the benefits from them. The clumsiness of the bureaucratic procedure involved in the sanctioning of loans often become too tedious and time-consuming for the small growers leading to frustration and general discouragement. The small growers therefore prefer to arrange their own finance through other means. Thus they prefer to get advance from bought leaf factories and agents.

In summary, the nature of small tea sectors can be considered as informal/unorganized. Along with increase in their number, the area as well as the yield of small tea growers has also increased over the years in Assam. However there are severe challenges that small tea growers face. Like all other small farmers they are cut off from institutional credits. Many don't have land deeds. The fact that they are located in Assam, a relatively backward region with low

banking penetration, only compounded the difficulty. Due to proliferation of small growers in a short time span there is intense competition in the market to sell leaves, depressing the price. The factories, BLFs which process this perishable good are few in number. Agents often pay unremunerative prices. There is dearth of infrastructure. Organisaitons or unions of growers are few and ineffective.

Chapter III

ESTIMATING EXPLOITATION AND PRODUCTION FUNCTION: THEORETICAL AND EMPIRICAL PRELIMINARIES

In this chapter we turn to the theoretical discussion of estimating exploitation of small tea garden owners by buyers of tea leaves. We also discuss the estimation of production function of small-scale tea gardens. Both of these are part of our research objectives.

3.1 Market Structure of STGs:

From the discussions so far we see that the buyers who buy tea leaves from the small tea growers are few in number compared to the number of small tea growers. From this one can infer that the market for small tea growers is monopsonistic in nature. Monopsony refers to a market where a single buyer confronted with many sellers. In case of our study there are few buyers, it is not that there is absolutely a single buyer. The market here can be considered as monopsonistic, it is very close to monopsony market, not exactly monopsony. Monopsony market comes into existence in an area where various organizations of same kind form collusion to purchase a single product from the set of sellers. In case of green tea leaves produced by small tea growers, they have a single buyer or a few buyers, i.e., the tea manufacturing units (estate factories and specially bought leaf tea factories). If the small tea growers do not sell their produce to the bought leaf tea factories/estate factories, there are not many alternatives. Thus in this case the bought leaf tea factories play the role of monopsonist as they are the sole purchasers of the tea leaves and the small tea growers are large in number. If sellers are unorganized and whose geographical mobility is very much limited it induces monopsony. Small tea growers are unorganized and non-unionized and tea is a location specific crop. Their geographical mobility is also very much limited, they have limited options of where to sell their product because of costly transportation and long distances between processing centers. Monopsony market situation prevails when a big employer buys proportionately a very large number of a certain type of product so that he is in a position to influence the price, or it may prevail when various big organizations have an understanding not to compete. As the monopsonists have buying power in the market, they are the price-makers and the small tea growers are price-takers. This buying power implies that a

monopsonist can exploit the suppliers to negotiate lower prices. In effect this reduced cost of purchasing inputs (tea leaves in our case) increases monopsonists' profit margins. The monopsonists may gather under the single-representative-firm where small and identical producers of raw materials are precluded from affecting raw material price.

In the labour market, the presence of monopsony causes a lower rate of wages than what the workers ordinarily deserve. In the same way in the product market, the presence of monopsony causes a lower price than what the sellers are entitled to receive. Such a situation results in exploitation in the form of paying lower price to the growers than what they should receive. In real world, even though monopsony is very rare in the product market but it may exist in certain input markets, especially the labour market, or even product markets at times. Small tea growers' tea leaf market appears to be one such market.

The monopsonist may use his power in any manner in order to realize maximum profit. The monopsonist is said to be in equilibrium when he earns maximum profits. As per the marginalist rule profits are maximized where MR = MC. That is, the monopsonist will buy the quantity of green tea leaves that equates its marginal cost with marginal revenue. Below we discuss the monopsonist farm's equilibrium conditions.

(a) Firm's Equilibrium when there is Monopsony in the Product Market:

Since a monopsonist is a price-maker with extensive market control, it faces a positively-sloped supply curve for the good it is purchasing, and it can set the price of the good. A monopsonist cannot purchase an unlimited amount of the good at a uniform price, since to sell a large quantity, a higher price would be generally charged by the sellers. In the 1990s the high price of tea attracted a large number of small growers to initiate tea cultivation. At a higher price more small tea growers were attracted to produce and supply more green tea leaves. Accordingly, the supply curve of the small tea growers can be assumed to be upward sloping due to positive relationship between price of the tea leaves and its supply. From the point of view of the monopsonist, the supply curve of the tea leaves or average factor cost (AFC) curve which illustrates the price charged by sellers will be rising upward from the left to the right. As the AFC curve will be rising, MFC or Marginal Factor Cost curve will be above it, MFC here indicates the change in total cost due to purchase of additional units of inputs (green tea leaves)

by the bought leaf tea factories or estate factories. Upward rising average and marginal factor cost of the monopsonist implies that higher price is needed to attract additional small tea growers to supply their tea leaves.

To purchase one more unit of a product, the buyer must compare the marginal benefits of the product against its additional cost. The buyer continues to buy more units of the product as long as the marginal revenue product (MRP) exceeds the marginal expenditure. Marginal Revenue Product (MRP) is the increment in the total revenue of the firm by employing an additional unit of the factor under consideration. In this case, MRP is the increment in the total revenue of the bought leaf tea factories by purchasing an additional unit of the factor input (i.e., green tea leaf). Marginal revenue product is the marginal physical product of the factor multiplied by the marginal revenue. Thus, MRP = MPP × MR.

Even though the monopsonist is the sole purchaser of the product but he may sell his product either in the perfectly competitive market or in imperfect competition. Under the condition of perfect competition, price of the commodity remains same irrespective of the units sold, and hence P (Price) = MR, and consequently MRP = MPP × P. This can be derived as follows:

$$MRP = \frac{dTR}{dG}$$

$$= \frac{d(p \times q)}{dG}$$

$$= \mathrm{p}\,\frac{dq}{dG}$$

$$\therefore MRP = \mathrm{p} \times MPP$$

Where G = Green tea leaves (Output of STGs and inputs of BLFs);

p = Price of made tea;

MPP = Marginal Physical Product;

q = Quantity of made tea

Under such a situation price of the product remains same whatever the level of its output. As more units of input is employed, total output will increase but at a diminishing rate. Thus MPP, the marginal physical product declines due to the operation of law of diminishing marginal productivity. Since MRP = MPP × P, where MPP is declining and P is constant, hence MRP will be downward sloping.

On the other hand, if there is imperfect competition in the product market, there will be an inverse relationship between price of the product and its quantity sold. And consequently, price will be higher than marginal revenue and the price line will be downward sloping. In other words, as the firm increases its output by employing more units of inputs, the price of the product declines and consequently the price line is downward sloping and MR curve will lie below it. In other words, MR will be less than price of the output. Since MRP = MPP × MR, and since MPP as well as MR both are declining, hence, MRP is also declining. This can be derived as

$$\text{MRP} = \frac{d(p \times q)}{dG}$$

$$= \frac{d(p \times q)}{dq} \times \frac{dq}{dG}$$

= MR × MP of tea leaves

= MR × MPP

Here also like before MRP will go on falling as more inputs are employed and more output is produced. This is because MR and MPP are both declining.

The monopsonist or the single buyer continues to purchase inputs as long as value of marginal product (MRP) exceeds marginal expenditure or marginal factor cost (MFC). Equilibrium is attained when they are equal and the slope of the latter is higher. This is demonstrated in the next section.

(b) Mathematical Representation:

Profit is the excess of total revenue over the total cost of production. In the case of monopsony, as the output (made tea) increases total cost also increases along with the increase in the purchase of inputs (green tea leaves). On the other hand, total revenue is the product of price and output, where output is the function of inputs. Hence the total costs of production (TC) as well as the total revenue (TR) are functions of inputs (green tea leaves). The production function is given as follows (we ignore the other inputs of made tea here as they are not relevant here).

$$q = F(G) \qquad \text{…….. (3.1)}$$

Here q and G are quantity of made tea produced and amount of green tea leaves used to produce it.

And the total revenue (TR) is the product of the price and its output. Therefore,

$$TR(G) = pq = pF(G) \quad \ldots\ldots\ldots\ldots (3.2)$$

Therefore the marginal revenue product (MRP) function of the monopsonist will be given by (under the assumption of competitive made tea market):

$$\frac{d\,[TR(G)]}{dG} = \frac{d[pF(G)]}{dG}$$

$$MRP = pF'(G) \quad \ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

Where p = Price of made tea;

F′(G) = Marginal Product of tea leaves;

∴ MRP = Price × Marginal Product of Tea Leaves

This is under the assumption that the monopsonist sells made tea in a perfectly competitive market where price (p) of made tea is assumed to be constant. Under the assumption that marginal product of tea leaves is declining, due to the law of diminishing marginal product, it can be inferred that marginal product of tea leaves will be a downward sloping line and therefore MRP is also a downward sloping line.

On the other hand, if the monopsonist sells made tea in monopolistic market then,

$$MRP = \frac{d(p \times q)}{dG}$$

$$= \frac{d(p \times q)}{dq} \times \frac{dq}{dG}$$

= MR × Marginal Product of tea leaves

On the cost side, the cost function is given by the following (once again we are abstracting away from the other costs of production).

$$TC(G) = rG \quad \ldots\ldots\ldots\ldots\ldots\ldots (3.4)$$

where r = Price paid for green tea leaves (G);

G = Tea leaves i.e., output of STGs and inputs of BLFs.

However price of green tea leaves (r) is an increasing function of the amount of tea leaves used. Therefore,

$$r = r(G) \qquad \text{…….……..} \quad (3.5)$$

where dr/dG>0. Consequently the marginal factor cost is the rate of change of its cost with respect to quantity of tea leaves used. Thus the MFC function of the monopsonist will be:

$$\frac{dTC(G)}{dG} = \frac{d[r(G)G]}{dG} \qquad \text{[Equations (3.4) and (3.5)]}$$

$$MFC = r(G) + Gr'(G)$$

$$MFC = r + Gr'(G) \qquad \text{……..…..} \quad (3.6)$$

Since r´(G)>0, the marginal factor cost of green tea leaves exceeds its price for G>0.

The monopsonist's profit can be expressed as a function of the amount of tea leaves which she purchases as follows. Thus

Total Profit: $\pi(G) = TR(G) - TC(G)$

or, $\pi(G) = pF(G) - r(G)G \qquad \text{……..} \quad (3.7)$

The first-order condition for profit maximization requires that tea leaves of the small tea growers should be purchased upto a point at which the value of marginal revenue product of bought leaf tea manufacturing units equals their marginal factor cost.

Setting the derivative of (3.7) with respect to G equal to zero,

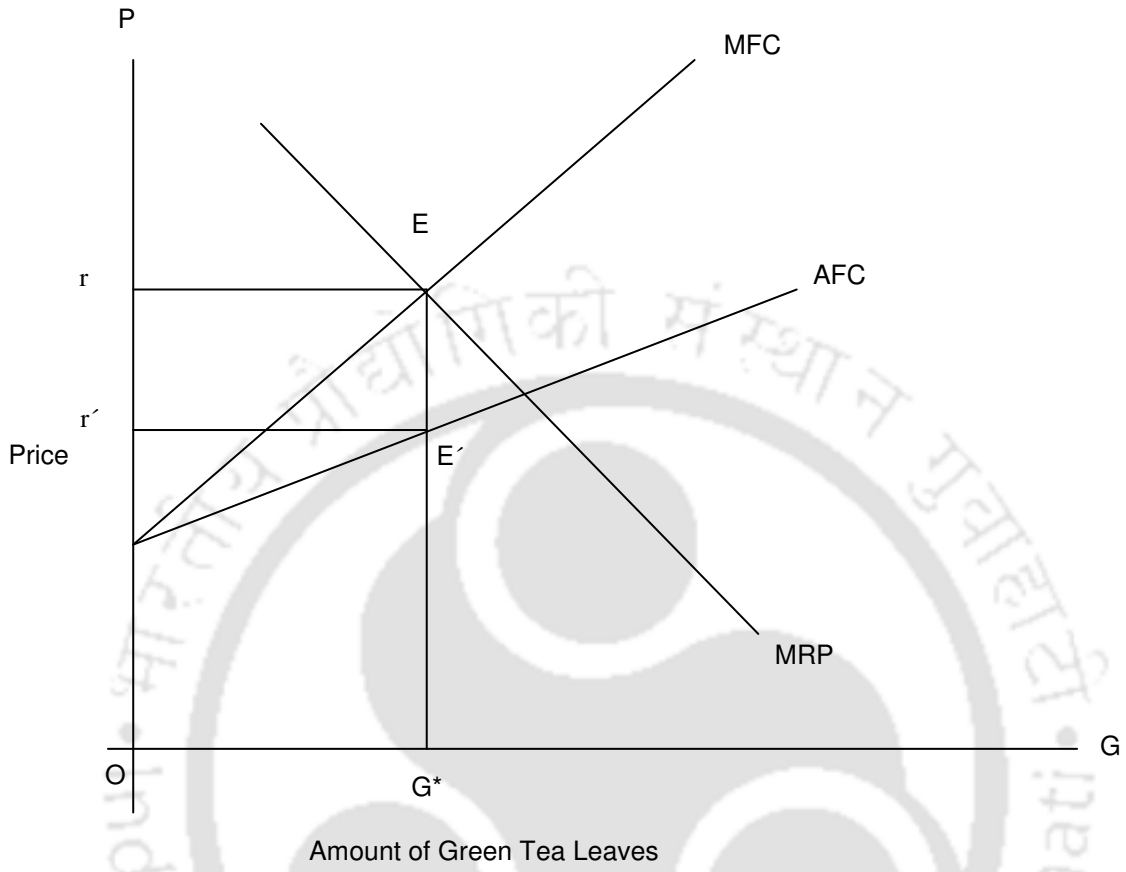
$$\frac{d\pi}{dG} = pF'(G) - r - Gr'(G) = 0$$

$$pF'(G) = r + Gr'(G) \qquad \text{……..} \quad (3.8)$$

$$MRP = MFC$$

This is under condition of perfect competition in product market. MRP is a downward sloping line here. But if the monopsonist sells made tea in a non-competitive market then also the MRP will be a downward sloping with respect to the quantity of tea leaves as we have explained before. The bought leaf tea factories/estate factories with monopsony power maximize profits by equating marginal revenue product and marginal factor cost. This can be explained with the help of the following diagram (see figure 3.1):

Figure 3.1: Price Determination under Monopsony Market



Assuming the monopsonist tries to maximize profits, it will demand tea leaves upto the point where MFC = MRP. As a result the firm is in equilibrium when MRP is equal to MFC and MRP curve cuts MFC curve from above (the second order condition). The equilibrium price is also determined at the point where MFC will be equal to MRP of the firm. It is depicted in the figure 3.1. The MRP curve of the monopsonist intersects the MFC curve at point E, corresponding to that OG* is the amount of tea leaves demanded by the bought leaf tea factories at Or´ price. But it is clear that Or´ (or G*E´) price of tea leaves is less than the marginal revenue of the product which is equal to G*E. Thus the monopsonist pays the small tea growers EE´ amount less than their marginal revenue product. To pay the growers less is to exploit them. Therefore, in the figure the volume of exploitation of each grower done by the monopsonist is equal to EE´. Because this exploitation is due to the existence of monopsony, it is termed as the monopsonistic exploitation. In a monopsonist market MFC is always greater than AFC. Therefore, at

equilibrium when MRP is equal to MFC, MRP has to be greater than the AFC, that is, the price of the tea leaves. Thus exploitation is a certainty as long as AFC is below MFC.

Next, we express the exploitation, that is, the gap between MRP and price, in relative terms. It is $\frac{MRP-Price}{Price}$. This has been termed as the rate of exploitation by Pigou and Hicks (Ashenfelter *et al.,* 2010).

The first-order condition for a monopsonistic firm (Equation 3.8) can be expressed as (also see (Ashenfelter *et.al*, 2010):

$pF'(G) = r + Gr'(G)$

$pF'(G) - r = Gr'(G)$

$pF'(G) - r = G\frac{dr(G)}{dG}$

$pF'(G) - r = G\frac{dr}{dG}$ $[\because r(G) = r]$

$\frac{pF'(G)-r}{r} = \frac{G}{r}\frac{dr}{dG}$

$$\frac{pF'(G) - r}{r} = \frac{1}{e_{sr}}$$

$\frac{MRP-Price}{Price} = \frac{1}{e_{sr}}$

Thus, Exploitation $= \frac{1}{e_{sr}}$ …….. (3.9)

e_s^r is the price elasticity of supply of tea leaves the monopsonistic firm is facing. This expression (3.9) demonstrates the inverse relationship of the gap between the marginal revenue product and the price paid with the price elasticity of supply of tea leaves supplied. If price elasticity of supply varies, exploitation will vary in reverse manner. We can take two extreme cases to show how elasticity and exploitation are related.

- If the elasticity of supply is very low, $e_s^r \rightarrow 0$, in such a case the supply curve will be a steep vertical curve, then the degree of exploitation will go to infinity. The steeper the supply curve, the less sensitive it is to a change in price – it is less elastic. If the quantity supplied by the small tea growers is not responsive to price change at all then the degree of exploitation is the highest.

- If the price elasticity of supply is very high, $e_s^r \rightarrow \infty$, in such a case the supply curve will be a flat and horizontal curve and the volume of exploitation will go to zero. The flatter the curve, the more sensitive it is to a change in price – it is more elastic. This means that if the quantity supplied by the small tea growers changes very much to small changes in the prices of green tea leaves then they will be subject to low exploitation.

From the above it is clear that if we want to estimate exploitation we need to estimate the price elasticity of supply of small tea growers. To estimate the elasticity of supply we need to consider the supply function of the small tea growers. What does the supply of leaves produced by small tea growers depend on? Below we discuss the factors determining the supply function.

(c) Determinants of Supply of Tea Leaves:

During any year, the supply of green tea leaf is virtually the production of green leaf tea since nothing is retained for personal consumption in the growers' family, also there is no scope of stocking the green leaves. As mentioned by Bhuyan *et al.* (2004) supply comprises two dimensions, i.e., area and productivity.

In their study area is taken as dependent variable rather than output, in response to price changes. The justification that has been given is that area expansion and contraction by removal of tea bushes are under the control of the growers. The decision of growers to expand or remove the existing tea crop depends upon the price of tea and other constraints.

The yield variable is also controlled to a certain extent by the growers in terms of application of inputs and other agronomic practices like plant protection and weed control measures. According to the authors, supply can be controlled only through application of inputs to effect changes in productivity.

In the long run, the growers' decision to invest on the expansion/reduction of area would depend upon the future return of the crop. Hence, the price variable assumed to be of importance.

In the short-run supply can be controlled only through application of inputs to effect changes in productivity. The supply could be improved through efficient utilization of resources. Use of the inputs depends on the price of inputs. In the supply function as we know only the prices are included (both of the output and inputs). Some of the factors that influence the supply of tea leaves are described below. Some of these factors are within the control of the organization whereas others may be beyond their control.

1. **Price** is one of the main factors that influences the supply of a product to a greater extent. Unlike demand, there is a direct relationship between the price of a product and its quantity supplied. In case of supply of green tea leaves also if the price of the product is high, the quantity supplied of the product can be assumed to be high, and if price is low the quantity supplied is likely to go down. In the literature it is found that the high price of the tea leaves has attracted a large number of growers to join tea cultivation, which ultimately has increased the quantity supplied of tea leaves. When the growers have not received remunerative price for their product they were reluctant to supply tea leaves. Bhuyan *et al.* (2004) estimated supply function of small tea growers, however, the problem of reverse causality and endogeneity has not been addressed in the study.
2. Prices of inputs would determine the use of inputs and that would affect cost of production. The cost of production rises due to increase in the input prices, and that reduces the supply of output. **Price of Urea, Price of MOP, Price of cow-dung, Price of Irrigation, Price of Vitamin, Price of Herbicide,** etc. are found to be important in the production and supply of tea leaves by small tea growers (Ganguli, 2013).
3. **Wage rate of male and female labour** determines the cost of production. As has been mentioned by several authors labour cost is the most important cost for small tea growers. Higher the wage rate, lower is the profitiablity, which induces the producer to produce less and consequently supply will also be less, and vice versa (Baruah, 2004).
4. **Farm size** influences the supply of tea leaves. Generally, supply may be affected by the land under cultivation. Higher the area of land under cultivation, higher will be production and supply of tea leaves (Bhuyan *et al.*, 2004).
5. **Linguistic community** of the grower can also play a role in determining the supply. Small tea cultivators mostly belong to the rural people of Assamese community. It is possible that belonging to that community gives some competitive advantage in terms of higher production. These may work in terms of better network among the same community members. Better network can enhance the spread of information, as well as economic ties within the community from which each member benefits. It has been mentioned by many authors that the Assamese speaking rural youth took to small tea growing in a big way. It is probable that members belonging to that community could have a relative advantage.

On the basis of the above factors the following function of supply can be formulated:

$qSupply_i = f(P_{Yi}, P_{Ui}, P_{Mi}, P_{Si}, P_{Di}, P_{Ii}, P_{Vi}, P_{Hi}, wa\_m, wa\_f, farmsize, d\_ling)$ ..... (3.10)

- (qSupply) = Quantity Supplied (dependent variable);
- P_Y = Price of the output;
- P_U = Price of Urea;
- P_M = Price of MOP;
- P_S = Price of SSP;
- P_D = Price of Cow-dung;
- P_I = Price of Irrigation;
- P_V =Price of Vitamin;
- P_H =Price of Herbicide;
- wa_m =Wage rate of male workers;
- wa_f =Wage rate of female workers;
- famsize =Farm Size;
- d_ling =1 if Assamese
  =0 if non-Assamese.

i stands for ith STG. i can vary from 1,2,3,…,n.

A logarithmic transformation of the supply function will enable to estimate the elasticity of supply. Log-linear models allow estimation of elasticity that does not vary with price and quantity. Consequently, they are often referred to as constant elasticity models. Thus by transforming the supply function into a logarithmic expression, a constant price elasticity of supply will be estimated. Consequently a logarithmic form of the supply function is assumed, which actually derives from a Cobb-Douglas supply function. It will enable us to calculate a constant elasticity. Thus (3.10) is given a particular form in (3.11) by rewriting the supply function by taking the natural logarithm (ln) of both dependent and independent variables of both the sides of equation (3.10):

$$\ln(qSupply_i) = \beta_0 + \beta_1 \ln P_{Yi} + \beta_2 \ln P_{Ui} + \beta_3 \ln P_{Mi} + \beta_4 \ln P_{Si} + \beta_5 \ln P_{Di} + \beta_6 \ln P_{Ii} + \beta_7 \ln P_{Vi} + \beta_8 \ln P_{Hi} + \beta_9 \ln wa\_m_i + \beta_{10} \ln wa\_f_i + \beta_{11} \ln famsize_i + \beta_{12} d\_ling_i + \varepsilon_i \quad \text{..... (3.11)}$$

where

- $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11}, \beta_{12},$ = parameters to be estimated, they would give the elasticities of supply, our interest is in β_1 which is the price elasticity of supply.
- ε_1 = error term.

A change in the logarithm of a number is a relative or proportionate change, that is, d[ln(qSupply)] equals d(qSupply)/qSupply and d[ln(price)] equals d(price)/price. In such a case, β_1 which equals d{ln(qSupply)}/d{ln(price)}, that is proportionate change in quantity supplied [d(qSupply)/qSupply] divided by proportionate change in price [d(price)/price]. The estimated price parameter $\widehat{\beta_1}$ in equation (3.11) is the price elasticity of supply. Thus by transforming the supply function into a logarithmic expression, a constant price elasticity of supply will be estimated. And a constant price elasticity of supply will give us the amount of exploitation using equation (3.9).

The error term in the model implies that for every value of the independent variable there is a whole probability distribution of value of dependent variable. The error term is included because of the possibility of random shocks which may have influence on the dependent variable that can lead to error. Even the same variables have different behavior in different environments. Sampling error and measurement also cause error in the model. The net effect of all these factors is represented by error term in regression model. Instrumental variable (IV) can be used to address a situation where explanatory variables are correlated with the error terms of a regression relationship. To estimate the price elasticity of supply instrumental variable would be used as discussed in the next section.

(d) Estimation of Price Elasticity of Supply with Instrumental Variable:

Suppose from our model we want to estimate the response of market supply to exogenous changes in market price. Quantity supplied clearly depends on price, but prices are not exogenously given since they are determined in part by market supply and it is correlated with the error term. Since price is endogenous, it cannot be taken as explanatory variable for supply. We take some variables which affect the price but this affect on price is not through the supply side. This is independent of supply and in this case these external disturbances are exogenous. Price will change, supply will change, but this change in price is completely exogenous. Thus by taking instrumental variable it can be checked how supply is affected along with change in price, which is affected by some other factors. The instruments we are considering are (i) Number of

options which the tea growers have to sell their tea leaves. (ii) Distance between the tea garden to the processing plant. (iii) A dummy for tea gardens which are situated in the more traditional districts (these districts have had STGs for a longer time; they also have greater number of STGs). According to the latest data (Table 2.6) Dibrugarh (22,719) and Golaghat (11,344) districts are considered as the traditional tea growing districts and Nagaon (449), Biswanath and Sonitpur (1,499) are considered as the new districts. Since Biswanath and Sonitpur districts are recent divisions, separate data are not available. Even if we take both the districts together the total number is less. (iv) A dummy for those tea growers who sell their tea leaves directly to the processing plant. These four factors might affect the price of tea leaves which the grower receives. More sales options, less distance from the processing unit, location in the traditional districts (better infrastructure), direct sale to the processing plants – all these may raise the price. These are demand side factors. They may not raise the supply directly.

But we need to make sure that these instruments are appropriate. A valid instrumental variable must satisfy two conditions, known as instrument relevance (correlated with the included endogenous variables, in our case price of tea leaves) and instrument exogeneity (or be exogenous to the dependent variable, in our case the quantity supplied of tea leaves).

To calculate the price elasticity of supply, where price is correlated with the error term, the help of two-stage least squares (2SLS) would be taken. This process will be conducted with the help of primary data collected from the small tea growers.

Estimating equation (3.11) with instrumental variable will give us the estimated value of $[\widehat{\beta_1}]$. The estimated value of $[\widehat{\beta_1}]$ which is price elasticity of supply, will give us the idea about the exploitation of the small tea growers.

3.2 Definition and Measures of Technical Efficiency, Estimation of Production Function:

The technical efficiency of a farm can be defined as the ability of the farm to obtain the maximum possible outcome with a specified endowment of inputs, given the technology and environmental conditions surrounding the farm (Kalirajan and Shand, 1994).

Constantin, Martin and Rivera (2009) mentioned that from a theoretical point of view, producers do not always optimize their production functions. The production frontier characterizes the minimum number of necessary combinations of inputs for the production of diverse products, or

the maximum output with various input combinations and a given technology. Producers operating above the production frontier are considered technically efficient, while those who operate under the production frontier are denoted technically inefficient.

Hong and Yabe (2015) have opined that efficiency is an important factor of productivity growth as well as stability of production. Technical efficiency measures the ability of a farmer to achieve the maximum output with given and obtainable technology.

Thus technical inefficiency arises when less than the maximum output is obtained from a given package of factors. It is generally assumed to reflect inefficiency due to timing and method of application of production inputs (Mokgalabone, 2015).

In literature, there have been two typical techniques are applied to estimate efficiency such as: stochastic frontier analysis (SFA) and data envelopment analysis (DEA). The former is a parametric approach or stochastic approach that was simultaneously introduced by Aigner *et al.* (1977) and Meeusen and Van den Broeck (1977). The latter is a non-parametric approach or deterministic approach which proposed by Charnes *et al.* (1978).

In our case, in the first step the estimation of production function will be done under the assumption that there is no technical inefficiency. In the second step we shall allow for technical inefficiency and estimate the production function by stochastic production function method.

Stochastic Frontier Analysis (SFA)

(a) Theory:

Stochastic frontier approach has found wide acceptance within the agricultural economics literature because of its consistency with the theory, usefulness and relative ease of estimation. The model has been applied in a considerable number of empirical studies in agricultural economics in many developed and developing countries.

Aigner *et al.* (1977) and Meeusen and Broech (1977) developed stochastic frontier model that assume that the output of a firm is a function of a set of inputs, inefficiency and random error. A general stochastic production function with a single output is given by:

$y_i = f(x_i; \beta).\exp(\varepsilon_i)$,

$\varepsilon_i = v_i - u_i$

$f(x_i; \beta)$ → deterministic kernel

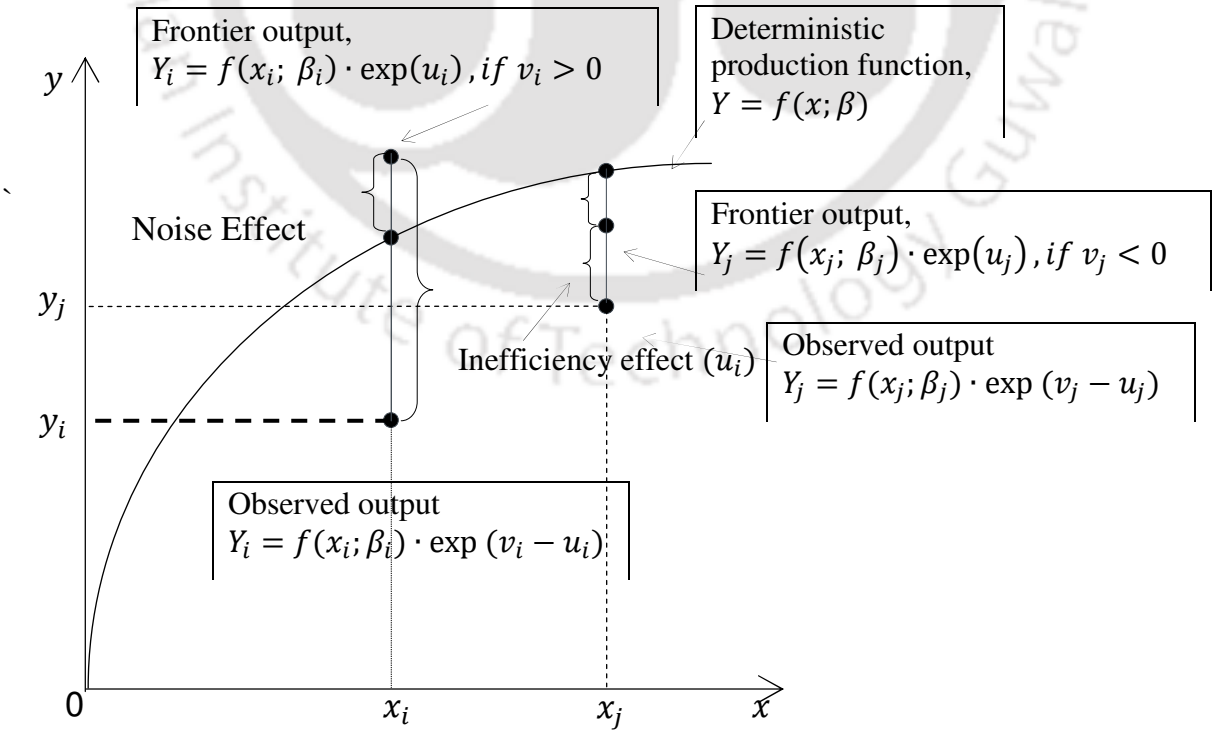
$\exp(v_i)$ → effect on output of exogeneous shocks

$\exp(-u_i)$ → inefficiency

$f(x_i; \beta).\exp(v_i)$ → stochastic frontier

where y is output, x is a set of inputs, β is a set of parameters to be estimated and i denotes producers. ε_i is a compound error term consisting of two elements, v_i and u_i. The term v_i is a two-sided ($-\infty < v_i < \infty$) normally distributed random error [$v \sim N(0, \sigma_v^2)$] that represents the stochastic effects outside the farmer's control (e.g., weather, natural disasters, and luck), measurement errors, and other statistical noise. The term u_i is non-negative random error term, independently and identically distributed as $N^+(0, \sigma_v^2)$ that represents the inefficiency effects of the farm.

Figure 3.2: Illustration of Stochastic Frontier Analysis



Source: Hong (2016)

The basic structure of the stochastic frontier model is illustrated in figure 3.2 in which the productive activities of two producers (*i* and *j*) are considered for illustration. Producer *i* uses inputs x_i and produces output Y_i. If productive activity is associated with favourable conditions for which the random error v_i is positive, and had been utilizing the inputs in an efficient way (u_i=0), production would have been $Y_i = [f(x_i; \beta).\exp(v_i)]$, which lies above the deterministic frontier $f(x;\beta)$. However, producer *i* is not utilizing inputs efficiently, hence production is y_i, which is below the deterministic frontier.

On the other hand, producer *j* is producing output Y_j using inputs x_j which is less than the value on the deterministic frontier $Y = [f(x;\beta)]$ because its productive activities are associated with unfavourable conditions, for which the random error is negative $(v_j<0)$. In addition, producer *j* is not utilizing its inputs efficiently ($u_j \geq 0$). Observed production is Y_j which is given by $f(x_j; \beta).\exp(v_j - u_j)$ and reflects both random error and inefficiency.

Battese (1991) applied the stochastic frontier model to estimate technical efficiency of individual firms' input-per-unit-of-output values and it is defined by:

$$Y_i = f(x_i; \beta) \exp(V_i - U_i), \qquad i = 1,2,\ldots\ldots\ldots\ldots,N,$$

Where V_i is a random error, assumed to be independently and identically distributed as $N(0, \sigma_v^2)$, which is associated with random factors (e.g., measurement errors in production, weather, industrial action, etc.) not under the control of the firm, and independent of the U_i's, which were assumed to be non-negative truncations of the $N(0, \sigma^2)$ distribution (i.e., half normal distribution) or have exponential distribution. The author has also used the basic structure of the stochastic frontier model as formulated by Aigner *et al.* (1977) and Meeusen and Broech (1977).

Technical efficiency of a given firm is defined to be the factor by which the level of production for the firm is less than its frontier output. It is defined in terms of the ratio of the observed output to the corresponding frontier output, given the levels of inputs used by that firm and it is estimated as:

$TE_i = Y_i/Y_i^*$ i.e.,

$TE_i = f(x_i;\beta) \exp(V_i - U_i)/ f(x_i;\beta) \exp(V_i)$

$= \exp(-U_i)$

Where Y_i is the observed firm output and Y_i* is the maximum possible output (frontier output) correcponding to a set of given levels of inputs (x_i) for firm *i*.

(b) <u>Estimation of Production Function of the STGs</u>:

In the first part production function estimation will be done in the Ordinary Least Square (OLS) method by taking Cobb-Douglas production functions. As mentioned by Hanley and Spash (1993), if there are three or more independent variables in the model, Cobb-Douglas functional form is more popularly applied than other forms. In this study, Cobb-Douglas production function with five independent variables will be applied. Labour (La), fertilizer (F), and pesticides (P) are taken as variable inputs and land under cultivation (L) and capital cost per year (C) are fixed inputs for our production function. (Capital Cost per year = 22% of the Price of Machine + Running Expenses. 22% of Price of Machine = 15% Depreciation + 7% Rate of Interest) These variables have been commonly taken as explanatory variables in several studies, including Baanante, C.A. and Surjit S. Sidhu (1981); Goyal, Suhag and Pandey (2006); Sidhu (1974); Hong and Yabe (2015); Bonabanna-Wabbi (2002); Saidur, Sattar, Kei, Humnath (2014). In the second part we are going to attempt to estimate the technical efficiency of production function through stochastic frontier approach.

The following assumptions will be made which underline the specification of a stochastic frontier.

(i) The frontier is stochastic in nature due to factors beyond human control and systematically distributed error term present in it captures the effects of outside random shocks, observation and measurement error on the dependent variable and statistical 'noise'.

(ii) Variation in the technical efficiency of individual farm is due to factors completely under the control of the growers (Bhuyan *et al.,* 2004).

For econometric estimation of production function five independent variables will be applied. Labour (La), fertilizer (F) and pesticides (P) are used as variable inputs and land under cultivation (L) and capital cost per year (C) are considered as fixed inputs for our production function. The Cobb-Douglas production function with these model specific variables can be written as:

$$\ln(y_i) = \alpha_0 + \alpha_1 \ln(L) + \alpha_2 \ln(La) + \alpha_3 \ln(F) + \alpha_4 \ln(P) + \alpha_5 \ln(C) + v_i - u_i \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.12)$$

v_is are assumed to be independent and identically distributed normal random errors having mean zero and variance σ_v^2 and are distributed independently of u_i . Where u_is are non-negative technical inefficiency effects representing management factors and are assumed to be independently distributed with mean u_i and variance σ^2. The *i*th farm exploits the full technological production potential when the value of u_i comes out to be equal to zero, and the farmer is then producing at the production frontier beyond which he cannot go. The greater the magnitude of u_i far away will be the farmer from the production frontier and be operating more inefficiently (Ahmed, Chaudhry, Iqbal, 2002).

Higher the efficiency, higher is the productivity and vice-versa, hence stochastic frontier model provides useful insights into best-practice technology and measures by which the productive efficiency of different farms may be improved. Stochastic frontier analysis assumes that each farm potentially produces less than it might do ideally due to inefficiency. Stochastic frontier model provides estimators for the parameters of a linear model with a disturbance that is assumed to be a mixture of two components, which have a strictly non-negative and symmetry distribution, respectively. Frontier can fit models in which the non-negative distribution component (a measure of inefficiency) is assumed to be from a half-normal, exponential, or truncated-normal distribution. Thus stochastic frontier model will help to find inefficiency in the production function.

Thus the technical inefficiency effect u_i in the stochastic frontier model (3.12) could be specified in equation (3.13). The random variable u_i is assumed to be a function of a set of explanatory variables and an unknown vector of coefficients δ. The explanatory variables in the inefficiency model may include some input variables in the stochastic frontier, provided the inefficiency effects are stochastic like, in our model, age of the farmer, level of education of the farmer, dummy for linguistic community of the farmer, dummy for own transport of farmer, age of the farm, farm size, dummy for electricity of the farm and dummy for TB Registration of the farm. Thus, following the model, the inefficiency effects, u_i, which is a function of farm- and farmer-specific attributes can be defined as:

$$u_i = \delta_0 + \delta_1 Age_i + \delta_2 Educ_i + \delta_3 d\_ling_i + \delta_4 d\_t_i + \delta_5 FarmAge_i + \delta_6 FarmSize_i + \delta_7 d\_el_i + \delta_8 d\_TB_i + \omega_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.13)$$

Here

- Age_i Age of the *i*th farmer in years;
- $Educ_i$ Number of years spent by the *i*th farmer on education;
- d_ling_i Dummy for Linguistic Community of the *i*th farmer;
- d_t_i Dummy for Own Transport of *i*th farmer;
- $FarmAge_i$ Age of the *i*th farm in years;
- $FarmSize_i$ Size of the *i*th farm in bighas;
- d_el_i Dummy for Electricity of the *i*th farm;
- d_TB_i Dummy for TB Registration of the *i*th farm;
- ω_i is unavoidable random error assumed to be independently distributed with a positive, half-normal distribution.

With the theoretical concepts to be used been clarified, we proceed towards the discussion of collection of data in the next chapter.

Chapter IV

THE SURVEY

This chapter contains two sections. The first section, section 1 has the pilot survey, and the second section, section 2 has the main survey. We are going to describe the collection of data, features of the data obtained from the surveys and its summary statistics. Deeper statistical analysis and inferences from the survey data will be presented in the next chapter, i.e., Chapter V, titled "Results and Discussions".

Section 1: Report of the Pilot Survey

In order to obtain the data required for statistical test first we devised a draft questionnaire. The draft questionnaire had to be tested for its validity. For this a pilot survey was conducted during the month of March, 2017. Three districts of Assam, viz., Nagaon, Jorhat, and Sonitpur were chosen for this exercise. These districts are from three separate geographical zones of the State: central Assam, upper Assam and the northern banks respectively. During the pilot survey certain problems pertaining to data collection were detected, viz.,

- Small tea growers are unable to provide accurate information regarding fertilizers, insecticides, pesticides, herbicides, etc.
- They are unable to provide data on the actual cost of production.
- Only tentative information regarding profit could be obtained.

In short, there is inability of the respondents to provide precise quantitative information.

Brief results of the Pilot Survey

The main findings from the pilot survey are as follows:

- Most of the gardens are new; the age ranges from 1-23 years suggesting that most surveyed gardens are in the productive or pre-productive period.
- Largely the gardens were virgin, i.e., the lands were not used for any kind of cultivation prior to the cultivation of tea production.
- 80 percent of the growers have land *patta*.
- 75 percent of the growers are registered with Tea Board of India (TBI) and 85 percent of the growers are registered with All Assam Small Tea Growers Association (AASTGA).

- Regarding labour, in general the growers depend on casual labours and payment is on the basis of time rate. Hiring of contractual labours in the gardens is very uncommon.
- Even though the growers are unable to provide precise information regarding fertilizers, insecticides, pesticides and herbicides, but most of the growers apply these chemicals in their gardens. Some farmers do not apply some kind of fertilizers, while others use significant amount of it.
- Although area of cultivation remained the same, but over the years the volume of production per farm has increased significantly. This indicates an improvement in the yield of land.
- Even though a slight increase can be noticed in 2015, but over the years the selling price of green tea leaves remained somewhat the same.
- Over the years a significant increase in the amount of profit can be noticed in case of each farm.
- Regarding finance, the farmers prefer to use their own fund. But in certain cases it is found that they depend on credit. These are mostly non-institutional in nature.
- 40 percent of the growers are found to irrigate their gardens.
- Nearly 60 percent of the growers sell their tea leaves to the BLFs because of their concentration in those areas. On the other hand, 50 percent of the growers sell their leaves to the estate factories. Some to both.
- 80 percent of the growers sell their leaves on their own and they have their own transportation facilities, whereas remaining 20 percent depend on the leaf agents as they do not have their own transport facilities.
- Most of the growers opined that if they sell through agents, it affects their profits adversely.

Section 2: The Main Survey

The pilot survey helped us to revise the questionnaire and make it more useful and specific with respect to research questions. From the pitol survey it was realized that the growers were unable to provide sufficient quantitative information regarding the quantity of inputs used, costs of production, profits generated, etc. Accordingly certain questions were revised and few new questions were included in the revised questionnaire. For example, to get detailed quantitative

information regarding the cost of production, question no. 32 was modified. It was divided into different groups to get sufficient quantitative information.

As capital is considered as one of the important variables of production in our study, hence the question on expenditure on machines has been modified. It was also divided into different sub-groups to get detailed information (question nos. 38 and 39 in the final questionnaire).

Whether the STGs have access to grid electricity (question no. 42) was included after the pilot was conducted.

Question like number of options the small tea growers have to sell their tea leaves was included in the final questionnaire (question no. 52 (c)).

Similarly whether the STGs like tea gardening as a profession (question no. 54) was an additional question which was included in the final questionnaire after the pilot survey to extract more accurate quantitative information.

Thus many such gaps in the questionnaire could be detected and addressed after the pilot was conducted. In the revised questionnaire certain specific modifications were done to extract more accurate quantitative information and a number of additional questions were added to cross-verify the quantitative information. After finalizing the questionnaire we undertook the main survey of the small tea growers in the months of July-September 2017. The final questionnaire is attached in the appendix for reference (Appendix I).

Assam has been broadly divided into six agro-climatic zones on the basis of patterns of rainfall, terrain, soil type and climatic conditions. They are (1) Barak Valley Zone (Cachar, Hailakandi, Karimganj); (2) Central Brahmaputra Valley Zone (Morigaon, Nagaon); (3) Hills Temperate Zone (Karbi-Anglong, N.C.Hills); (4) Lower Brahmaputra Valley Zone (Barpeta, Bongaigaon, Dhubri, Goalpara, Kamrup, Kokrajhar, Nalbari, Baksa); (5) North Bank Plain Zone (Udalguri, Darrang, Dhemaji, Lakhimpur, Sonitpur, Biswanath) and (6) Upper Brahmaputra Valley Zone (Dibrugarh, Golaghat, Jorhat, Sivasagar, Tinsukia). From Table 2.6 it is clear that the number of small tea growers in Lower Brahmaputra Valley Zone is very small. Similar is the situation in case of Barak Valley Zone, Central Brahmaputra Valley Zone and Hills Zone. As we wanted to find a representative sample and as most of the small tea growers are located in Upper Assam districts either in south bank or north bank, within that some conscious decision was made to select districts.

Thus the distribution of respondents across districts has been designed by keeping in mind two criteria. Firstly, the concentration of the small tea growers' across districts varies, so all districts may not have the same number of respondents in the sample. We have taken a bigger number of respondents from districts with greater number of tea gardens. Secondly, we wanted to capture the variations of the local conditions across districts. Most of the growers in Assam are concentrated on the south bank of the Brahmaputra. We wanted to take a sizeable part of the sample from the north bank which belongs to a different agro-climatic zone. Hence, districts on the north bank of Brahmaputra - Biswanath and Sonitpur - were purposefully given some weight although the cultivation by small tea growers is mostly concentrated on the south bank. In all 210 respondents were interviewed. They are spread out across five districts of Assam. The distributions of the respondents in the main survey over the districts are as given in table 4.1:

Table: 4.1
Distribution of Small Tea Gardens

Districts	**Number of Respondents**
Biswanath	13
Sonitpur	34
Nagaon	32
Golaghat	61
Dibrugarh	70
Total	**210**

Source: Author's own survey

Sampling Design

The study was confined to five districts of Assam. The districts were selected purposively. The reason for relying on purposive selection has been explained above: the aim was to draw samples not only from the districts where the gardens are more concentrated and older (Tinsukia, Dibrugarh, etc.), but also to obtain samples from the newer areas such as Nagaon, Sonitpur and Biswanath where the number of garden is also low. The motivation behind this was manifold. First, to probe the sustainability of STGs. If STGs are doing well in new areas it is an indication that there is promise of its further expansion in new areas. Drawing sample from the upper Assam, south bank districts alone would not allow that examination. Second, purposive variation in districts means that the samples are likely to vary more with their different characteristics. Third, agro-climatic conditions would also vary once districts from different agro-climatic zones are purposively selected. Random sampling from the pooled data

of all districts may not give us this variation since the STGs are highly concentrated geographically.

A simple random sampling design was used for drawing the sample from each district after the districts were selected in the first stage. Initially from the list of small tea growers registered with the Tea Board of India (TBI) we drew a sample at random. But we also wanted to have respondents in our sample who are not members of the TBI, since selecting the TBI members alone would not make the sample representative. Hence we could not rely on the TBI members' list alone. Taking non-members will make the sample more representative of all the small tea growers' population (as we have seen in previous chapters the majority of the STGs are not members of the TBI). Thus apart from the sample that we drew from the TBI list we selected respondents who are not TBI members. Unfortunately there is no recorded list of non-TBI member small tea growers, from which a random sample could be drawn. The selection of the non-TBI sample was done through the tea growers who are TBI members (in some cases they provided information of non-TBI tea gardens, after which the non-TBI gardens were visited). Since the TBI sample is random, this later sample is also random. In some cases, non-TBI small tea growers were from the same locality of the sampled TBI gardens, but were selected at random. Around half of the respondents in our sample are TBI members.

Limitation of the Study

Out of 35 districts of Assam where tea is produced on a small scale, the sample for the present study is drawn from 5 districts. However as explained earlier the motivation behind drawing the sample was to render it as representative as possible.

Considering time, cost and other factors like spread of small tea growers, it was decided to have a sample size of 210 growers (0.25% of the total number of STGs).

As the study is based on sample survey, the impact of sampling errors on the findings of the study cannot be ruled out.

The following table provides the summary statistics of the data we have collected on quantitative variables.

Table: 4.2 Summary Statistics of the Survey Data (Quantitative Variables, all data pertain to 2016 unless specified otherwise)				
	Arithmetic Mean	**Coefficient of Variation**	**Maximum**	**Minimum**
Output (in kg.)				
2014	23125.67	164.27	400000	0
2015	24552.3	156.54	400000	0
2016	26013.35	149.27	400000	100
Area in Ha.				
2014	3.07	311.22	107	0
2015	3.16	302.28	107	0.08
2016	3.27	292.13	107	0.08
Mandays_Male	1341.08	598.14	116368	0
Mandays_Female	1442.97	325.54	64800	0
Age of the farm	14.22	52.41	45	2
Age of the Farmer	44.49	26.34	75	19
Year of Education	11.63	27.81	20	0
No. Of Family Member	5.56	47.22	19	2
No. Of Sales Option @	1.92	86.22	15	1
Distance*(in km.)	4.72	223.81	76.3	0
Quantity of Fertilizer:				
Urea (in kg.)	1069.44	153.48	15000	0
MOP (in kg.)	532.50	159.32	6000	0
SSP (in kg.)	546.10	195.57	6370	0
Cow Dung (in kg.)	3657.26	240.74	92000	0
Insecticides (in kg.)	14.91	586.32	1248	0
Vitamins (in kg.)	7.49	202.91	150	0
Herbicides (in kg.)	15.07	217.06	300	0

@ Number of options which the tea growers have to sell their tea leaves

** Distance from garden to the nearest processing centre.*

Source: Author's own survey

The average output per farm shows a considerably healthy increase from 23125.67 kg in 2014 to 26013.35 kg in 2016 showing an increase of 12.5 percent. In small tea cultivation, an important resource is land. The study found that the average area under tea cultivation has increased slightly from 3.07 ha to 3.27 ha during the period of 2014 to 2016 showing an increase of 6.5 percent. This reiterates the point of the pilot that yield increase contributed to output increase.

Aside from land another major input in most farming activities is labour. The labour in the sample farms has several characteristics. The composition of labour force on an individual farm varies according to the type, size and location of the farm. Major sources of labour on an

individual farm include contractual labour (all year round) and casual labour (occasional). Again both the contractual and casual labours are subdivided into family labour and hired labour - which can be further subdivided into male labour as well as female labour. In our analysis, utilization of labour, in terms of male labour (contractual as well as casual, family as well as hired) and female labour (contractual as well as casual, family as well as hired), has been worked out separately. In the sample survey the average mandays of female labour per farm is found to be higher (1442.97) than average mandays of male labour (1341.09). Thus the use of female labour is more than that of male labour in the small tea gardens. The average age of the farm is 14.22 years and the average age of the farmer is calculated to be 44.49 years. It has been reported by the farmers that no child labour has been engaged in the gardens, although any definite conclusion is not possible since detailed and reliable data on this have not been collected. This is difficult to collect as well, since child labour is illegal. The average level of education of the sample farmer is 11.63 years (years of schooling). The average number of family member is found to be more than 5. The farmers usually have more than one sale options. The average distance from the farm to the nearest selling point is more than 4 km.

It is observed that there is considerable amount of use of fertilizers in the form of urea, MOP (Muriate of Potash), SSP (Single Super Phosphate), cow dung, insecticides, vitamins and herbicides. The small tea growers apply these plant protection chemicals with the expectation that these would boost their productivity. The sample tea growers have reported that these inputs are applied twice or thrice a year. In many cases it coincides with the rainy season as a result of which there may be loss due to overflow. District-wise detailed data are provided in the appendix of this chapter.

Table: 4.3 Summary Statistics of Survey Data (Price Variables, all data pertain to 2016 unless specified otherwise)				
	Arithmetic Mean	**Coefficient of Variation**	**Maximum**	**Minimum**
Selling Price of Output (in Rs./kg):				
2014	15.85	22.18	29.35	9
2015	16.22	22.42	30.60	10
2016	16.06	18.69	27.25	10
Price of Fertilizers:				
Urea (in Rs./bag*)	401.09	17.94	800	300
MOP (in Rs./bag*)	801.79	22.53	1500	340
SSP (in Rs./bag*)	485.95	30.70	1170	220
Price of Cow Dung (in Rs./Thela)	1585.45	52.37	6000	800
Price of Insecticides (in Rs./bag*)	1042.95	44.60	2500	800
Price of Vitamins (in Rs./bag*)	770.01	51.94	3000	480
Price of Herbicides (in Rs./bag*)	399.03	72.01	3500	800
Wage Rate:				
Male (in Rs./Man-day)	137.26	25.12	250	90
Female (in Rs./Man-day)	115.09	10.15	160	90

*1 bag=50 kg

Source: Author's own survey

From table 4.3 it is quite clear that there is very negligible increase in the selling price of the tea leaves over the years. There is considerable difference between the wage rate of male and female workers. This may explain the greater use of female labour. Besides, the rate of wages paid to labours is not uniform in all the sample districts. It may depend on demand and supply of labour among a host of other factors. As can be seen there is a wide variation in the wage rates in our data: the wage rate varies from Rs. 90 to Rs. 250 in case of male labour and Rs. 90 to Rs. 160 in case of female labour. Moreover, a number of other facilities are to be provided to the tea workers by the small tea growers. In reality, probably not all of these are actually provided, but the list is given below:

i) Incentives during Durga Puja and Bihu;
ii) Festive gifts;
iii) Japi (hats made of bamboo)/Umbrella;
iv) Polythene sheet/Apron;
v) Bag/Tukri (bamboo basket);
vi) Medical aids;

vii) Mid-day meal;

viii) Foot wear;

ix) Maternity leave;

x) Free accommodation (in some cases).

Table: 4.4
Distribution of Linguistic Community

	Number of Respondents	Percentage of Respondents
Percentage of Assamese	138	65.71%
Percentage of Hindi	5	2.38%
Percentage of Bengali	12	5.71%
Percentage of Nepali	42	20%
Others		
Percentage of Adibasi	6	2.85%
Percentage of Karbi	5	2.38%
Percentage of Oriya	2	0.95%
Total	210	100%

Source: Author's own survey

Table 4.4 shows that most of the farmers are from the Assamese community. A significant number of Nepali people are found in the small tea cultivation, mainly in Sonitpur region. Apart from that a small number of Bengali and Hindi speaking growers along with insignificant number of Adibasi, Karbi and Oriya speakers are also found to be engaged in the tea cultivation during the survey period. District-wise detailed data are provided in the appendix of the chapter.

Table 4.5
Distribution of Religion of the Respondents

	Number of Respondents	Percentage of Respondents
Percentage of Hindus	191	90.95%
Percentage of Muslims	16	7.60%
Percentage of Christians	3	1.43%
Percentage of Others	0	0.00%
Total	210	

Source: Author's own survey

Table 4.5 shows that majority of the small tea growers is from Hindu community. Of late a very small number of Muslims and insignificant number of Christians are moving towards small tea cultivation. District-wise detailed data are provided in the appendix of the chapter.

Table: 4.6 Distribution of Sale of Tea Leaves		
	Number of Respondents	Percentage of Respondents
Percentage of farms who sold to agents	139	66.19%
Percentage of farms which sold to Estate Factory directly	25	11.90%
Percentage of farms which sold to Bought Leaf Factory directly	52	24.76%
Total	210	

Source: Author's own survey

Table 4.6 shows that majority of the small tea growers (66.19%) in Assam sell their tea leaves through agents. (District-wise detailed data are provided in the appendix of this chapter) It is reported by them that they hesitate to sell the green leaf to the factory directly due to high cost of transportation. The small tea growers depend on agents on two ways. One, they depend on credit provided by the agents. Two, the agents help them sell their tea leaves to a third party – the factories. So we are having condition of interlined market because small tea garden owners depend on agents for more than one economic reason – sale of output and credit. On the other hand, factories do not opt to buy small quantities of leaf from individual growers because that increases the total transaction cost because of the smallness of output of each growers. Factories want to make bulk purchase. The factories enter into contracts with leaf collection agents.

A considerable number of growers (24.76%) sell their tea leaves directly to the bought leaf factories. The small tea growers are to an extent dependent upon the private bought leaf factories. The small tea growers do not have a ready market for their green tea leaves, particularly in harvest seasons. Some of the estate factories also procure green leaves from small tea growers. They have expanded their factory production by outsourcing production of green leaves. In our survey it is found that 11.9% of the small tea growers sell their tea leaves directly to the estate factories. District-wise detailed data are provided in the appendix of the chapter.

Table: 4.7 Percentage Distribution of Different Variables of Sample Tea Growers		
	Number of Respondents	Percentage of Respondents
Percentage of proprietorship	203	96.97%
Percentage of male owned farms	203	96.97%
Percentage of female owned farms	7	3.33%
Percentage of farms which are flood prone	17	8.09%
Percentage of farms with TB Registration	115	54.76%
Percentage of farms with AASTGA Registration	134	63.81%
Percentage of farms with TB and AASTGA Registration	99	47.14%
Percentage of farmers who have availed any credit	41	19.52%
Percentage of farms which use electricity	24	11.43%
Percentage of farms which use irrigation	56	26.67%
Percentage of farmers who have their own transportation facility	63	30.00%
Percentage of farmers who have reported reduction in their income	157	74.76%
Percentage of farmers who like farming	182	86.67%
Total	210	

Source: Author's own survey

Table 4.7 shows that the percentage of proprietorship of the small tea growers in Assam is 96.97%. The table also shows that only 3.33% of sample growers are female. Most of the farms are male owned. Tea is generally cultivated in the high lands as low lying lands are not suitable for tea cultivation. Hence in the field visit it is found that most of the tea gardens are generally not flood prone. 54.76% of the sample small tea growers have registered their plantation with the Tea Board of India (TBI). Most of the sample tea growers (63.81%) have membership in the All Assam Small Tea Growers Association (AASTGA) and a significant percentage of the farms (47.14%) are registered with both the TBI as well as AASTGA. Growers have reported that after every three years they need to renew their TBI registration. Some of them have not renewed because of the lengthy process of registration, it also requires bribes according to them. District-wise detailed data are provided in the appendix of the chapter.

During the field survey it was found that only 19.52% of the small farmers have availed credit facility either from institutional sources or from non-institutional sources.

A very few of the farms, 11.43%, use electricity in their tea gardens. The average percentage irrigated area is 26.67% of the sample farms. It is also observed from the survey that the upper Assam districts (Golaghat and Dibrugarh in our survey) use less irrigated water. Only during

first months of plantation watering may be required on the planted saplings in absences of rain for a long period of time. This is because the quantity of rainfall is heavy in upper Assam, spreading ten months in a year. Only during November and December the quantity of rainfall is less in upper Assam. This is more clear from the appendix of the chapter. Table 4.6 shows that majority of the farmers sell their tea leaves through agents. Most of the farms do not have their own transportation facility and in our survey growers with transportation facility are only 30%. The most common mode of transportation of green leaf are jeeps, trucks and bicycles.

Most of the sample growers (86.67%) mentioned that they prefer small tea cultivation over other occupations. Regarding their satisfaction on income, there is a mixed response. Majority of the farmers (74.76%) reported the reduction in their income from small tea cultivation over the years. If the green leaf is delivered through agents, the growers get a lower price, since the agents deduct the cost of delivery from the due payable to the growers as well as the agent's commission. In our study it is noticed that the agents deduct Re.1 to Rs.3 per kg of green leaf depending on the distance of the farm to the processing centres. If the green leaf is delivered by the growers themselves to the factories, transportation cost gets added to production cost of the growers.

Brief Comments on the Surveyed Small Tea Growers:

From the field visit we found that a large number of other crops and trees viz., by uprooting sugarcane, bamboo, paddy, mustard, maize, pulses, oil seeds, pan, areca-nut, thatch, bari-mati, pat, ahu rice, vegetables, ginger, locally produced fruits, mainly banana, pineapple, orange, etc., have been replaced by the small tea growers and the ground for tea was prepared. These have been replaced because they were either less remunerative/ less profitable or because of the attack of wild animals such as elephants, monkeys and also birds, in some areas. Such problems are not there in case of tea plantations. Considering the permanent nature of tea cultivation and in expectation of a regular flow of income, people had converted their high lands from other crops to tea plantations. In Assam, the harvesting period of tea is March to November each year. So, by selling green tea leaf small tea growers earn money throughout these nine months. We were also told that land under double cropping of paddy is not suitable is converted to tea cultivation.

Tea cultivation is a highly labour intensive enterprise. It needs all year round supply of labour for various operations in varying quantities depending on the nature of operations. Labour utilization in the tea cultivation has been worked out for three periods.

i) January to April;

ii) May to August and

iii) September to December.

From January to April, labour is needed to conduct pruning of bushes, irrigation, mulching, tipping and the start of plucking. Demand for labour is less during this period. The peak season is May to August in which plucking starts and at the same time pests and disease also attack. Consequently the demand for labour is the highest during this season. During September to December the productivity of tea leaf gradually declines. Practically, no plucking is done during the month of December. The demand for labour is low during this part of the year. In our study labour has been categorized into family labour and hired labour. It is evident from the study that the number of family labour decreases with the increase in the farm size indicating that along with uplift in status of the small tea growers, emphasis on family labour decreases, as had been reported in the existing literature. Or, labour is replaced with machines as the financial strength of the tea grower rises. Besides this, in the larger sized farms, there is no female family labourers engaged in farming indicating that in this particular group of farmers, female members are not encouraged to be engaged in the farm activity. The share of contractual hired labour increases with the increase in the farm size. Labour supplied by family and contractual hired labour is not adequate for the peak season. So, farmers resort to use of hired casual labour according to their requirement during the peak season. All these observations are in line with the existing literature of small tea growing sector.

Plucking of tea leaves is by far the most labour intensive operation in the small tea gardens. Female labourers are deft in this operation. In our study labour scarcity was found during the peak plucking season. As reported by the tea growers the peak plucking season also coincides with rice transplantation time. The labourers who have their own rice fields are often preoccupied in transplantation of rice during this period. Under such circumstances, the utilization of casual hired labour in the small tea gardens assumes importance because plucking rounds have to be maintained. Utilization of female pluckers increases with increase in farm size. However for weed control - for spraying of herbicides rather than hand weeding, spraying of various insecticides, pesticides, vitamins, etc., pruning, manuring, fencing the boundary, etc., the utilization of male labour is found to be considerable.

In order to measure the financial position at the end of the year, a systematic record of all the transactions is a must. It was observed during the field visit that most of the small tea growers

failed to maintain the account record. Consequently, they cannot measure their income properly and cannot exactly state the cost of cultivations - as a result they are unable to report their profit. The TBI has provided diary to the agents which should be supplied to the small growers. But from the sample small tea gardens of the study area it has come to our notice that either the small tea growers have not received the diaries or they have overlooked to maintain the diaries.

In summary, majority of the growers sell their produce through agents. In many cases they have more than one sale options. It is felt that the bargaining power of the growers is weak which compel them to sell to the agents. Some small tea growers complained that BLFs and large tea estates often offer low price for green leaf on any flimsy pretext. Most of the growers do not have their own transportation facility which forces them to sell their produce through agents. The prices of the fertilizers, insecticides, vitamins and herbicides, other inputs like sprayer machines, small tools etc. are also relatively high. This makes the running cost of production of the small tea cultivation is considerable. High transportation cost, either paid directly or paid through the margin to the tea agent, also adds to the cost. But there is no corresponding increase in the price of green leaf which makes it difficult for small tea growers to carry on.

Most of the small tea growers are from Hindu Assamese community. Most of them have their land documents and majority of the farms are either registered with the TBI or the AASTGA. But most of them have reported that they have not financially benefited from any of the organisations, even though a Tea Board registration entitles a small tea grower a number of facilities including plantation subsidy, price subsidy, interest subsidy, re-plantation/rejuvenation etc. In many cases the growers take advances from the agent which is adjusted with the price of tea leaves later. The percentage use of electricity in the tea gardens and irrigated area of the sample farms is low.

In the next chapter the data collected from the survey would be analysed. This analysis will help us address the research questions the thesis started with.

Chapter V

RESULTS AND DISCUSSIONS

This thesis started with two research objectives

A. To investigate the possible monopsonistic exploitation of small tea growers by the buyers of tea leaves, and to investigate the production conditions of the small tea growers.
B. To frame policy prescriptions in order to enable the survival of small tea growers in the long run.

From the first research objective following questions can be formulated.

A(1). What is the degree of exploitation of the small tea growers by buyers of tea leaves?

A(2). What does the production of small tea grower depend on? Is there presence of technical inefficiency?

We begin this chapter by trying to answer the first part of the first research question [A(1)] which is regarding the degree of exploitation of small tea growers by the buyers of raw leaves. This will be done in sections 5.1 to 5.3. In section 5.4 we shall take up A(2), the second part of the first research question. After we are able to answer these two questions, we shall be in a position to answer the second research question, which is regarding policy prescription. This will be taken up in the next chapter.

5.1 Estimation of Price Elasticity of Supply

As we have seen in chapter three, the degree of exploitation can be expressed as the reciprocal of price elasticity of supply. In this section we shall first estimate the price elasticity of supply. As has been mentioned earlier, in the supply function, price is an explanatory variable of the quantity supplied, but price itself gets affected by the amount of supply, thus there could be reverse causality here which leads to endogeneity problems. We want to resolve this problem by the use of instrumental variable (IV) and using two stage least square (2SLS) techniques.

Two stage least square (2SLS) technique is an extension of the OLS method. It is used when the dependent variable or endogenous variable's error term is correlated with the independent variables. In the first stage, a new variable is created using the instrumental variable to compute

estimated values of the problematic variable. In the second stage, the model- estimated values from stage one are then used in place of the actual values of the problematic predictors to estimate a linear regression model of the dependent variable. Since the computed values are based on variables that are uncorrelated with the errors, the results of the two-stage model are optimal (Johnston and DiNardo, 1997).

The econometric model that we have in our mind is the following:

$$\ln Y_i = \beta_0 + \beta_1 \ln P_{Yi} + \beta_2 \ln P_{Ui} + \beta_3 \ln P_{Mi} + \beta_4 \ln P_{Si} + \beta_5 \ln P_{Di} + \beta_6 \ln P_{Ii} + \beta_7 \ln P_{Vi} + \beta_8 \ln P_{Hi} + \beta_9 \ln wa\_m_i + \beta_{10} \ln wa\_f_i + \beta_{11} \ln famsize_i + \beta_{12} d\_ling_i + \varepsilon_i \quad \ldots\ldots\ldots\ldots (5.1)$$

where

Y = Output (Tea Leaves);

P_Y = Price of the output;

P_U = Price of Urea;

P_M = Price of MOP;

P_S = Price of SSP;

P_D = Price of Cow-dung;

P_I = Price of Irrigation;

P_V = Price of Vitamin;

P_H = Price of Herbicide;

wa_m = Wage rate of male workers;

wa_f = Wage rate of female workers;

farmsize = Farm Size;

d_ling = 1 if Assamese

= 0 if non-Assamese.

i represents households. i = 1,2,……., 210.

P_Y is the price of tea leaves produced by small tea growers. There could be reverse causality in equation (5.1). The theoretical concern is briefly explained in the appendix of the chapter (Appendix VII).

To get around the reverse causality we take the instrumental variable (IV) approach. In the first stage we instrument price of tea leaves with certain variables which are likely to directly affect

the price of tea leaves and through that channel only they affect the supply of tea leaves. In other words the instruments must satisfy the condition of (a) relevance, they should be related to the variable to be instrumented (price of leaves) and (b) exogeneity, they should be unrelated to the regressed (supply of leaves). The instruments we are considering are

1. Number of options which the tea growers have to sell their tea leaves.
2. Distance between the tea garden to the processing plant.
3. A dummy for tea gardens which are situated in the districts with greater concentration of STGs. These districts have had STGs for a longer time; they also have greater number of STGs. In our survey Golaghat and Dibrugarh are these districts. Nagaon, Sonitpur, Biswanath are relatively new entrants in small tea cultivation, they have fewer STGs.
4. A dummy for those tea growers who sell their tea leaves directly to the processing plant.

These four factors might affect the price of tea leaves which the tea growers get from various sources. First it is reasonable to expect that as the number of sales options rise the growers will get a better price for their leaves.

Secondly, as the distance of the grower to the processing unit rises that might affect the price in a negative direction.

Thirdly, nature of the district may play a part in affecting the price. Districts with high concentration of small tea growers may have better infrastructure which might improve the price for the grower. But on the other hand, a greater concentration of growers in the districts may also mean that the price that they get is not very high due to competition with other growers. In other words the direction of the sign cannot be predicted a priori. It would depend on which of the above conflicting factors is stronger.

And finally, if the grower is not selling through any middle man (i.e., agents) he/she may get a better price. The dummy for grower who self sell may be important.

So in our instrumental variable approach where we are adopting a two stage least square (2SLS) method, the first stage model is given by

$$\ln P_{Yi} = \alpha_0 + \alpha_1 optn_i + \alpha_2 disn_i + \alpha_3 d\_dold_i + \alpha_4 d\_selfsale_i + \alpha_5 \ln P_{Ui} + \alpha_6 \ln P_{Mi} + \alpha_7 \ln P_{Si} + \alpha_8 \ln P_{Di} + \alpha_9 \ln P_{Ii} + \alpha_{10} \ln P_{Vi} + \alpha_{11} \ln P_{Hi} + \alpha_{12} lnwa\_m_i + \alpha_{13} lnwa\_f_i + \alpha_{14} lnfamsize_i + \alpha_{15} d\_ling_i + \nu_i \quad \ldots\ldots\ldots (5.2)$$

where

optn = Number of sales options of a farmer;

disn = Distance from the farm to the point of sale;

d_dold = Dummy for districts with high concentration of STGs;

d_selfsale = Dummy for self sale of tea leaves;

P_U = Price of Urea;

P_M = Price of MOP;

P_S = Price of SSP;

P_D = Price of Cow-dung;

P_I = Price of Irrigation;

P_V = Price of Vitamin;

P_H = Price of Herbicide;

wa_m = Wage rate of male workers;

wa_f = Wage rate of female workers;

famsize = Farm Size;

d_ling = 1 if Assamese

= 0 if non-Assamese.

To remind ourselves, the second stage of the regression is given by equation 5.1. This is reproduced below,

$$\ln Y_i = \beta_0 + \beta_1 \ln P_{Yi} + \beta_2 \ln P_{Ui} + \beta_3 \ln P_{Mi} + \beta_4 \ln P_{Si} + \beta_5 \ln P_{Di} + \beta_6 \ln P_{Ii} + \beta_7 \ln P_{Vi} + \beta_8 \ln P_{Hi} + \beta_9 \ln wa\_m_i + \beta_{10} \ln wa\_f_i + \beta_{11} \ln famsize_i + \beta_{12} d\_ling_i + \varepsilon_i \quad \ldots\ldots\ldots\ldots (5.1)$$

We have estimated the models mentioned above through the two stage least square (2SLS) method. The results are reported in appendix of the chapter (Appendix VIII).

A series of tests pertaining to IV has been conducted that are reported below. These are related to the question whether the use of instrumental variable technique is feasible in our case. These are post-estimation tests. These tests have ascertained that the method that we have used is valid.

Post-Estimation Tests

To use the 2SLS technique we need to make sure the following three conditions are satisfied:

1. We need to make sure that the explanatory variables in (5.1) are indeed endogenous. That is, the price of Y is not an exogenous variable. If the test fails to verify that endogeneity is present, there is no need to estimate (5.1) using instruments. The results of the endogeneity tests are stated in the following table:

Tests of endogeneity	
H_o : variables are exogenous	
Durbin (score) chi2(1) = 27.0961	(p = 0.0000)
Wu-Hausman F(1,196) = 290362	(p = 0.0000)

As reported in the above table the Durbin chi square statistic is 27.09 with *p* - value 0.0000 and the Wu-HausmanF statistic is 290362 with *p* – value 0.000. This implies we can reject the null hypothesis that the variables are exogenous. So the use of instruments is justified.

2. The second test we have conducted is the test for over - identification. This test basically tries to verify if the instruments are sufficiently exogenous to the dependent variable lnY. Here the null hypothesis that our model is correct. The results of this over - identification are given below:

Tests of over-identifying restrictions:	
Sargan (score) chi2 (3) = 6.86242	(p = 0.0764)
Basmann chi2 (3) = 6.55373	(p = 0.0876)

As we can see the *p* - values are greater than 0.05. So we accept the null hypothesis at 5 percent level of significance. (However, if the level of significance is taken to be 10 percent then the null hypothesis is rejected.)

3. Finally the last test that we conduct is to ascertain that the instruments are sufficiently correlated to the variable we are instrumenting i.e., $\ln P_y$. For this we conduct the test for the null hypothesis that the instruments are weak.

First-stage regression summery statistics					
Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	F(4,194)	Prob > F
lnP_Y	0.3507	0.3005	0.2374	15.0977	0.0000

Critical Values H_o : Instruments are weak	Of endogenous regressors: 1 Of excluded instruments: 4			
2SLS relative bias	5% 16.85	10% 10.27	20% 6.71	30% 5.34
	10%	15%	20%	25%
2SLS Size of nominal 5% Wald test	24.58	13.96	10.26	8.31
LIML Size of nominal 5% Wald test	5.44	3.87	3.30	2.98

From the panel above we see that the F value is 15.10. At 10 percent relative bias the critical value is given in the second panel to be 10.27. Hence we can reject null hypothesis at 10 percent level. Clearly the null hypothesis of weak instruments gets rejected at a higher level of relative bias (20%, 30%), thus we continue to find that the instruments are strong. However, if we are ready to tolerate a lower level of bias (5%) the critical value is 16.85 exceeding 15.10. In conclusion, the strength of the instruments is established with a reasonable degree of relative bias.

5.2 Heteroskedasticity and Re-estimation:

There is a possibility that the error terms in our structural model display heteroskedasticity. For this we have conducted the test of heteroscedasticity, the Breush-Pagan test, with the Stata software. The results of the test are stated below.

Table 5.1 **Heteroskedasticity Test (1)**
chi2(1) = 23.78 Prob> chi2 = 0.0000

Since the Breusch-Pagan test result (in Table 5.1) indicates that the errors are heteroscedastic, we estimate and report heteroscedasticity-robust standard errors (SEs). In table 5.2 below we have reported the results of the test.

Table: 5.2 (Panel 1)
First stage Regressions

Number of Observations = 210
Prob>F = 0.0000
R-squared = 0.3507
Adj R-squared = 0.3005

Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.093334	0.641343	0.147
Log of Price of MOP (lnP_M)	-0.10147**	0.0473826	0.033
Log of Price of SSP (lnP_S)	0.035605	0.0363387	0.328
Log of Price of Cow-Dung (lnP_D)	-0.21561	0.0432145	0.618
Log of Price of Irrigation (lnP_I)	0.009669	0.0177315	0.586
Log of Price of Vitamin (lnP_V)	-0.03323*	0.017009	0.052
Log of Price of Herbicides (lnP_H)	-0.01389	0.0212238	0.513
Log of Wage Rate of Male Workers (lnwa_m)	0.191421***	0.0487899	0.000
Log of Wage Rate of Female Workers (lnwa_f)	-0.2222**	0.1099276	0.045
Log of Farm-Size (lnfamsize)	-0.02692	0.0291779	0.357
Dummy for Linguistic Community (d_ling)	0.063092**	0.0319157	0.049
Option (Optn)	-0.0025	0.0056051	0.657
Distance (disn)	-0.00162*	0.0008269	0.052
Dummy for districts with high concentration of STGs (d_dold)	-0.11268***	0.0334044	0.001
Dummy for self-sale (d_selfsale)	0.146311***	0.0240373	0.000
Constant	3.191309	0.8989933	0.000

Table: 5.2 (Panel 2) Instrumental Variables (2SLS) Regression			
Number of Observations = 210 Wald chi2 (12) = 54.42 Prob>chi2 = 0.0000 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	5.3107***	1.323345	0.000
Log of Price of Urea (lnP_U)	-1.865259**	0.7843309	0.017
Log of Price of MOP (lnP_M)	0.2491209	0.5261056	0.636
Log of Price of SSP (lnP_S)	-0.987648**	0.4370614	0.024
Log of Price of Cow-Dung (lnP_D)	-0.1304657	0.4097076	0.750
Log of Price of Irrigation (lnP_I)	0.2210201	0.236627	0.350
Log of Price of Vitamin (lnP_V)	0.2846655	0.1866983	0.127
Log of Price of Herbicides (lnP_H)	0.3351553	0.3024638	0.268
Log of Wage Rate of Male Workers (lnwa_m)	-1.325012**	0.5344132	0.013
Log of Wage Rate of Female Workers (lnwa_f)	2.020179	1.226378	0.100
Log of Farm-Size (lnfamsize)	0.2972352	0.2493869	0.233
Dummy for Linguistic Community (d_ling)	0.4210801*	0.2492724	0.091
Constant	6.084347	9.874025	0.538

Significance at 1% ***, significance at 5% **, significance at 10% *

Panel 1 of Table 5.2 reports the first stage regression model (5.5). And Panel 2 of the table reports the second stage regression model (5.1). If we consider panel 1 of Table 5.2 we can see that there are some variables which affect the price statistically significantly. These are price of MOP, price of vitamin, wage rate of male labour, wage rate of female labour, the linguistic community the growers belong to, distance from the farm to the processing centre, whether the district where the farmer is located is an old district or not, whether the farmer sells the leaves directly. Out of these eight important variables, the sign of male labour wage rate is on the expected line (which is positive), implying that as the wage rate of male labour rises, it tends to raise the price of tea leaves. The wage rate of male labour is found to be statistically significant with *p*-value: 0.000. However, the sign of coefficient of female labour wage rate is surprisingly negative, although it has a lower statistically significance than the case of male labour wage rate. What can explain this negative relation? One probable explanation is rising female wage rate is leading to some sort of substitution of female labour by other inputs which are responsible for the fall of price. But still this answer is not satisfactory because we donot know the exact mechanism through which decline of price is taking place. More research in this direction can be thought of.

For inputs such as price of MOP, price of vitamin we again find negative sign for the coefficients. Interestingly, we find that it is statistically significant whether the grower belongs to the Assamese community. It implies Assamese community growers tend to get higher price than non-Assamese growers. This could be because of the reason that the small tea growers are mostly from the Assamese community, they have taken up small tea growing earlier than other people. This probably led to the better skills they have acquired and the skill percolated through social network they have developed among themselves which may have translated in terms of better prices.

Distance affects the price of tea leaves negatively which is not surprising. We curiously find that the growers in the districts with high concentration of small tea gardens receive lower price compared to the growers of districts with less concentration of small tea gardens. It is possible that higher supply due to higher concentration contributed to lesser price in districts with higher number of STGs. This effect has dominated the possible positive effects of better infrastructure etc. which these older districts have.

Finally, the growers who sell their tea leaves directly to the processing centres get higher price compared to those who sell through agents and this is not surprising. The coefficient of self-sale is found to be highly statistically significant with *p*-value: 0.000.

Now we come to the final table which is reported in panel 2 of table 5.2. As our objective is to estimate the degree of exploitation which can be calculated from the coefficient of price elasticity of supply, hence our interest is to calculate the coefficient of $\ln P_Y$. We see from the table that the coefficient is positive (the numerical value is 5.31) and it is highly statistically significant with *p*-value: 0.000. This is not surprising because as we would expect the output produced by the growers will rise as the price of the product rises. The price elasticity is estimated to be 5.31.

About the other coefficients reported, in the second model also we see that price of urea (P_U), price of SSP (P_S), wage rate of male labour (wa_m), wage rate of female labour (wa_f) and the linguistic community the grower belongs to are statistically significant. Price of urea (P_U) and price of SSP (P_S) affect the supply of leaves negatively. This is expected because higher input price tend to raise cost of production and reduce the production level and output supplied by the growers. Similarly, male labour wage rate has a negative impact on the production since it raises the cost.

Female labour wage rate raises output. This is surprising but it is in line with the result of female wage rate in the first panel. And finally – again in line with the first panel- we find that linguistic community of the grower is statistically significant. The Assamese growers tend to grow higher output compared to the non-Assamese growers, other factors remaining the same.

As can be seen from the table 5.2 that there is not much difference in the regression coefficients compared to the results prior to addressing the heteroskedasticity test (Appendix VIII). For example comparing the panel 1 of the two tables we find the same set of explanatory variables are found to be significant, with similar signs of coefficients (except that in the second case distance was negatively significant at 10%, although the value of the coefficient is very low). Similarly when we compare the panel 2 of the two tables, the same set of variables are found to be significant with similar signs of coefficients (except that in the second case wage of female labour is only marginally significant at 10%; its significance was quite low in the earlier section 5.2 as we have noted before).

In particular we note that the coefficient of log of price of tea leaves in both the cases are same: 5.31.

As the results in both the cases are very close, we can say that results we have obtained are robust. For obvious reasons results in table 5.2 are ones which we are going to refer henceforth.

From the above we deduce two conclusions. First, the own price elasticity of supply of tea leaves by the small tea growers is 5.31. This is a rather large number. Perhaps it testifies that due to high number of small tea growers there is stiff competition. Therefore a small rise in price leads to a proportionally large rise in quantity supplied. Secondly, our estimation of elasticity is likely to be correct because it has been confirmed by two different tests (Appendix VIII and table 5.2).

Like before a series of post-estimation tests has been conducted which addresses the question whether the use of instrumental variable technique is feasible in case of model 2. The results of these tests are being reported below.

Post-Estimation Tests

To use the 2SLS technique in case of the presence of heteroskedasticity also, we need to make sure the following 3 conditions are satisfied:

1. That the variables are indeed endogenous, that is, the price of Y is not an exogenous variable. The results of the endogeneity tests are stated as follows:

Tests of endogeneity

H_o : Variables are exogeneous

Robust chi2 (1) = 23.7442 (p = 0.000)

Robust Regression F (1,196) = 26.8991 (p= 0.000)

As reported in the above table the robust chi square is 23.74 with *p* value = 0.000. Here both the *p* values are less than 0.05. This implies we can reject the null hypothesis that the variables are exogenous. Therefore the IV method can be used.

2. The second condition we need to satisfy that the instrumental variables (IV) must be uncorrelated with the error term. For this we test for over identification. Here the null hypothesis that our model is correct. The result of this test is given below:

Test of over identifying restrictions:

Score chi2 (3) = 7.58712 (p = 0.0554)

As we can see the *p*-value is greater than 0.05. So we accept the null hypothesis at 5 percent level of significance. (However, if the level of significance is taken to be 10 percent then the null hypothesis gets to be rejected.)

3. Finally the last test that we conduct is to ascertain that the instruments are sufficiently correlated to the variable we are instrumenting i.e., P_Y. For this we conduct the test for the null hypothesis that the instruments are weak.

First-stage regression summery statistics

Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust 4 (4,194)	Prob > F
lnP_Y	0.3507	0.3005	0.2374	13.8706	0.0000

From the above table we can see that the *p*-value is less than 0.01. Hence we reject the null hypothesis at 1 percent level of significance. The lack of correlation of the instrumental variable with the error terms is therefore established at 99 percent level of confidence.

5.3 Estimation of Monopsonistic Exploitation

One main objective of this chapter is to find out the degree of monopsonistic exploitation. As we saw in chapter three, reciprocal of price elasticity of supply expresses the degree of monopsonistic exploitation. From panel 2 of table 5.2 we can see that the coefficient of price elasticity of supply is calculated to be 5.31. As degree of exploitation is formulated as

Degree of Exploitation = $\frac{1}{Price\ Elasticity\ of\ Supply} = \frac{1}{e_{sr}}$

We know price elasticity of supply $(e_{sr}) = 5.31$

Therefore, Degree of Exploitation = $\frac{1}{e_{sr}} = \frac{1}{5.31} = 0.19$.

The degree of exploitation is just a number. Implication of it will be clearer once we compare this number with the exploitation index estimated in a similar manner in other areas, other fields of economic activity. So far unfortunately we are yet to come across such estimations. One thing is certain the exploitation exists. The degree of exploitation is not zero.

As with just one average elasticity measure there is little scope for any empirical investigation of the potential determinants of price elasticity of supply and in turn of monopsonistic exploitation. Hence data has been classified according to four objective criteria. The purpose is to find out if elasticity varies significantly with respect to these variations in critieria. *Firstly*, tea gardens which are situated in the districts with greater concentration of STGs (in our survey Golaghat and Dibrugarh are these districts) and districts with fewer STGs (Nagaon, Sonitpur and Biswanath in our analysis). *Secondly*, Assamese community growers and non-Assamese community growers have been grouped into two separate categories. T*hirdly*, growers with single sale option and multiple sales options have been treated and tested separately. And *finally*, growers who sell their tea leaves directly to the processing plant and growers who sell through some agents are treated differently. Price elasticity of supply for different groups have been calculated through the two stage least square (2SLS) method considering equation 5.5 as first stage regression model and equation 5.1 as second stage regression model. The results have been reported in the appendix of the chapter (Appendix IX). The summary of the findings have been explained in Table 5.3.

Table: 5.3 Summary				
Criteria	No. of STGs	Price Elasticity of Supply	p>/z/	Degree of Exploitation $= \frac{1}{Price\ Elasticity\ of\ Supply} = \frac{1}{e_{sp}}$
New Districts	79	5.011074	0.057	0.199558
Old Districts	131	9.275945	0.002	0.107805
Assamese Community	138	4.274804	0.000	0.233928
Non-Assamese Community	72	10.64315	0.013	0.093957
Single Option	111	4.768278	0.000	0.209719
Multiple Options	99	9.969479	0.032	0.100306
Self Sale	78	2.669997	0.148	0.374532
Other Sources	132	5.003468	0.204	0.199861

Although some of the supply elasticites are rather high, they cover a range from 10.64 to 2.67. The elasticities of supply are all positive, as expected. As one of the objectives of this chapter is to find out the degree of monopsonistic exploitation, and as the reciprocal of price elasticity of supply expresses the degree of monopsonistic exploitation, accordingly the degree of exploitation of different criteria has been calculated.

It is noticed that in case of the first criterion, degree of exploitation is more in case of new districts where the concentration of STGs are less and it is less in case of districts with high concentration of STGs. This is not surprising, one would expect that new growers being less experienced and challenged infrastructure-wise would be exploited more.

In case of the second criterion, comparatively higher degree of exploitation can be observed in case of Assamese community growers than the non-Assamese community growers. This result is somewhat surprising. The literature tells us that STGs first took root among the unemployed youth of the Assamese community. One would expect that being the pioneers they would have some advantage over others. But this is not the case it appears from table 5.3. Further investigation on this is required.

Growers with single sale option of their tea leaves are exploited more than the growers who have multiple sales options. The coefficient of elasticity of supply in case of growers who have only

one sale option is highly statistically significant with *p*-value: 0.000. This is not surprising since having more sales options is likely to reduce the exploitation.

Comparatively higher degree of exploitation can be observed in case of growers who directly sell their tea leaves to the processing plants than the growers who sell through other sources. Although this result is unusal we can ignore it since the statistical significance is low.

As reported in table 5.2, panel 1, the coefficient of the instrumental variable, option, is negative and insignificant. This is in contradiction with expectation. As a robustness check, we dropped 'option' as instrumental variable and we have done a re-estimation to check the validity of results. The results have been reported in the appendix of the chapter (Appendix X). In Table 5.4 a comparative analysis is presented for with and without 'option' as an IV.

Table 5.4
Comparative Statistical Analysis

		With Option as IV		Without Option as IV	
Data/Criteria	No. Of STGs	Elasticity of Supply	p >/z/	Elasticity of Supply	p > /z/
Complete Data	210	5.3107	0.000	5.37522	0.000
New Districts	79	5.01107	0.057	5.265221	0.052
Old Districts	131	9.27595	0.002	9.888876	0.001
Assamese Community	138	4.274804	0.000	4.453295	0.000
Non-Assamese Community	72	10.6432	0.013	9.759449	0.023
Single Option	111	4.76828	0.000	4.768278	0.000
Multiple Options	99	9.96948	0.032	9.824527	0.032
Self Sale	78	2.669997	0.148	3.693241	0.076
Other Sources	132	5.003468	0.204	4.801441	0.314

Table 5.4 depicts that the coefficients rise slightly in the estimation where option is dropped as an IV. But the numbers donot change much. As the results are very close, we can say that the results are robust. Thus from the above table it is clear that the results are roughly valid even if option as an IV is dropped.

5.4 Estimation of Production Function

Production function refers to the technological relationship between the factors of production and the maximum possible level of output. Production is an activity that transforms inputs or resources into outputs of goods and services. Any deviation of a farm from the level of output- given the set of inputs- represents random disturbances, such as extremely favourable or adverse weather conditions, random price shocks, etc. These random disturbance terms are assumed to be of symmetric nature, with zero expected value and equal variance.

In a stochastic production frontier model, output is assumed to be bound by a stochastic frontier where disturbance term consists of two components- one component representing one-sided elements, usually assumed to follow a half-normal distribution. This is the inefficiency component, called technical inefficiency, which can arise due to administrative missteps or managerial errors in taking decisions. The other element is a symmetric component, which captures random effects outside the control of the decision-maker including the statistical noise contained in every empirical relationship. This is like the random symmetric disturbance term we discussed in the paragraph above. The stochastic frontier approach treats deviations from production function as comprising both random error and inefficiency.

In the present section, in the first step we start with the conventional production function. In case of a conventional production function, it is assumed that the farms use available resources efficiently, there is no technical inefficiency. In the second step, we shall adopt the stochastic frontier approach to examine the nature of production function and the presence of technical inefficiency.

(a) Estimation under Ordinary Least Square (OLS) Method

Production depends on a number of explanatory variables and the error terms. The production function in this case is assumed to be of the Cobb-Douglas form. This is the standard form of production function often used in the study of farm output (Battese and Coelli, 1995; Battese, 1997). We take the standard economic inputs such as labour, land, capital etc. as the possible explanatory variables of crop output. These variables have been commonly taken as explanatory variables in several studies, including Baanante, C.A. and Surjit S. Sidhu (1981); Goyal, Suhag and Pandey (2006); Sidhu (1974); Hong and Yabe (2015); Bonabanna-Wabbi (2002); Saidur, Sattar, Kei, Humnath (2014).

The production function is formulated in the following way.

$$\ln Y_i = \beta_0 + \beta_1 \ln Lb_i + \beta_2 \ln La_i + \beta_3 \ln F_i + \beta_4 \ln P_i + \beta_5 \ln C_i + \varepsilon_i \quad \text{..... (5.3)}$$

where

ln = Natural Logarithm;

Y = Output in kg (Tea Leaves);

Lb = Number of Labour hours used;

La = Area of Land in ha;

F = Quantity of Fertilizer in kg;

P = Quantity of Pesticides in kg;

C = Annual Capital Cost;

i represents households. i = 1,…….., 210.

The results of OLS estimation are presented in the appendix of the chapter (Appendix XI).

We need to clarify the nomenclature we are using here. There are two models: Model 1 and Model 2. Model 1 represents the standard form of OLS method with regular economic variables. Subsequently, Model 2 will be estimated where along with farm specific regular economic variables some social and non-farm specific variables are included.

(i) Heteroskedasticity Test

Heteroskedasticity occurs when the error term has non-constant variance. To determine whether there is heteroskedasticity, the Breusch-Pagan test was conducted. It is a chi-squared test. If the chi-squared value is significant with p-value below an appropriate threshold (e.g., $p<0.05$) then the heteroskedasticity is assumed to be present. That is to say a large chi-square would indicate the presence of heteroskedasticity.

Table 5.5
Heteroskedasticity Test (2)

chi2(5) = 45.58
Prob> chi2 = 0.0000

In this case as reported in table 5.5 we find the presence of heteroskedasticity. Thus the presence of heteroskedasticity is observed in the model. Accordingly the OLS estimation was redone tackling heteroskedasticity. In table 5.6 below we have reported the modified results.

Table: 5.6 Production Function (Model 1)			
Number of Observations = 210 **Prob>F = 0.0000** **R-squared = 0.6078**			
Dependent Variable: log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | t |**
log of Labour (lnLb)	0.02328	0.0748207	0.756
log of Land (lnLa)	0.71295***	0.0987389	0.000
log of Fertilizer (lnF)	0.10689**	0.0433433	0.014
log of Pesticides (lnP)	0.05151	0.0507992	0.312
log of Capital Cost (lnC)	0.01532	0.0414513	0.712
Constant	8.15608	0.7066264	0.000

Significance at 1% ***, significance at 5% **, significance at 10% *

Table 5.6 reports that there are some variables which affect the output significantly. Among the explanatory variables land and fertilizer have positive and significant influence on the production of green tea leaves. Land is highly significant at 1% level. We have the elasticity of output with respect to land is 0.71. In other words one percent change in land use will lead to 0.71 percent change in the tea leaves output. This is expected because higher the use of land tends to raise the production level and output supplied by the growers. Similarly, the use of fertilizer is positively significant at 5% level of significance. The elasticity of output with respect to fertilizer is 0.10. It indicates that one percent change in the use of fertilizer will lead to 0.10 percent change in the tea leaves production.

For rest of the explanatory variables that is, labour, pesticides and capital cost, although the regression coefficients are positive but they are not statistically significant. So we ignore them.

Thus land is found to be a major contributor to change in output whereas fertilizer is also important although the effect on output is lower.

(ii) Multicollinearity Test

One of the assumptions of the OLS method is that there is no multicollinearity. To identify whether multicollinearity is present in our data, the Variance Inflation Factors (VIF) test has been used. As the values of VIFs are less than 4 in our data analysis which is presented in Table 5.7, it indicates that there is no multicollinearity problem among the variables.

Table: 5.7 Multicollinearity Test		
Variables	**VIF**	**1/VIF**
log of Land (lnLa)	3.1	0.32299
log of Pesticides (lnP)	2	0.49896
log of Labour (lnLb)	1.81	0.55217
log of Capital Cost (lnC)	1.71	0.58404
log of Fertilizer (lnF)	1.4	0.71661
Mean VIF	2	

Next, we expand our ambit a bit. Instead of confining to the regular economic variables specific to the farms we include social and non-farm specific factors. This new model we term as model 2 (in contrast to the results of model 1 whose results are reported in Table 5.6). Explanatory variables like linguistic community the farmer belong to, location of the farm (that is if the production is taking place in the districts with high concentration of STGs or districts with less number of STGs) have been included in model 2. These factors might be affecting the production of tea leaves. We got a clue regarding this from the last section. In the last section we have seen that these factors do indeed have a bearing on the supply of tea leaves (directly or through price). In this chapter we are pursuing the same route. The model is specified in equation (5.4).

$$\ln Y_i = \beta_0 + \beta_1 \ln Lb_i + \beta_2 \ln La_i + \beta_3 \ln F_i + \beta_4 \ln P_i + \beta_5 \ln C_i + \beta_6 d\_ling_i + \beta_7 d\_dold_i + \varepsilon_i \quad \text{..... (5.4)}$$

where, d_ling = Dummy for Linguistic Community the farmer belongs to;

d_dold = Dummy for districts with high concentration of STGs;

Other variables in (5.4) are same as in equation (5.3).

The OLS estimates of the coefficients of the model are presented in the appendix of the chapter (Appendix XII).

(i) Heteroskedasticity Test

To determine whether there is heteroskedasticity in model 2, the Breusch-Pagan test is conducted. Table 5.8 reports the presence of heteroskedasticity.

Table 5.8 Heteroskedasticity Test (3)
chi2(7) = 49.04 Prob> chi2 = 0.0000

Thus the presence of heteroskedasticity is observed in the model. Accordingly the same test is conducted to tackle heteroskedasticity. In table 5.9 below we have reported the results of the test.

Table: 5.9
Production Function (Model 2)

Number of Observations = 210
Prob>F = 0.0000
R-squared = 0.6533

Dependent Variable: log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**P>|t|**
log of Labour (lnLb)	0.04686	0.0718699	0.515
log of Land (lnLa)	0.71704***	0.0982815	0.000
log of Fertilizer (lnF)	0.06762*	0.0408455	0.099
log of Pesticides (lnP)	0.04418	0.0486459	0.365
log of Capital Cost (lnC)	0.09250**	0.0464914	0.048
Dummy for linguistic community (d_ling)	-0.00240	0.145558	0.987
Dummy for districts with high concentration of STGs (d_dold)	0.64013***	0.1467988	0.000
Constant	7.26637	0.753653	0.000

Significance at 1% ***, significance at 5% **, significance at 10% *

From table 5.9 we observe among the seven explanatory variables, four variables viz. land, fertilizer, capital cost and dummy for districts with high concentration of STGs have positive and significant influence on the production of green tea leaves. Fertilizer is a borderline case, which is marginally significant at 10% level, with a coefficient of 0.07. Land is significant at 1% level of significance. From the table it can be seen that the elasticity of output with respect to land is 0.71. That is one percent change in land leads to 0.71 percent change in the tea leaves production. The positivity of the sign was expected. Higher use of land tends to raise the production level and output supplied by the growers. The value of the coefficient is also similar to that reported in table 5.6. Similarly, the capital cost is positively significant at 5% level of significance. The regression coefficient or the elasticity of output with respect to capital cost is 0.09, indicating one percent change in capital cost leads to change in output by 0.09 percent. The dummy for districts with high concentration of STGs has a positive impact on the production of the farms at 5% level of significance. Compared to districts with low concentration of STGs, in the districts with high concentration of STGs the output is significantly higher. This is indicated by 0.64 in Table 5.9. Dibrugarh and Golaghat with a high concentration of STGs may have better infrastructure which might be good for the output. On the other hand, Biswanath, Sonitpur and Nagaon may have very few STGs, enabling infrastructure is less.

For rest of the explanatory variables, labour and pesticides used, the estimated coefficients are positive but they are not statistically significant. The dummy for linguistic community is negative but non-significant.

In sum, in model 2 land and dummy for districts with high concentration of districts are found to be the major contributors to the change in output whereas capital cost is also important although the effect on output is lower. Fertilizer is found to be a borderline case.

The regression coefficients in the Cobb-Douglas production function are the production elasticities, and their sum indicates the return to scale. In case of table 5.9, if we consider four explanatory variables which are found to be significant, the estimates of return to scale are much higher and significantly different from unity, indicating increasing return to scale. Return to scale for the sample growers is found to be 1.51729 showing overall efficiency of resource use in the sample tea growers. An increase in the use of the significant variables would result in more than proportionate increase in total production of green tea leaves. However, this method is problematic because dummy for older district is beyond farmer's control. If we consider the rest of the variables which are found to be significant (land, fertilizer and capital cost), the returns to scale is found to be 0.87716 which is less than unity. It basically shows decreasing returns to scale.

(ii) Multicollinearity Test

An assumption of the OLS method is that there is no multicollinearity. Now to identify whether multicollinearity is present in our data, VIF test is used. As the values of VIFs are less than 4 in our data analysis which is presented in Table 5.10, it indicates that there is no multicollinearity problem among the variables and the mean VIF is 2.19.

Table: 5.10
Multicollinearity Test

Variables	VIF	1/VIF
log of Land (lnLa)	3.88	0.257624
log of Labour (lnLb)	2.26	0.441619
log of Pesticides (lnP)	2.1	0.476953
Dummy for districts with high concentration of STGs (d_dold)	1.95	0.511521
log of Capital Cost (lnC)	1.91	0.523374
Dummy for linguistic community (d_ling)	1.71	0.584701
log of Fertilizer (lnF)	1.49	0.669081
Mean VIF	2.19	

In summary, from both the models, model 1 and model 2, it can be concluded that the explanatory variables land, capital cost, fertilizer and dummy of districts with high concentration of STGs are significant.

In the next section stochastic frontier method is used to determine the factors influencing the production of tea leaves, and also to determine if technical inefficiency is present.

(b) Estimation under Stochastic Frontier Method

Empirical Model

As has been explained in Chapter three that stochastic frontier model assumes that the output of a farm is a function of a set of inputs, the degree of inefficiency and a random error term. We start with the corresponding version of Model 1 as mentioned in the last section. Accordingly, a Cobb-Douglas production function is assumed with five independent variables (labour, land, fertilizer, pesticides, capital cost).

$$\ln Y_i = \beta_0 + \beta_1 \ln Lb_i + \beta_2 \ln La_i + \beta_3 \ln F_i + \beta_4 \ln P_i + \beta_5 \ln C_i + \varepsilon_i \quad \text{..... (5.5)}$$

where $\varepsilon_i = v_i - u_i$

v_i is a two-sided ($-\alpha < v_i < \alpha$) normally distributed random error that represents the stochastic effects outside the farmer's control. u_i is a one-sided ($u_i \geq 0$) efficiency component that represents the technical inefficiency of the farm.

We assume that the inefficiency error terms (u_i) are distributed in a truncated normal distribution, with the truncation at zero, and the distribution has a positive mean. But the convergence of the Maximum Likelihood Estimator was not achieved while we performed the test. According to Meestersa (2014) a reason for the non-convergence could be the underlying distribution is exponential, instead of truncated normal. We proceeded with the exponential distribution assumption of the disturbance terms.

The estimates of the coefficients of the stochastic frontier model are presented in Table 5.11.

Table: 5.11 Stochastic Frontier Model (Model 1)			
Number of Observations = 210 Wald chi2 (5) =279.80 Prob>chi2 = 0.0000			
Dependent Variable: log of Output (lnY)	**Regression Coefficient**	**SE**	**p>|z|**
log of Labour (lnLb)	-0.0252677	0.0278357	0.364
log of Land (lnLa)	0.7180343***	0.083045	0.000
log of Fertilizer (lnF)	0.0899076**	0.0385294	0.020
log of Pesticides (lnP)	0.0528719	0.0530526	0.319
log of Capital Cost (lnC)	0.0103209	0.0402686	0.798
Constant	9.25351	0.5278992	0.000
lnsig2v	-0.9171898***	0.1491892	0.000
lnsig2u	-1.528294***	0.3276672	0.000
sigma_v	0.6321713	0.0471566	
sigma_u	0.465731	0.0763024	
sigma2	0.6165459	0.0689788	
Lambda	0.7367165	0.1063639	
Likelihood-ratio test of sigma_u=0:chibar2(01) =13.50 Prob>=chibar2 = 0.000			

Significance at 1% ***, significance at 5% **, significance at 10% *

Like OLS estimates, in case of stochastic frontier model also we have taken two models. In Model 1 we have considered five explanatory variables (Labour, Land, Fertilizer, Pesticides and Capital Cost) which affect the output of the farm. Later, in Model 2, along with these five explanatory variables we shall include few non-farm specific factors. The dummy for linguistic community the growers belong to and the dummy for districts with high concentration of STGs have been considered in Model 2.

From table 5.11 it can be seen that the explanatory variables land and fertilizer are significant. This is in line with the results of Model 1 in the OLS estimation. The elasticity of output with respect to land is 0.71 indicating that one percent increase in land will lead to 0.71 percent increase in production. Land is significant at 1% and the use of fertilizer is positively significant at 5% level of significance. The elasticity of output with respect to fertilizer is 0.089, indicating that every one percent increase in fertilizer would increase the production by 0.089 percent. Thus the influence of fertilizer on output is lower than that of land use, as it was in table 5.6.

The influence of labour, pesticide and capital cost on output is low among other variables. Unlike the OLS results of table 5.6 the coefficients of labour is negative (and non-significant).

On the other hand, even though the influences of pesticides and capital cost on output are positive but they are non-significant.

The output from frontier includes estimates of the standard deviations of the two error components, σ_v and σ_u, which are labelled sigma_v and sigma_u respectively in the table. In the log likelihood, they are parameterized as $\ln\sigma_v^2$ and $\ln\sigma_u^2$, and these estimates are labelled as sigma2v and sigma2u in the output, frontier also reports two other useful parameterizations. The estimate of the total error variance, $\sigma_S^2 = \sigma_v^2 + \sigma_u^2$, is labelled sigma2, and the estimate of the ratio of the standard deviation of the inefficiency component to be standard deviation of the idiosyncratic component, $\lambda = \sigma_u / \sigma_v$, is labelled lamda.

At the bottom of the test output of table 5.11, the results of a test that there is no technical inefficiency component in the model is reported. This is a test of the null hypothesis $H_0: \sigma_u^2 = 0$ against the alternative hypothesis $H_1: \sigma_u^2 > 0$. The hypotheses of interest are tested using the likelihood-ratio test statistic. As the *p*-value is 0.000 (Prob>=chibar2 = 0.000), we reject the null hypothesis that there is no technical inefficiency and instead accept the alternative hypothesis that there is technical inefficiency. Therefore we conclude that there is technical inefficiency in Model 1.

Comparing Table 5.6 and Table 5.11, we can see that the coefficients of stochastic model are slightly different from that of OLS. The same set of explanatory variables land and fertilizer are found to be statistically significant in both the cases. The coefficient of land is found to be same in both the cases (0.71). The coefficient of fertilizer in case of OLS method is estimated to be 0.107 whereas in case of stochastic frontier method it is estimated to be 0.089. The explanatory variables labour, pesticides and capital cost are found to be non-significant in both the methods. The coefficient of labour which was found to be positive in case of OLS method is found to be negative in case of stochastic frontier method.

Next, we expand our scope. Instead of confining to the regular economic variables specific to the farms we include social and non-farm specific factors. This new model we term as Model 2 (in contrast to the results of Model 1 whose results are reported in Table 5.11). Like the OLS method, in case of stochastic method Model 2 is constructed where there is introduction of two factors viz. linguistic community the farmer belong to, location of the farm (if the production is taking place in the districts with high concentration of small tea growers or districts with less number of small tea growers). The model is specified in equation (5.6).

$$\ln Y_i = \beta_0 + \beta_1 \ln Lb_i + \beta_2 \ln La_i + \beta_3 \ln F_i + \beta_4 \ln P_i + \beta_5 \ln C_i + \beta_6 d\_ling_i + \beta_7 d\_dold_i + \varepsilon_i \quad \text{..... (5.6)}$$

where $\varepsilon_i = v_i - u_i$

d_ling = Dummy for Linguistic Community the farmer belongs to;

d_dold = Dummy for districts with high concentration of STGs;

Other variables are as in equation (5.3).

v_i is a two-sided ($-\alpha<v_i<\alpha$) normally distributed random error that represents the stochastic effects outside the farmer's control. u_i is a one-sided ($u_i \geq 0$) efficiency component that represents the technical inefficiency of the farm.

The estimates of the coefficients of the stochastic frontier model are presented in Table 5.12.

Table: 5.12
Stochastic Production Function (Model 2)

Number of Observations = 210
Wald chi2 (7) =317.67
Prob>chi2 = 0.0000

Dependent Variable: log of Output (lnY)	**Regression Coefficient**	**SE**	**p | z |**
log of Labour (lnLb)	-0.0142872	0.0269368	0.596
log of Land (lnLa)	0.7292346***	0.0826355	0.000
log of Fertilizer (lnF)	0.0655847*	0.0380635	0.085
log of Pesticides (lnP)	0.0450919	0.0522117	0.388
log of Capital Cost (lnC)	0.0787774*	0.0407067	0.053
Dummy for linguistic community (d_ling)	-0.0646563	0.1383146	0.640
Dummy for districts with high concentration of STGs (d_dold)	0.5651231***	0.1460601	0.000
Constant	8.396379***	0.5388798	0.000
lnsig2v	-0.9422524***	0.1498403	0.000
lnsig2u	-1.770919***	0.3714151	0.000
sigma_v	0.6242988	0.0467726	
sigma_u	0.4125246	0.0766089	
sigma2	0.5599255	0.0608933	
Lamda	0.6607808	0.1079165	
Likelihood-ratio test of sigma_u=0:chibar2(01) = 7.48 Prob>=chibar2 = 0.002			

Significance at 1% ***, significance at 5% **, significance at 10% *

From the above table 5.12 it can be seen that the explanatory variables land, fertilizer, capital cost and the dummy for districts with high concentration of STGs are significant. This is in line with the Model 2 results of the OLS (Table 5.9). Higher use of land tends to raise the production

level of growers. Similarly, impact of the use of fertilizer is positive and statistically significant at 10% level of significance. In the same way the coefficient of capital cost is positive and significant at 10% level of significant. The coefficient of dummy for districts with high concentration of STGs is positive and statistically significant. The elasticity of output with respect to land is positive (0.72) and it is highly statistically significant (p-value: 0.000), indicating that one percent increase in land will lead to 0.72 percent increase in production. Similarly, the elasticity of output with respect to fertilizer is 0.065, indicating that every one percent increase in fertilizer would increase the production by 0.065 percent. Compared to districts with low concentration of STGs, in the districts with high concentration of STGs the output is significantly higher. This is indicated by 0.56 in Table 5.12. Like table 5.9 here also one finds the evidence of technical inefficiency (reported at the bottom of the table).

Thus in case of the stochastic production function also it is observed that land, fertilizer use, capital cost and dummy for districts with high concentration of STGs are statistically significant. Among these the impact of land is the highest, whereas that of fertilizer is the least.

The influence of the explanatory variables labour, pesticides and dummy for linguistic community on output is insignificant.

Comparing Table 5.9 and Table 5.12, we can see that the coefficients of stochastic model are not very different from that of OLS. The same set of explanatory variables land, fertilizer, capital cost and dummy for districts with high concentration of STGs are found to be statistically significant in case of both the methods. The coefficient of land in case of OLS method is estimated to be 0.71 whereas in case of stochastic frontier method it is estimated to be 0.72. The coefficient of fertilizer which was found to be 0.067 in case of OLS method is slightly different in case of stochastic method and it is found to be 0.065. On the other hand, the explanatory variables labour, pesticides and dummy for linguistic community are found to be non-significant in case of both the methods.

(c) Sources of Technical Inefficiency:

It is observed from the above stochastic frontier analysis that there exists technical inefficiency. While the estimation results shed lights on the factors that affect output, hence our analysis is further expanded to determine the factors determining technical inefficiency. As we saw in chapter three the inefficiency effects, u_i, is a function of farm- and farmer- specific attributes. It can be defined as:

$$u_i = \delta_0 + \delta_1 Age_i + \delta_2 Educ_i + \delta_3 d\_ling_i + \delta_4 d\_t_i + \delta_5 FarmAge_i + \delta_6 FarmSize_i + \delta_7 d\_el_i + \delta_8 d\_TB_i + \omega_i$$

Here

- Age_i Age of the *i*th farmer in years;
- $Educ_i$ Number of years spent by the *i*th farmer on education;
- d_ling_i Dummy for Linguistic Community of the *i*th farmer;
- d_t_i Dummy for Own Transport of *i*th farmer;
- $FarmAge_i$ Age of the *i*th farm in years;
- $FarmSize_i$ Size of the *i*th farm in bighas;
- d_el_i Dummy for Electricity of the *i*th farm;
- d_TB_i Dummy for TB Registration of the *i*th farm;
- ω_i is unavoidable random error assumed to be independently distributed with a positive, half-normal distribution.

The summary statistics of the technical inefficiency are reported in Table 5.13.

Table: 5.13

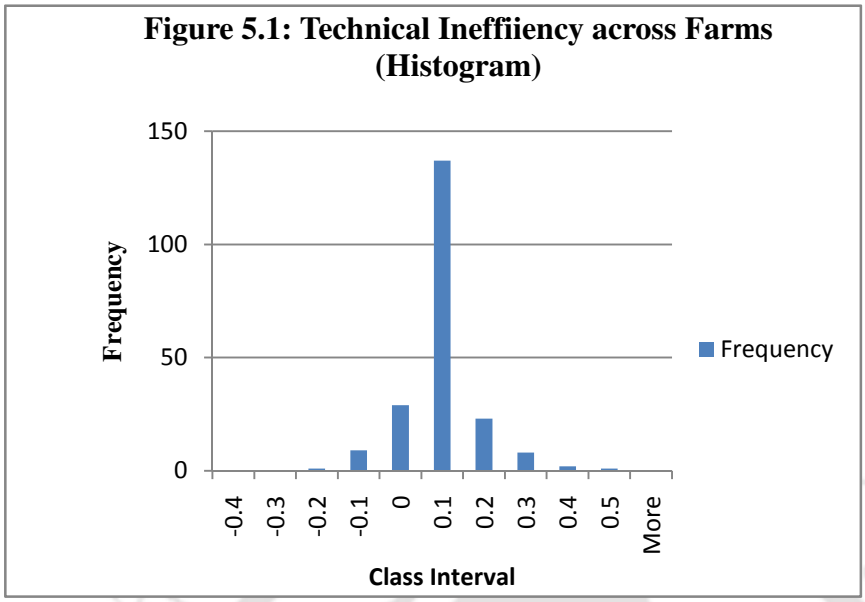
Summary Statistics of Estimated Technical Inefficiency

Technical Inefficiency	Value (%)
Mean	4.82
Standard Deviation	8.41
Minimum	-23.41
Maximum	43.65

Overall, technical inefficiency of the farms in our sample is quite low, with 4.82 percent being the average. The study of technical inefficiency of rice farmers of Assam (Bhattacharyya and Mandal, 2016) found to be 8.545. The mean technical inefficiency of paddy farmers of Haryana (Goyal, Suhag and Pandey, 2006) was found to be 0.23 per cent. Mean technical inefficiency of small tea growers of Udalguri district of Assam was found to be 0.17 (Lama *et al*, 2016). This implies that on average of the small tea growers fell short of maximum frontier level of technology by 4.82 percent.

The inefficiency measures across farms have been expressed with the help of a histogram. Highest technical inefficiency can be observed in the class interval of 0-0.1.

Figure 5.1: Technical Ineffiiency across Farms (Histogram)



The results of the estimation are presented in Table 5.14.

Table: 5.14
Technical Inefficiency Model

Number of Observations = 210
Prob>F = 0.0038
R-squared = 0.1054
Adj R-squared = 0.0698

Technical Inefficiency (TI)	Regression Coefficient	SE	p> |t|
log of Age of Farmer (lnag_fm)	-0.051654**	0.0210744	0.015
log of Education of Farmer (lnedu)	0.0068701	0.0154354	0.657
Dummy for Linguistic Community (d_ling)	0.0154689	0.0139771	0.270
log of age of farm (lnag_fa)	-0.280075***	0.0104488	0.008
Dummy for Own Transportation (d_t)	-0.0263949**	0.0129385	0.043
log of farmsize (lnfarmsize)	-0.0094442	0.0142036	0.507
Dummy for Electricity (d_el)	-0.0019507	0.0183117	0.915
Dummy for TB Registration (d_TBRegistration)	-0.0513459**	0.0217064	0.019
Constant	0.3128772	0.0934678	0.001

Significance at 1% ***, significance at 5% **, significance at 10% *

Table 5.14 reports that age of the farm, age of the farmer, availability of own transportation facility of the farmers and TB registration of the farmers are important variables that help to improve the efficiency of the growers. It indicates that as the age of the farm rises by one year there is 0.28 percent lower technical inefficiency. As the age of the farmer rises by one year there is fall of 0.05 percent technical inefficiency. Probably experience of the farmer as well as how many years the farm has been in the business tend to make the farm more efficient. On the other hand, small growers who have their own transportation facility have 0.02 percent lower

technical inefficiency than the growers who do not have their own transportation facility. We find that the technical inefficiency is 0.05 percent lower for dummy for growers who are registered with the Tea Board of India than the growers who are not registered with the Tea Board of India. Education has no significant impact on technical efficiency levels of the small tea growers. This is contradictory to the results found by Lama *et al.* (2016) where education is found to be positively related with technical efficiency of the growers.

5.5 Summary

The present chapter discussed (i) the estimation of exploitation of the small tea growers by the buyers of tea leaves and (ii) the estimation of factors determining the production function and possibility of presence of technical inefficiency. The major findings of the chapter are summarised as follows:

1. Supply function was estimated considering the factors price of the output, price of urea, price of MOP, price of SSP, price of cow-dung, price of vitamin, price of herbicides, wage rate of male workers, wage rate of female workers, farm-size and dummy for linguistic community. The four instrumental variables for price of tea leaves were: number of sales option of a farmer, distance from the farm to the point of sale, dummy for districts with high concentration of STGs and dummy for self sale of tea leaves. Some explanatory variables are found to be statistically significant. Price of urea (P_U), price of SSP (P_S), wage rate of male labour (wa_m), wage rate of female labour (wa_f) and the linguistic community of the grower belongs to are statistically significant.
2. From the supply function we have calculated the price elasticity of supply. This was used to estimate the monopsonistic exploitation of the small tea growers by the buyers of small tea leaves. The degree or the index of exploitation is found to be 0.19.
3. The data has been chategorized into four groups according to certain criteria to check intergroup variations of the coefficients of price elasticity of supply and in turn compare their degree of exploitation. Exploitation was found to be higher in the districts where concentration of STGs are less (compared to districts where the concentration of STGs are more), who belong to the Assamese community (compared to non-Assamese), who have a single sales options (compared to those with multiple sales option).
4. We used two alternative models to estimate production function of tea leaves with the OLS method. Model 1 considers the regular economic variables in the estimation of production

function of agricultural goods. In Model 2 along with farm specific regular economic variables some social and non-farm specific variables are also included. The explanatory variables considered in the Model 1 were labour, land, fertilizer, pesticides and capital cost, whereas along with these five explanatory variables Model 2 includes two non-farm specific factors viz. dummy for linguistic community and dummy for districts with high concentration of STGs. Our preferred specification is Model 2 since it is more comprehensive. We are reporting results of Model 2 here, although the results of Model 1 are not very different.

5. The Cobb-Douglas production function was used. Out of all the explanatory variables, land, fertilizer, capital cost and dummy for districts with high concentration of STGs are found to be statistically significant. The coefficient of elasticity of output with respect to land is 0.71, showing one percent change in land directly changes the production of tea leaves by 0.71 percent. The coefficient of elasticity of output with respect to fertilizer is 0.07, one percent change in fertilizer changes the production of output by 0.07 percent. In the same way, the coefficient of elasticity of output with respect to capital cost is 0.09, one percent change in capital cost changes the production of output by 0.09 percent. Lastly, the dummy for districts with high concentration of small tea growers are found to be statistically significant. Compared to districts with low concentration of STGs, in the districts with high concentration of STGs the output is significantly higher. This is indicated by 0.64.

6. It is observed that between Model 1 and Model 2 there is only minor change in the results of the coefficients of the explanatory variables or their significance levels. So we can say that results we have obtained are statistically robust.

7. Land is always significant. In both the models the elasticity of output with respect to land is found to be 0.71 which is higher than the elasticity of output with respect to any other explanatory variable. Fertilizer is also important although the effect on output is lower. Capital cost is also found to be significant in case of Model 2 (it was not significant in case of Model 1).

8. In reality farms may not use the available resources efficiently, this results in technical inefficiency and a consequent loss in output. Hence in the next step the stochastic frontier (SF) model is used to estimate the production function and to find the presence of technical inefficiency. The results are robust as the same set of explanatory variables are found to be statistically significant in the OLS estimation and in SF estimation. The relative importance of the explanatory variables has also remained the same. In either case of Model 1 and Model 2 technical inefficiency was detected. Land, fertilizer, capital cost and dummy for districts with

high concentration of STGs was found to be statistically significant, and this result is not very different from what we obtained in the OLS case. This consistency leads us to conclude with a degree of confidence that these variables are vital as far as production of tea leaves is concerned. It is observed that age of the farm, age of the farmer, availability of own transportation facility of the farmers and TB registration of the farmers have dampening effects on inefficiency.

The mean technical inefficiency is found to be 4.82.

Chapter VI

CONCLUSIONS AND POLICY IMPLICATIONS

Small tea growers of Assam occupy a significant place in the economy of Assam by providing livelihood to the thousands of unemployed youths in the backward pockets of the economy. In addition, these tiny tea gardens have changed the nature of operation of big tea factories. It is observed that availability of plenty of fallow lands and support provided by the State Government to bring those unutilized lands under tea cultivation has encouraged the small tea growers to start tea cultivation in the State. At the same time there are serious infrastructural weaknesses as far as the small tea gardens' operations are concerned. To tackle the labour scarcity and to reduce other costs the big estate factories have decreased their stake in their self production of leaves and have outsourced this production, which gave the small tea growers opportunity to sell their produce. With the establishment of BLFs the small tea growers got a further boost as they did not have to rely on estate factories alone.

Small tea cultivation comes under unorganized or informal sector of the economy, and the market structure is monopsonistic. The informal sector is marked by low bargaining power of the petty producers, extremely low wages, abysmal conditions of work, no social security, and job security. Literature points out that the small tea growers of Assam face several challenges like shortage of labour, infrastructural difficulty because of their location in the remote areas, financial constraints, low productivity, etc., which affect their produce quality which has a direct effect on the price of their produce. The small tea growers mostly rely on BLFs, tea agents (middlemen) and estate factory owners for disposing their green leaf at a price fixed by the buyers. Thus the small tea growers of Assam are probably exploited by the tea processing factories. In the present study an attempt has been made to investigate the possible exploitation of the small tea growers by the buyers of tea leaves. We also investigate the production conditions of small tea growers because that may give a clue as to what need to be done to boost production therefore profits.

Specifically, the present study has been conducted on the basis of the following objectives:

A. To investigate the possible monopsonistic exploitation of small tea growers by the buyers of tea leaves, and to investigate the production conditions of the small tea growers.

B. To frame policy prescriptions to enable the survival of small tea growers in the long run.

A survey was conducted by including 210 small tea growers from the five districts of Assam, viz., Biswanath, Sonitpur, Nagaon, Golaghat and Dibrugarh. Even though the concentration of small tea growers are more in the southern banks of Brahmaputra, but we wanted to take a sizeable part of the sample from the north bank, hence purposefully some districts were selected from the north banks. In the first stage a sample was selected from the list of small tea growers registered with the TBI. But to make the sample more comprehensive a reasonable number of unregistered with the TBI small tea growers have been selected. The enquiry was conducted by survey method. The primary data were collected by direct personal interview with the respondents. The secondary data were obtained from the TBI, AASTGA office, different journals, reports etc.

Data collected were tabulated and analysed using simple tabular analysis with averages and percentages along with coefficient of variation and maximum and minimum values. District-wise variation in the data could be noticed, there were variations across gender as well.

The major findings and results of analysis of the study are summarised below:

6.1 General Characteristics of the sample Small Tea Growers

It is observed that in 2014 an average sample small tea grower produced 23126 kg of green tea leaf whereas in 2016 on an average a small tea grower produced 26013 kg of green tea leaf. In 2014 the average area under cultivation was observed to be 3.07 ha which increased to 3.27 ha in 2016. Thus, it appears that one of the reasons of increased production of green leaf during the aforesaid period may be due to expansion of area under cultivation. The other element of rise of production was rise in yield, which rose from 7508 kg/ha to 7931 kg/ha in those two years. The age of the sample farmers lies between 19 to 75 years. And the age of the sample farms is 2 to 45 years. The average age of the farm is about 14 years. Small tea cultivation in Assam is a recent phenomenon.

In our data collection, utilization of labour, in terms of male labour (contractual as well as casual, family as well as hired) and female labour (contractual as well as casual, family as well as hired), has been worked out separately. On an average the average man-days of female labour per farm is found to be higher (1442.97) than average man-days of male labour (1341.09) per year. There is considerable difference between the wage rate of male and female workers. Besides, the wage rate paid to labourers is not uniform in all the sample districts. In our study the wage rate varies from Rs. 90 to Rs. 250 in case of male labour and Rs. 90 to Rs. 160 in case of female labour. A definite trend was that as the size of small tea farms increased, the contribution of family labour declined. The percentage of regular hired labour increased with increase in farm size.

The number of sales option, that is the number of sellers a farmer can sell to, ranges from 1 to 15. Not all the growers are restricted to sell their produce to a particular buyer. Distance of the farm to the nearest processing centre varies from adjacent area i.e, 0 km to 76.3 km. A considerable quantity of fertilizers in the form of urea, MOP, SSP, cow dung, and insecticides, pesticides and herbicides have been used to increase the productivity of tea leaves.

It is observed from our study that there is not much increase of the price of tea leaves over the years. On the other hand, the prices of the fertilizers, pesticides, insecticides and herbicides are rising quickly.

Most of the sample small tea growers are found to be from Hindu Assamese community.

66.19 percent of the sample small tea growers are found to sell their produce to the agents. 24.76 percent of small tea growers sell their produce directly to the BLFs and only 11.9 percent of the small tea growers sell their produce directly to the estate factories.

Majority of the farms are male owned and most of the farmers have land documents. As tea is cultivated in high lands, hence most of the tea gardens are generally not flood prone.

54.76 percent of the sample small tea growers have registered with the Tea Board of India (TBI). A majority of the sample tea growers (63.81%) have membership in the All Assam Small Tea Growers Association (AASTGA) and a significant percentage of the farms (47.14%) are registered with both the TBI as well as AASTGA.

The growth and development of small scale tea cultivations are self financed. Most of the tea growers are from low income groups and depend upon their family and relatives for finance. A

small percentage of the small tea growers have availed any credit either from institutional sources or from non-institutional sources.

6.2 Estimation of Monopsonistic Exploitation

In the present study the monopsonistic exploitation is calculated as the reciprocal of price elasticity of supply. The higher the price elasticity of supply, the lower is the level of exploitation and vice versa. A supply function is modlled where price is one of the important explanatory variables of supply of tea leaves. A logarithmic supply function is assumed. But as is well known price in the supply function is endogenous, it is affected by supply. Hence by taking some instrumental variables (IV) of price, the supply function was estimated and the price elasticity of supply was found, in order to estimate the exploitation of the small tea growers. In our study this is done with the help of two-stage-least square method. In the first stage price of tea leaves is instrumented with certain variables viz., (1) Number of options which the tea growers have to sell their tea leaves, (2) Distance between the tea garden to the processing plant, (3) A dummy for tea gardens which are situated in the more traditional districts and (4) A dummy for those tea growers who sell their tea leaves directly to the processing plant. From the estimation the price elasticity of supply is calculated to be 5.31 and accordingly the degree of exploitation is calculated to be 0.19. To understand what lies behind the exploitation we divided the sample according to some objective criteria and re-did the exercise. Exploitation was found to be higher among farmers in the districts with less concentration of STGs (compared to districts with more concentration of STGs), who belong to the Assamese community (compared to non-Assamese), who have a single sales options (compared to those with multiple sales option).

6.3 Production Function Estimation

A production function of the Cobb-Douglas form was used to model the major factors affecting the total amount of green tea leaf production. The different explanatory variables considered in the model were labour, land, fertilizer, pesticides and capital cost.

After running the OLS regression, all the variables were found to have the expected signs. Among the explanatory variables, land and the volume of fertilizer used had positive and significant influence on the production of green tea leaf. For the rest of the explanatory variables

that is, labour, pesticides and capital cost, although the regression coefficients are positive but they are not statistically significant.

To determine the presence of heteroskedasticity Breush-Pagan test was conducted. Heteroskedasticity is found to be present and accordingly the OLS estimation is conducted by tackling heteroskedasticity. Not much difference in the regression coefficient was observed. The same set of explanatory variables are found to be significant with only minor change in the value of regression coefficients.

VIF test was used to identify the presence of multicollinearity in the model. No multicollinearity problem was observed in the data.

In the second step, in model 2 some social and non-farm specific factors were included in addition to the variables in the model 1. These additional variables are linguistic community of the grower and the location of the farm. We found that among the explanatory variables, along with land and fertilizer the dummy for districts with high concentration of STGs is found to have positive and significant influence on the production of green tea leaves.

To determine the presence of heteroskedasticity in model 2, again the Breusch-Pagan test was conducted like before. Like model 1 in model 2 heteroskedasticity was found to be present. After taking care of the heteroskedasticity we found that there is not much difference in the regression coefficients. The same set of explanatory variables were found to be significant. Out of all the explanatory variables the four variables viz., land, fertilizer, capital cost and dummy for districts with high concentration of STGs are found to be significant like in model 1.

Like model 1, in case of model 2 also VIF test is conducted and there is no multicollinearity among the variables.

Thus from both the models it can be inferred that the same set of explanatory variables land, capital cost, fertilizer and dummy of districts with high concentration of STGs are found to be significant.

6.4 Estimation of Technical Efficiency

The study used the Stochastic Frontier Approach (SFA) to estimate the technical efficiency of the farmers. Like the OLS estimates, in case of stochastic method we have taken two models. In Model 1 we have considered five explanatory variables (Labour, Land, Fertilizer, Pesticides and Capital Cost) which are the usual inputs one takes in regressing the output in the literature. In Model 2, along with five explanatory variables include non-farm specific factors – the dummy

for linguistic community of the growers and the dummy for districts with high concentration of STGs.

In this case also it is seen that the explanatory variables land and fertilizer are significant. The influences of labour, pesticide and capital cost on output are low. Unlike the OLS results the coefficient of labour is negative and non-significant. Even though the influences of pesticides and capital cost on output are positive but they are non-significant.

It is observed that there is technical inefficiency in the production of tea leaves by the small tea growers.

Comparing OLS and SF models, in model 1 the coefficients of stochastic frontier model are only slightly different from that of OLS, even though the same set of explanatory variables land and fertilizer are found to be statistically significant in both the cases. On the other hand, the explanatory variables labour, pesticides and capital cost were found to be non-significant in both the methods.

In model 2 even though the coefficients of SF model are a bit different from that of OLS, in case of the SF also it is observed that land, fertilizer use, capital cost and the dummy for districts with high concentration of STGs are statistically significant like in the OLS. Among these the impact of land is the highest, whereas that of fertilizer is the least. Technical inefficiency was present in model 2 as well.

Thus the sample farmers are found to be technically inefficient in both model 1 and 2. This might imply that in the small tea cultivation of Assam optimum use of inputs is not taking place. Technical inefficiency can originate from lack of managerial skills of the farmers or dearth of coordination within the farm as well. This calls for better training of the farmers, which may add substantially to the level of yield and output of the small tea growers. It was observed that the age of the farm, age of the farmer, availability of own transportation facility of the farmers and TB registration of the farmers have dampening effects on inefficiency. It is likely that inefficiency is stemming from lack of experience and training which is why age is so important. It could also be due to lack of information, which is why TBI registration was important.

6.5 Policy Implications

Policy implications can be derived from our conclusion stated above. Implementation of these measures is expected to increase the production of green tea leaves of small tea growers and thereby boost up the production of made tea in Assam.

1. In our study land, fertilizer and capital cost are found to be positively significant for production of tea leaves. Perhaps the growers are not using land to the optimal amount, which gives this result. Policy should be formulated by the Government for the provision of greater accessibility of land to farmers. Fallow land with the Government can be made available on easier terms to the less affluent growers. There is a sizable amount of "barren and unusable land" with the Government, which can be reclaimed. Fertilizer has a positive impact on the production of tea leaves, even though the impact is not very high. As fertilizers cannot be afforded by the tea growers, they may be using it sub-optimally. Subsidy should be provided to correct this. Several Government policies exist regarding price subsidization of fertilizers. But either the policies are not applicable for the small tea growers or they are not effective. Existing policies should be revised or made effective for the benefits of the small tea growers. Capital cost per year also has a significant impact on the production of tea leaves in some cases. Various agricultural equipments are available on subsidy under various Government schemes like Central Sector Plan Scheme, etc., but during the field survey it was noticed that the small tea growers are not aware of them. Secondly, they prefer to purchase the agricultural machineries and tools through agents - which might be another source of exploitation. Efforts should be taken by the Government to make the small tea growers aware of the available benefits, and help the purchase of machines at a subsidized rate.

2. Technical inefficiency is found to be present in our study, and it most likely comes from lack of tranining and experience among other things. Suitable extension services, which train the farmers of the right farming practices, need to be taken up to educate the small tea growers about the rational use of inputs and farm management. The Government should design appropriate public policy for the small tea growers that would enhance their skills and bargaining power. Capacity building for the smallholders must not only include technical advice but also training on small enterprise management, finance and the wherewithal for them to set up self-help groups (SHGs) and other producers' organizations. SHGs are playing a significant role in Nilgiris by forming groups of STGs which arrange technical training for them. Focus was on improvement in field and changing the growers' plucking practices. Looking into the technical problems of the small tea growers, the Tea Board of India, Tea Research Authority and corporate tea producers should take the responsibility to train different aspect of tea cultivation to the small tea growers. This will improve the technical knowhow of the cultivators.

3. This is regarding the quality of leaves and better price realization and training. Tagat and Tagat (2017) mentioned that in 2002 the Farmer Producer Organization (FPO) was set up under NABARD in the context of prevalence of smallholders in agricultural sector in India. One of the initial objectives of FPO was to organize farmers for distribution of agricultural inputs like fertilizers, seeds and pesticides and later explore aggregation and grading of the produce. The role of FPO was extended to cater the needs of credit, market access, technology adoption, handholding support for enhancing productivity, etc., of the fragmented and sub-divided farmers. It has been argued that by organizing themselves into producer companies, small and marginal farmers stand to reap the benefits of economies of scale as well as collective bargaining. Thus by forming the FPOs in small tea gardens NABARD can extend its role for the benefits of the small tea growers. FPO can also participate in value-adding processes such as grading, processing and packing. Accordingly they can negotiate better prices because of an improved bargaining position.

4. Price Stabilization Fund Scheme was introduced in 2003 by the Ministry of Commerce and Industry with a view to protect the farmers of plantation crops including tea from losses on account of price fluctuations. The scheme was formulated for the benefits of small farmers to obtain some compensation as and when price falls below a certain level. The scheme should be properly implemented with quarterly revisions as per price fluctuation in the market and timely release of money to the small tea growers should also be ensured. During the survey it is noticed that the small tea growers are not aware of it. There should be wide publicity to these schemes.

5. Very few farmers in our survey were taking production loans from the formal sector institutions, which could be reason for suboptimal use of capital found in our tests. This is despite the Priority Sector Lending (PSL) policy of the Reserve Bank of India. This policy directs banks to provide a specified portion of loans to few specific sectors like agriculture and allied activities, micro and small enterprises, etc. The Commercial Banks of the State must expand lending operations under PSL by extending their loans to small tea gardens. A thorough and systematic planning should be devised for sanction of loans under this scheme.

6. In our survey differences in the wages between genders, as well as prevalence of low wages were found. Male labours receive wages in between Rs. 90 to Rs. 250 per day whereas the female labours receive Rs. 90 to Rs. 160 per day. In other words, on an average the male labours receive Rs. 170/day and female labours receive Rs. 125/day, which are in any case much lower than the prescribed minimum wage. According to Government of Assam, Office of Labour

Commissioner, the latest minimum wage for the unskilled labour which was forwarded on 4th January, 2016 is Rs. 250/day or Rs. 7500/month irrespective of the sex of the labour (Government of Assam, 2016). But to get rid of exploitation, the policy should be strictly followed and the proper monitoring by the Government authority should be done on regular basis.

7. Exploitation of small growers is noticed in our study. It was found that farmers who have a single sales option are exploited more than those with multiple sales options. This implies that due to lack of avenues to sell the produce the farmers are forced to accept lower price. One possible way to tackle this exploitation to form farmers' cooperatives in order to get the benefit of collective bargaining of farmers. The Government should take steps by guiding the growers and encouraging them to form co-operatives. This may help in not only to overcome the exploitation by monopsonistic buyers, but also to avail the benefits of Government schemes and programmes. The co-operatives should be encouraged to take entrepreneurial ventures, and for owning and operating bought leaf factories of their own as is common in the Southern India.

8. Wide-spread non-registration of growers with the TBI was noticed. We also found that non-TBI farms are more inefficient. Registration of small tea growers is essential for identification of actual number of small tea growers for compiling area, production and other data, and for devising programmes to benefit them. The TBI should take extensive registration programme to register all the small tea growers of Assam. It was found that many growers were not registered and therefore not eligible for the benefits provided by the Tea Board and the Government. There were complaints of bribes related to registration renewal and of non-existence of benefits from the growers. Such factors may have discouraged registration and its renewal. They should be addressed.

9. Tea cropping in Assam is seasonal in nature; the peak cropping months are July, August, September and October. Every year during these months the green leaf price goes down severely because of oversupply. In the State budget 2015-16 it was announced that during peak harvesting season, STGs can store green leaves in cold storage units. Even factories can store them in cold storage if they receive leaves beyond the factory capacity. For the proper application of such strategies Government should focus on green-leaf cold storages in the vicinity of the small tea gardens. The fact that older district farmers face less exploitation is probably because the supporting infrastructure is more developed in those districts. Priority Sector Lending policy can be useful in this regard. Building of infrastructure facilities, such as

roads, electricity is an important and related issue. Poor road conditions often mean that the STGs receive low prices.

10. In most districts plucking standards are found to be arbitrary, the general practice of one bud with two leaves was very rare. Tea leaves are plucked in the morning, and it is collected by the agents by the evening which deteriorates the quality of the tea leaves, as a result of which small tea growers received non-remunerative price for green leaf. An effective monitoring unit should be established to ensure that the quality of green leaf plucked is fine and uniform. This may lead to protest from the growers immediately. But it would benefit them in the long run in terms of building a reputation and getting remunerative prices.

11. Historically, at the time when the Tea Board was set up in 1954, small tea growers were non-existent. Tea Board does not have an institutional set up to cater the needs of the small tea growers. During the 12th Plan period Tea Board introduced Tea Directorate. A STG Directorate should have within its purview the functioning of small tea growers so that maximum number of small tea growers can avail the Tea Board benefits. Licenses of the BLFs should be issued by the STG Directorate conditional to implementation of the Price Sharing Formula (PSF). From our survey it is noticed that either the PSF is not followed. As the price received by the small tea growers is low, hence it can be inferred that the PSF is not effective on the ground. Hence (a) implementation of the formula should be emphasized and made effective, (b) the formula should be closely examined, and revised if necessary. It should be followed up by the STG Directorate whose aim should be to gurantee a fair price to growers.

6.6 Conclusions

The introduction of small scale tea cultivation had a positive impact on the rural economy of Assam. It has brought changes in the socio-economic scenario of rural Assam, particularly in the occupational pattern. Apart from self employment, the small tea cultivation has opened wide vistas of business opportunities, which provided employment with steady income to many stakeholders. Many farmers reorganised their highland crops fields for small tea cultivation. Thousands of hectares of sugarcane fields, pineapple gardens, homestead gardens and bamboo forests made way for small tea cultivation. Mostly educated unemployed youths came forward for small tea cultivation without any direct help from Government. From our findings it may be concluded that there exists scope for increasing the productivity and income of the small tea growers. However, their scattered nature, lack of organisation among growers, lack of

commercial capacity, low levels of technical knowledge and limited access to resources are serious impediments. Many growers live in dismal economic conditions in remote areas of the border regions. Failure to get a fair price has a significant impact on their sustainability. Lack of infrastructure, exploitation by buyers, lack of awareness, varying quality standard of the product, etc. are some of the challenges the small tea growers face. From our study we find there is scope for overcoming at least some of these hurdles if proper policy is formulated and implemented.

We found that the production by small tea growers critically depends on a number of factors like, use of the available land, fertilizers, etc. Exploitation of the growers has been noticed. It is observed that the small tea growers are technically inefficient. Some policies have been suggested so that the productivity of the growers can be increased.

It goes without saying that in every business the future prospects are judged by the rate of returns. The high rate of returns in the business of small tea cultivation till recently attracted a number of growers. Interestingly, this is not the only attraction. Our questionnaire elicited information regarding the satisfaction from the small tea cultivation. Out of 210 sample small tea growers 182 (86.67%) have reported their satisfaction from the small tea cultivation. They ranked small tea cultivation over other cultivation not only due to the profitability of the business but also to the prestige associated with tea cultivation. Besides, other practical considerations such as the fact that tea bushes once planted would yield returns for the entire life time of the growers, that tea cultivation is less strenuous and demanding than any other cultivation played a part. Even though at present the small tea growers of Assam are producing a considerable amount of green tea leaves, they have been struggling on many fronts as described above. One only hopes that the policy prescription mentioned here would be taken into account by the concerned authorities. That would assist in the economic upliftment of small tea growers and other stakeholders associated with the sector.

BIBLIOGRAPHY

Abrar, Suleiman (2001) "Duality, Choicebof Fundamental Form and Present Supply response in Ethiopia". *Centre for Research in Economic Development and International Trade, University of Nottingham*. CREDIT Research Paper. No. 01/20.

Ahuja, H. L. (1997) "*Advanced Economic Theory: Microeconomic Analysis"* (New Delhi: S. Chand and Company Ltd.)

Ahmed, N., G.M. Chaudhry and M. Iqbal (2002) "Wheat Productivity, Efficiency, and Sustainability: A Stochastic Production Function Analysis" *The Pakistan Development Review,* 14.4 Part II (Winter 2002) pp. 643-663

Ali M. Khalil "A Cross Section Estimate of Translog Production Function: Jordanian Manufacturing Industry".

Andrews, Hazel Patterson and Carlisle A. Pemberton (2008). "Factors Affecting Profitability of Small Scale Farming in Southern Trinidad and Tobago". *International Journal of Food and Agricultural Economics,* ISSN 2147-8988, Vol. 2, No.3, pp 1-18, 2008

Anthony O. Gyaong and Kwabena Gyimah-Brempong (2001) "Factor Substitution, Price Elasticity of Factor Demand and Returns to Scale in Police Production: Evidence from Michigan"

Arha, R.S. and Singh Latika (2008) "*Glimpses of Assam*" (Jaipur: ABD Publishers).

Arunatilake, Nisha and Jayawardena (2010) "Why People Choose to Participate in the Informal Sector in Sri Lanka" *The Indian Journal of Labour Economics,* Vol. 53, No. 2.

Arya, Nizara (2013) "Indian Tea Scenario" *International Journal of Scientific and Research Publications*, Vol. 3, Issue 7, July 2013, pp. 1-10.

Ashenfelter Orley C, Ferber Henry and Ransom Michael R. (2010) "Modern Models of Monopsony in Labour Markets: A Brief Study", IZA DP No. 4915, Discussion Paper Series.

Azhagaiah, R and R. Deepa (2012) "Determinants of Profitability of Food Industry in India: A Size-Wise Analysis" *Kanchi Mamunivar Centre for Postgraduate Studies, India* Vol. 7 pp 111-128

Baanante, C.A and Surjit S. Sidhu. (1981) "Estimating Farm-Level Input Demand and Wheat Supply in the Indian Punjab Using a Translog Profit Function". *American Journal of Agricultural Economics,* Vol. 63, No. 2, May 1981.

Banerjee, G.D. and Banerji, Surajit (2008) "Tea Industry: A Road Map Ahead", (Delhi: Abhijeet Publications)

Banerjee, Basudeb (2011) *"Contribution of Smallholders to the Tea Sub-Sector and Policies Required to enhance their livelihood"*

Barooah, Madhumita and Baruah, Swapon (2009) "Women Small Tea Growers: On the Road towards Empowerment" (Human Development Resource and Coordination Unit Planning and Development Department, Government of Assam)

Baruah, Pradip (2004) "Growth and Development of Tea Industry of Assam: An Analytical Study" (Thesis submitted to Gauhati University, Guwahati).

Baruah, Prarthana (2015) "Problems of Small Tea Growers: A Study in Sonitpur District, Assam", *Social Change and Development;* Vol. XII No.1, 2015

Basole, Amit and Basu, Deepankar (2011) "Relations of Production and Modes of Surplus Extraction in India: Part II- 'Informal' Industry", *Economic and Political Weekly; April 9, 2011, Vol XLVI No 15*

Basu, Majumder A., Bera B. and Rajan, A. (2010) "Tea Statistics: Global Scenario" *Inc. J. Tea Sci.* 8(1).

Basu, Deepankar, Das, Debarshi and Misra, Kartik (2016) "Farmer Suicide in India: Trends across Major States, 1995-2011", *Economic and Political Weekly*, 51:21, 61-65, 2016.

Batabyal Somnath (2014) "Assam's subaltern ruse- Reflections on a failed revolution", Himal A Review Magazine of Politics and Culture, Vol 27 No 2.

Battese, George E. (1991) "Frontier Production Functions and Technical Efficiency: A Survey of Empirical Applications in Agricltural Economics", Dept of Econometrics, University of New England, Armidale, N.S.W. 2351, Australia.

Battese, George E. (1997) "A Note on the Estimation of Cobb-Douglas production Functions When Some Explanatory Variables of Zero Values", *Journal of Agricultural Economics*, 48(2) 1997, 250-252.

Battese, G. E. and T.J. Coelli (1995) "A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data", *Empirical Economics.* Vol. 20. No. 2, 325-332.

Benoit, Kenneth (2011) "Linear Regression Models with Logarithmic Transformations", Methodology Institute, London School of Economics.

Bezat, Agnieszka (2009) "Comparison of the Deterministic and Stochastic Approaches for Estimating Technical Efficiency on the Example of Non-Parametric DEA and Parametric SFA Methods", Metody Ilosciowe W Badaniach Ekonomicznych X, 2009, str. 20-29

Bhatia, M.S. (2006) "Sustainability and Trends in Profitability of Indian Agriculture", *Agricultural Economics Research Review*, Vol. 19 pp 89-100.

Bhattacharjee, Prabin Kumar (1985) "Statistical Analysis of Long-Term Experiments on Tea" A Thesis presented to Gauhati University (PhD)

Bhattacharjya, Pranjal Kumar (2014) "Co-operative tea factory of Tripura an eye opener for Arunachalee STGs"; "Small Tea Growers in Assam"; *The Sentinel*, 16 May 2014; Guwahati

Bhattacharjee, A. and Mandal, R (2016) "A Generalized Stochastic Production Function Analysis of Technical Efficiency of Rice Farming", *Indian Growth and Development Review,* Vol 9, No 2, 2016, pp. 114-128, https://doi.org/10.1108/IGDR-10-2015-0041

Bhowmik, Sharit K (1991) "Tea Industry: Small Growers to Prop up Large Plantations", *Economic and Political Weekly;* 1989-1790, July 1991.

Bhuyan, Diganta Kumar (1993) "A Study on Financing the Small Tea Growers in Golaghat District of Assam" A Thesis presented to AAU (PhD)

Bhuyan, Rana Pratap (2004) "Economic Analysis of Green Leaf Production – The Case of Small Tea Growers of Assam" A Thesis presented to AAU (PhD)

Bonabana, J. and Wabbi (2002) "Agricultural profitability and technical efficiency: the case of pineapple and potato in SW Uganda", *American Journal of Agricultural and Resource Economics*, Vol 8, No.3 pages 145-159.

Borah, Ajit Chandra (2008) "Introduction of Small Scale Tea cultivation and Its impact on Land Use and Socio-Economic Condition of the People of Sibsagar District, Assam", (Thesis submitted to North-Eastern Hill University, Shillong, Meghalaya).

Borah, Kaberi (2013) 'Entrepreneurship in Small Tea Plantation: A case of Assam'. *The Echo, 1 (3) A Journal of Humanities and Social Science.*

Borah, Kaberi (2013) "Tea Cultivation on Small Holding: A New Business Opportunity for the Indigenous People of Assam", *EXCEL International Journal of Multidisciplinary Management Studies;* Vol. 3(1).

Borah, Kaberi and Das Dr. Ashim Kr. (2015) "Growth of Small Tea Cultivation and Economic Independence of the Indigenous People of Assam", *International Journal of Research in Social Science and Humanities;* Vol. No. 5, Issue No. 1, Jan-Mar, ISSN: 2249-4642.

Borah, Achyut Krishna (2013) "Socio-Economic Condition and Income and Expenditure Pattern of Plantation workers With Special Reference to Lepetkota Tea Estate" *International Journal of Innovative Research and Studies* Vol. 2 Issue 10.

Borah, Pujashree (2016) "A Study on the Problems and Strategies required for the development of Small Tea Growers in Assam with special reference to Dibrugarh District", *International Journal of Humanities and Social Science Studies (IJHSSS), Vol II, Issue VI, May 2016, Page No. 177-183*

Bordoloi, Prasanna Kumar (2012) "Global Tea Production and Export Trend with special reference to India", Research paper, Statistics and Agricultural Economics Dept, Tocklai Experimental Station, Tea Research Association, Jorhat.

Bose, Sanat (1986) "Assam Tea-Garden Labour Strike of 1920-21: A Fresh Appraisal" in *North East India History Association, Vol.VII, 1986*

Chand, Ramesh, Prasanna, P.A. Laxmi and Singh, Aruna (2011) "Farm Size and Productivity: Understanding the Strengths of Smallholders and Improving Their Livelihood", *Economic and Political Weekly,* Vol. XLVI (Pg 4-11), No. 26 and 27, June 25, 2011.

Chang, Kaison (2015) "World Tea Production and Trade Current and Future Development", Food and Agriculture Organization of the United Nations

Chatterjee, S. and Das Gupta, R. (1981) "Tea Labour in Assam: Recruitment and Government Policy, 1840-80", *Economic and Political Weekly,* XVI (44-46): 1861-1868, Nov. 1981.

Chatterjee, Tonmoy and John, J (2012) "Price Stabilization Fund for Tea Towards An Alternative Approach", NRPPD Discussion Paper 19

Chavas, J.P. and Cox, T.L. (1995) "On nonparametric supply analysis", *American Journal of Agricutural Economics,* Vol. 77, no. 1, pp. 80-92

Chen, Martha Alter (2007) "Rethinking the Informal Economy: Linkages with the Formal Economy and the Formal Regulatory Environment", *Economic and Social Affairs,* DESA Working Paper No. 46

Choudhary, Md. Ali; Khan, Mushtaq Ahmed and Naqvi, Kaukab Hassan (1998) "Estimating Farm Output Supply and Input Demand Elasticities: The Translog Profit Function Approach". *The Pakistan Development Review,* 37:4 Part II, 1998.

Constantin, P.D.; Martin, D.L. and Rivera, E.B.B.R. (2009) "Cobb-Douglas, Translog Stochastic Production Function and Data Envelopment Analysis in Total Factor Productivity in Brazilian Agribusiness" *The Flagship Research Journal of International Conference of the Production and Operations Management Society,* Vol. 2, No.2, July-Dec 2009

Dale, Squires (1987) "Long Run Profit Functions for Multiproduct Firms". *American Agricultural Economics,* 1987.

Damuth, Robert J. (2011) "Estimating the Price Elasticity of Ferrous Scrap Supply", NATHAN Associates Inc.

Das, Debarshi and Saikia, Arupjyoti (2011) "Early Twentieth Century Agrarian Assam: A Brief and Preliminary Overview", *Economic and Political Weekly,* Vol. XLVI, No. 4, Oct 2011

Das, Debarshi (2016) "Agricultural Investment in India in Recent Decades: A Political Economic Note of it Causes and Consequences", in Economic Challenges for the Contemporary World: Essays in Honour of Prabhat Patnaik (edited: M Das, S Kar, N Nawn), 286-299, Sage Publishing , New Delhi.

Das, H.N. (2008) "Assam Tea: Problems and Prospects" (Guwahati: EBH Publishers)

Das, Kalyan (2010) "Smallholding Tea Plantations of Sri Lanka and Assam", *International Journal of Ethnic and Social Studies,* Vol. I, No. 1

Das, Kalyan (2012) "Tea Smallholdings in Assam: Is there a Way Out?", *Economic and Political Weekly,* Vol. XLVII No 11, Mar. 2012.

Das, Kalyan (2013) "Plantation Infrastructure and the Performance of Assam's Tea Sector: An Analysis on the Smallholding Tea Plantation Sector", NRPPD Discussion Paper 29.

Das, Kalyan (2014) "*The Tea Smallholdings of Assam Search for competitiveness and inclusiveness*" (Guwahati: DVS Publishers).

Das, Ram Naresh (2014) "A Study on the Role of Tea Board of India in Promotion of Small Tea Growers With Special Reference to Dibrugarh District of Assam", *Global Journal for Research Analysis*, Vol3, Issue 9.

Dev, S. Mahendra (2012) "Small Farmers in India: Challenges and Opportunities", WP-2012-014

Diewert, W.E. (2008) "Applied Economics" Chapter 9: Flexible Functional Forms

Dutta Saikia, Deepika (2016) "Significance of Financial Inclusion in Small Tea Sector (A Case Study in Dibrugarh and Tinsukia Districts of Assam)", *International Journal of Humanities and Social Science Studies (IJHSSS), Vol II, Issue V, March 2016, Page No. 86-93*

Escudero, W.S. (2009) "Generalized Least Squares and Heteroskedasticity" Econ 507. Econometric Analysis. Spring 2009

Farooq, U., Young., N, Russel and Iqbal, M,. (2001) The Supply response of basmati rice growers in Punjab, Pakistan: price and non-price determinants. Journal of International Development, No 13: 227-237.

Ganguli, Partha (2013) "*The Problems of Small Tea Growers in Assam*" (Dibrugarh: Mahaveer Publication)

Ganguli, Partha (2014) "Small Tea Growers of Assam: Theories, Practices and Challenges of an Indigenous Entrepreneurship", *International Journal of Informative and Futuristic Research,* Vol. 2, Issue 1, Sep 2014, pp. 21-27.

Garcia-Bolivar, Omar E. (2006) "Informal economy: is it a problem, a solution or both? The perspective of the informal business" Northwestern University School of Law, Law and Economics Papers

Ghosh, A., Sinha, N.K., Ghosh. S., Rathor, U. "Seemingly Unrelated Regression", Indira Gandhi Institute of Development Research

Gerxhani, Klarita (2004) "Informal Sector in Developed and Less Developed Countries: A Literature Study", Public Choice 120: 267-300

Gogoi, Manuranjan (2012) "An Economic Analysis of Bought Leaf Tea Factories- A Case Study in Sibsagar District of Assam" Ph.D. Thesis, Assam Agricultural University, Jorhat.

Goswami, P.C. (1988) "*The Economic Development of Assam*" (New Delhi: Kalyani Publishers).

Goswami, Mukuta (2006) "Emerging Entrepreneurship in Tea Plantation: A Study of Small Tea Growers of Assam" (Thesis submitted to Gauhati University, Guwahati)

GAZETTEER OF INDIA, ASSAM STATE , Vol. 1, Editted by Mr. Amlan Baruah, ACS, and Smt. S.B. Choudhury, ACS, Government of Assam, Guwahati: Assam, 1999

Goswami, Deba Jyoti (2013) "Use of Chemical Fertilizers and Pesticides in Small Tea Gardens of Assam and its Effect on Environment: A Case of Golaghat District", International Journal for Basic Sciences and Social Sciences (IJBSS), 2(2), 2013

Goowalla, Horen (2015) "A Study on the Problem and Prospect of Small Tea Growers in Assam with special reference to Jorhat District", *International Journal of Scientific Engineering and Applied Science*- Vol-1, Issue-4, July 2015.

Goyal, S.K., Suhag, K.S. and Pandey, U.K. (2006) "An Estimation of Technical Efficiency of Paddy Farmers in Haryana State of India", *Ind. Jn of Agri Econ Vol. 61, No. 1 Jan-Mar 2006.*

Guha, Amalendu (1977) "*Planter-Raj to Swaraj: Freedom Struggle and Electoral Politics in Assam 1826-1947*" (New Delhi: People's Publishing House)

Gupta, Bishnupriya (1995) "Collusion in the Indian Tea Industry in the Great Depression: An Analysis of Panel Data", Discussion Paper 1995-74, Tilburg University, Center for Economic Research.

Hannan, Abdul (2013) "Organizational Innovations and Small Tea Growers (STGs) In India", NRPPD Discussion Paper 25, Centre for Development Studies, Thiruvantananthapuram

Harikumar, S. (1986) "Impact of Agricultural Credit in the Agricultural Development of Kuttanand" (Thesis submitted to University of Cochin, Cochin)

Hazarika, Kakali (2012) "A Cup of Tea; the Market Mechanism behind it" *Indian Journal of Research;* Vol.1, No 3

Hazarika, Kakali (2012) "Tea Tribes are lagging behind in the Process of Urbanization: A Study on Selected Tea Gardens of Jorhat District, Assam", *International Journal of trends in Economics Management and Technology;* Vol. I, Issue 6

Hazarika, Kakali "Tea Auction Market - With a special reference to Guwahati Auction Centre"

Hazarika, Kakali and Borah, Kaberi (2013) "Small Tea Cultivation in the Process of Self-Employment: A Study on the Indigenous people of Assam (India)", article published by *International Journal of Latest Trends in Finance and Economic Sciences*, Vol-3 No.2

H´ector Salgado Banda Lorenzo E. Bernal Verdugo Banco de M´exico Banco de M´exico. "Translog Cost Functions: An Application for Mexican Manufacturing". April 2007

Hicks, Alastair (2001) "Review of Global Tea Production and the Impact on Industry of the Asian Economic Situation", www.journal.au.edu

Hussain, Moon Moon and Hazarika, Sumee Dastidar (2010) "Assam Tea Industry and Its Crisis", Dialogue (July-Sep, 2010), Vol 12, No.1

Hong, N.B. and Yabe, M. (2015) "Resource Use Efficiency of Tea Production in Vietnam: Using Translog SFA Model" *Jouenal of Agricultural Science; Vol. 7, N0.9, ISSN 1916-9752.*

Hong, N.B. (2016) "Sustainable Tea Production at the Northern Mountainous Region in Vietnam", a dissertation submitted to Kyushu University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Agricultural Science, Department of Agricultural and Resource Economics.

Hussmanns Ralf, "Defining and measuring informal employment"

Hyuha, T.S.; Bashaasha, B.; Nkonya, E. and Kraybill, D. (2007) "Analysis Of Profit Inefficiency In Rice Production In Eastern And Northern Uganda". African Crop Science Journal, Vol. 15, No. 4, pp. 243 - 253 ISSN 1021-9730/2007

Izekor, O.B. and Olumese, M.I. (2010) "Determinants of Yam Production and Profitability in Edo State, Nigeria" *African Journal of General Agriculture.* Vol.6, No.4, December 31, 2010.

Johnston, J and J DiNardo (1997) "*Econometric Methods*" (McGraw Hill International Editions)

Johnson Liby T. (2009) "Sustainable Livelihood for Indian Small Tea Growers and Workers", Traidcraft Exchange Centre for Education and Communication, India, DFID CSCF Project, CN 536, Report of External Final Evaluation

Joseph, Merlin (2002) "Problems and Prospects of Tea Plantation Industry in Kerala", (Thesis submitted to the Cochin University of Science and Technology)

Kadavil Saji M. (2008) Indian Tea Research

Kanyua, M.J; Ithinji, G.K., Waluse, S.K.; Wairimu, W.R. (2015) "Factors Influencing Profitability of Diversified Cash Crop Farming Among Smallholder Tea Farmers in Gatanga District , Kenya" *Journal of Economics and Sustainable Development.* ISSN 2222-2855, Vol.6, No.3, 2015

Kakati, Niranjan (2011) "Problems of Small Tea Growers in Assam with Reference to Lakhimpur District", *Indian Journal of Applied Research*, Vol 1, Issue3.

Kakati, Niranjan (2012) "Income of a Small Tea Growers of Assam- An Evaluation", *Indian Journal of Research;* Vol.1, Issue 7

Kapila, Uma (2008) "*Indian Economy Since Independence*" (Academic Foundation, New Delhi)

Kar, Guruprasad (2018) "The Enduring Prevalance of Semi-feudal Agrarian Relations in India", *Journal of Labour and Society,* Page 1-21, https://doi.org/10.1111/wusa.12335

Karmakar, K. G. and Banerjee, G.D. (2005) "The Tea Industry in India: A Survey", Department of Economic Analysis and Research and National Bank for Agriculture and Rural Development, Mumbai.

Kavita, G. (2014) "A Study on Problems and Prospects of Tea Growers with Particular Reference to Nilgiries District (TN) in India", *International Journal of Research in Commerce, IT and Management,* Vol 4 (2014), Issue 1(January).

Kushwala, Ram Rup (2007) "Production and Productivity Performance of Pulses and Their Contribution in Income and Employment of Farms in Chitrakoot Dham Region of UP State", A Thesis presented to Bundelkhand University, Jhansi (PhD).

Kumar, P., P. Shinoj; Raju, S.S.; Kumar, Anjali; Rich, Karl M.; and Msangi, Siwa (2010) "Factor Demand, Output Supply Elasticities and Supply Projections for Major Crops of India" *Agricultural Economics Research Review.* Vol. 23 Jan-June 2010 pp 1-14

Kyi, T and M.V.Oppen (1999) "Stochastic Frontier Production Function and Technical Efficiency Estimation: A case study on irrigated rice in Myanmar", Deutscher Tropentag 1999 in Berlin Session: Sustainable Technology Development in Crop Production

Lama, Bondona (2016) "Efficiency Levels of Small Tea Growers in Udalguri District of Assam", A Thesis presented to Sikkim University (PhD)

Losby, Jan L. and Kingslow, Marcia E. (2003) "The Informal Economy – Experiences of African Americans", ISED Solutions, Creating opportunity, Building Capacity.

Marshman, J.C (2012) "Notes on the Production of Tea in Assam, and in India Generally", Cambridge University Press

Mansingh, P and Johnson, L.T. (2012) "Comparative Analysis of Existing Models of Small Tea Growers in Tea Value Chain in the Nilgiris" NRPPD Discussion Paper 20, Centre for Development Studies, Thiruvantananthapuram

Mitra, Nilanjana (1988) "An Econometric Study of Some Aspects of The Indian Tea Induatry", (Thesis submitted to Culcutta University, Culcutta).

Mitra, N. (1991) "Indian Tea Induatry: Problems and Policies", Economic and Political Weekly, Vol. 26, No. 48 (Nov 30, 1991), pp. M153-M156

Machek, O and Spicka, J. (2014) "Productivity and Profitability of the Czech Agricultural Sector After the Economic Crisis" *WSEAS Transactions on Business and Economics* Vol.11, 2014, E-ISSN: 2224-2899.

Medhi, Paramita (2016) "To Study Status of Entrepreneurship Development in Terms of Small Tea Growers of Assam", *XVII Annual International Seminar Proceedings, January 2016*

Mohan, Erani (2016) "Problems of Small Tea Growers (STGs) in Sibsagar District of Assam: A Sociological Study", *International Journal of Advanced Research, Volume 4, Issue 7, 2264-2267*

Mokgalabone, M.S. (2015) "Analyzing the Technical and Allocative Efficiency of Small-Scale Maize Farmers in Tzaneen Municipality of Mopani District: A Cobb-Douglas

and Logistic Regression Approach", Dissertation submitted in fulfillment of the requirements for the degree of Master of Agricultural Management, University of Limpopo.

Naik, Ajaya Kumar (2009) "Informal Sector and Informal Workers in India", Paper prepared for the Special IARIW-SAIM Conference on "Measuring the Informal Economy in Developing Countries", Kathmandu, Nepal, Sep 23-26, 2009.

Narain, Amarendra; Kumar, Purendu; Singh, S.N. (2006) *Socio-Economic and Political Problems of Tea Garden Workers: A Study of Assam.* Mittal p. ISBN 978-8183240987

Nath, T.N. (2013) "The Status of Micronutrients (Mn, Fe, Cu, Zn) in Tea Plantations in Dibrugarh district of Assam, India", *International research Journal of Environment Sciences;* Vol. 2(6)

Neog, C. (2010) "Production Behaviour and Operational Problems of the Small Tea Growers of Assam" A Thesis presented to Dibrugarh University (PhD)

Nerlove, M. (1956) "Estimates of the Elasticities of Supply of Selected Agricultural Commodities", *Journal of Farm Economics,* Vol. 38, No.2, pp. 496-509

Nwachukwu, Ifeanyi Ndubuto (2007) "Economic efficiency of Fedama Telfairia Production in Imo State Nigeria: A Translog Profit Function Approach". Micheal Okpara University of Agriculture, Umadike, 2007

Onoja, A.O.; Deeram, N.J. and Achike, A.I. (2012) "Profitability and Yield Determinants In Nigerian Cocoa Farms: Evidence from Ondo State" *Journal of Sustainable Development in Africa* Vol. 14, No. 4, 2012

Pachoni, Porag (2018) "Prospects and Problems of Small Tea Growers in Assam- A Study in Lakhimpur District", A Peer Reviewed Multidisciplinary International Indexed E-Journal, Vol 5, Issue 3, May-June 2018

Pavellescu, F. (2011) "Some aspects of the translog production function estimation"

Powell, J.P. "Zellner's Seemingly Unrelated Regression Model", Department of Economics, University of California, Berkeley

Perron, Beniot and Moon, Hyungsik Roger (2006) "Seemingly Unrelated Regressions"

Ramon E. Lopez. (1982) "Applications of Duality Theory to Agriculture", December 1982. Western Journal of Agricultural Economics

Raveendran, G. (2015) "Mapping National Definitions of Informal Employment to International Statistical Standards", WIEGO, 29/6/1015

Reddy, V N and Bhowmik, S.K (1989) "Small Growers and Co-operative Tea Factories in Nilgiris", *Economic and Political Weekly;* Vol. 24, No. 39.

Saidur, R.M.; Sattar, M.M. A Kei, K and Humnath, B. (2014) "Farm Size and Productivity in Rice Farming: Recent Empirical Evidence from Bangladesh"

Saikia, Bhupen (1994) "Tea Plantation Labour of Sonitpur district Assam- A Geographical Study" (Thesis submitted to the Gauhati University PhD)

Santeramo, F.G. (2014) "On the estimation of Supply and Demand Elasticities of Agricultural Commodities"

Sarkar, Kingshuk (2015) "Wages, Mobility and Labour Market Institutions in Tea Plantations: The Case of West Bengal and Assam", NRPPD Discussion Paper No. 46, Centre for Development Studies, Thiruvantananthapuram

Sarker, Debanarayan and De, Sudpita "High Technical Efficiency of Farms in Two Different Agricultural Lands: A study under Deterministic Production Frontier Approach", *Ind. Jn of Agri. Econ.* Vol.59, No.2, April-June 2004

Sarma, Gadapani (2007) "A Study on the Socio-Economic Conditions of Labourers in the Tea Gardens of Jorhat District, Assam" published as synopsis, North-Eastern Hill University, Shillong

Sen, A. K. (1962) "An Aspect of Indian Agriculture", Economic Weekly, vol. 14, no 4-6, p 243-246

Sen, Mohijit (2008) "*Economic Crisis in Tea Industry*" (USA: Stadium Press LLC)

Sen, Debabrata and Nath, Dr. Sudarshan (2012) "Role of Small Tea Growers in the Socio-Economic Development of Udalguri District of Assam", *International Indexed and Referred Research Journal*, Vol. IV, Issue 44.

Sharma S.K. and Sharma, Usha (2006) "*Documents on North-East India- An Exhaustive Survey*: *Assam (1664-1935)",* Vol 3, (New Delhi: Mittal Publication)

Shaoli, Chakraborty "*Small tea growers' price grouse*"; The Telegraph, Nov 2013; Kolkata

Shil, Parag (2013) "Export Scenario and Challenges in Front of Indian Tea Industry in the 21st Century" published by *Indian Journal of Applied Research*, Vol.3 Issue.6

Shrabani Mukherjee and Pradhan, Kailash Chandra "Anatomy of Input Demand Functions for Indian Farmers across Regions" (July 2016). Working Paper 150/2016

Shumway, C.R. and Hongil Lim (1993) "Functional Form and U.S. Agricultural Production Elasticities" *Journal of Agricultural ad Resource Economics,* 18(2):266-276

Siddique, M.A.B. (1988) "Emergence of the Tea Industry in Assam: 1834-1900" ISSN 0811-6067 ISBN 0-86422-779-5

Sidhu, S. (1974) "Relative Efficiency in Wheat Production in the Indian Punjab". *American Economic Review* 64(1974):742-51

Singh, S.N., Amarendra Narain and Purnendu Kumar (2006) *"Socio-Economic and Political Problems of Tea Garden Workers"* (New Delhi: Mittal Publications)

Sivanesan, Dr. R. (2013) "Tea Industry in India- Analysis of Import and Export of Tea" published by *International Journal of Business and Management Invention*, Vol.2 Issue 8

Sunair Junaid; Ali, Shahid; Ali, Salamat; Jan, Abbas Ullah and Shah, Syed Attaullah (2014) "Supply Response Analysis of Rice in Pakistan: Normalized Restricted Translog Profit Function Approach". *International Journal of Innovation and Applied Studies,* ISSN 2028-9324, Vol. 7, No. 3, August 2014.

Tagat, Venkatesh and Tagat, Anirudh (2017) "The Potential of Farmer Producer Organizations in India". https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2972488

Tanti, Sibani (2002) "A Study of the Problems of Primary Education among the Children of Tea Garden labourers of Assam with particular reference to Dibrugarh District" A Thesis presented to Gauhati University (MPhil)

Tewari, Amrit and Hiraizumi, Koichi (2004) "The role of Credit to Growth of 'Smallholders' in Tea Production – A Study on Tea Production in Eastern Nepal", Japanese Journal of Farm Management, Vol 42, Issue 2, Pages 98-103

Thomas W. Hertel and Mc Kinze, Lance (1996) "Pseudo Data as a Teaching Tool: Application to the Translog, Multiproduct Profit Function". *Western Journal of American Economics*, 11(1): 19-30, 1996.

Trebbin, Anika (2014) "Linking small farmers to modern retail through producer organizations- Experiences with producer companies in India", www.elsevier.com/locate/foodpol.

Talukdar, Sushanta "*Tea board approves mini, micro factories by small tea growers*"; The Hindu; 25th Dec 2013; Delhi

Talukdar, Ratna Bharali "*Big hopes from small tea*"; 27th Jan 2014, www.indiatogether.org

Vargas, Eliecer E. and Schreiner Dean F. (1999) "Modeling Monopsony Markets with Regional CGE: The Oklahoma Forest Products Industry Case", *The Journal of Regional Analysis and Policy*

Williamson, T; Hauer, G. and Luckert, M.K. (2004) "A restricted Leontief profit function model of the Canadian lumber and chip industry: potential impacts of US countervail and Kyoto ratification" Can. J. For. Res. 34: 1833–1844 (2004) doi: 10.1139/X04-058 © 2004 NRC Canada

Xavier Fageda and Voltes-Dorta, Augusto (2011) "Efficiency and Profitability of Spanish Airports: A Composite Non-Standard Profit Function Approach"

Xaba, B.G. (2013) "Factors Affecting the Productivity and Profitability of Vegetables Production in Swaziland" *Journal of Agricultural Studies* ISSN 2166-0379, Vol. 1, No. 2.

Non-Authored Reports, Data:

"Assam restarts registration of bought leaf factories" *The Economic Times*, 22 Dec 2012; Kolkata

"Minimum Wage in Assam with effect from January1, 2016" available at http://paycheck.in/salary/minimumwages/assam/minimum-wages-in-assam-1

"Small tea growers and tea lovers- bond@ myassamtea" available at https://www.myassamtea.com/about-myassamtea/about-us-and-small-tea-growers/

"Tea Association of India to export Cachar tea to Bangladesh" *The Times of India*, 7 Mar 2012; Guwahati;

"Tea output rises 6.5% in 2013"; *The Telegraph*, 4 Feb 2014; Guwahati

Tea Small Holdings Development Authority Annual Report 2009

"Understanding Wage Issues in the Tea Industry", Report from a multi-stakeholder project. As per of the Tea Improvement Program (TIP), facilitated by IDH – The Sustainable Trade Initiative. Ethical Tea Partnership, OXFAM, May 201

"Untitled-PeopleStrong" available at http://www.peoplestrong.com/wp-content/.../Assam-Minimum-Wages-Notification.pd

APPENDIX I
RESEARCH QUESTIONNAIRE
TOPIC
THE SMALL TEA GROWERS OF ASSAM: A STUDY OF THEIR MONOPSONISTIC EXPLOITATION AND PRODUCTION

General:

1.	Name of the grower *(In block capital letters)* :		
2.	Contact number:		
3.	Name of the farm :		
4.	Year of Establishment (commencement of cultivation):		
5.	Address :	Village/Town ……..……..… P.O. ……..….. Mouza ……..… Sub-Div/Block ….……..…..… District ……..…..……..…	
6.	Type of the organization *(Please Tick)* :	(a) Proprietarily ☐ (b) Partnership ☐ (c) Co-operative ☐ (d) Pvt. Ltd. Co. ☐	
7.	Educational qualification *(Please Tick)* :	(a) Under Matric ☐ (b) Under Graduation ☐ (c) Rest ☐	No. of years of Education …… …… ……
8.	Age:		
9.	Gender category of the planter :	Male / Female	
10.	Linguistic origin of the planter *(Please Tick)* :	(a) Assamese ☐ (b) Hindi ☐ (c) Bengali ☐ (d) Nepali ☐ (e) Any other *(to be mentioned)* …… ☐	

11.	Religious background of the planter *(Please Tick)* :	(a) Hinduism ☐ (b) Muslim ☐ (c) Christian ☐ (d) Any other *(to be mentioned)* …… ☐
12.	How many family members are there in farmer's family? …….	(a) Below 18 years …… ☐ (b) 18 to 60 years ……..... ☐ (c) Above 60 years …… ☐

Land Particulars:

13.	(a) Total land area under Tea operated by you: (b) Total land area under any other crop:	…….. bigha …….. bigha
14.	Out of total land you cultivate (a) How much has been leased in from a land owner? (b) How much land is owned by you?	……..… bigha …… bigha
15.	If you have leased in land then what is the rent that you pay? (a) How much of money rent (per year)? (b) If share crop, what percentage is the rent?	…… ……....
16(a)	Classification of land holding :	Mayadi……..…..bigha Eksonia……..……bigha Ceilling…..……..… bigha Touza…….……..……. .bigha Govt…..……... bigha Forest…….…..… bigha Other……..….. bigha

16(b) Type of Tea land

Sl.	Type of land	Area(bigha)
(a)	Virgin land	
(b)	Uprooting sugarcane	……..
(c)	Uprooting areca-nut	
(d)	Uprooting orange	
(e)	Uprooting bamboo	
(f)	Uprooting vegetables	
(g)	Paddy land	
(h)	Low filled-up land	
(i)	Others	
Total		

17.	Do you have the document of land patta?	Yes / No
18.	Area of patta land: (i) Annual (*Eksonia*) Patta: (ii) Periodic (*Mayadi*) Patta:	 ……. bigha ……. bigha
19.	Is the land flood prone?	Yes / No
20.	Registration with Tea-Board:	Yes / No
21.	Registration with Small Tea Growers' Advisory Programme, AAU:	Yes / No
22.	Registration with All Assam Small Tea Growers' Association (AASTGA):	Yes / No
23.	Membership of other societies *(Give Name and Address)* :	……
24.	Do you get any kind of support from the Government/Tea Board/AASTGA?	Yes / No

Labour Particulars:

25. **Present work-force**

Permanent/Contractual (mandays)				Total	Casual (mandays)				Total
Family Members		Hired			Family Members		Hired		
Male	Female	Male	Female		Male	Female	Male	Female	

26. What was the number of man-days for which casual workers were engaged in 2016?

Male	Female

27. What is the basis of payment to the casual workers? (Please Tick): (a) Time Rate (b) Piece Rate (c) Both

28. What is the daily wages paid to each casual worker under time rate?

Male	Female

29. What was the monthly wages paid to the Contractual workers?

	2015	2016
Male		
Female		

30. What is the time frame for which the labourers have been contracted? ……..

31. What are the terms and conditions of the contract:

32. Expenditure on inputs of Tea production (For plucking/Harvesting sections only)

(a) Fertilizers	Urea	MOP	SSP	DAP	Cow Dung	Others
Price						
Quantity						
Total Expenditure						

(b)	**Insecticide (All types)**	Quantity	
		Rate	
(c)	**Pesticide(All types)**	Quantity	
		Rate	
(d)	**Herbicides (All types)**	Quantity	
		Rate	

33. Production of green leaf and income:

Year	Area (bigha)	Production (Kg)	Selling price per Kg (Rs.)	Total Revenue (Rs.)	Total Cost (Rs.)	Profit (Rs.)
2014						
2015						
2016						

Credit:

34. Have you availed any credit? Yes / No

35. Code for credit type:

1. Short term credit <1 year
2. Medium term credit 1-5 years
3. Long term credit > 5 years.

36. If you have availed credit, then:

Source of credit	Amount	Rate of interest (per year)
(a) Institutional sources		
(b) Non-institutional sources		

Capital:

37. Do you use any machines such as pump sets, sprinkler, plucking equipment, sprayer etc.?

Yes/No

38. If yes, what is the total value of the machines if it is owned by you?

Items & Number	Valuation	Annual Cost
(a) Pump Set		
(b) Sprinkler		
(c) Sprayer		
(d) Plucking equipment		
(e) Others		
Total Value		

39. What is the running cost of the machines that you own (per year)?

Items	Cost
(a) Fuel (Diesel)	
(b) Maintenance	
Total Cost	

40. If you have hired those machines, then what was the rent per year paid for all the machines?

……..

41. What is the rate of interest on fixed deposits that you can get if you keep your money in the bank? ……..……..

42. Do you have access to grid electricity? Yes/No

Irrigation:

43. Do you have access to irrigation? Yes/No

44. Have you used any irrigation tool for your tea garden? Yes/No

45. Have you spent money in irrigation? Yes/No

46. If yes, what are the kinds? (like purchase of water, etc.) *(Please specify)*

47. Did your purchase water for irrigation in 2016? Yes/No

48. If yes, what is the amount you buy per year? ……

49. What is the price of water per unit?

50. If no, please give the source

(a) Springs (b) Wells/ponds (c) Tube well (d) Others *(specify)*……..

51. What is the amount of irrigated land out of total land? …….. bigha.

52**. Marketing constraints of Green Tea leaf:** *(Please answer the following questions)*:

Sl	Question	Answer	
(a)	Do you sell green leaf directly or through agents? …….	self sell: 1, if through agent: 0	
(b)	To whom is the green leaf sold *(Specify the name)* ……	Bought-leaf factory/Agent/ Tea Estate/Elsewhere	
(c)	How many options you have to sell your tea leaves?		
(d)	Distance to the selling point from your farm in KM		
(e)	How do you transport the green leaf from your garden to the selling point?		
(f)	Condition of the road from the farm to the selling point.	Excellent/good/bad/worse	
(g)	Do you have own transport facility for carrying green leaf? *(Please mention)*		
(h)	Who bears the cost of transportation of green leaf?	Self/Agent/Bought leaf Factory/Tea Estate	
(i)	Are you facing any problem in selling green leaf? *(Please mention)*		
(j)	What is the cost of transportation per Kg of green leaf?	2015 (Rs.)	2016 (Rs.)

53. If you sell through agents, does it reduce profit? Yes/No

54. Do you like small tea gardening as a profession? Yes/No

55. If not, why?

(a) Unprofitable (b) Risky (c) Lack of social status (d) Others *(Specify)*

APPENDIX II (Biswanath)

Table: 4.2.1 Summary Statistics: Quantity Variables

	Mean	C.V.	Maximum	Minimum
Output				
2014	21538.46	123.50	90000	1200
2015	24153.85	118.64	95000	1600
2016	27,938	120.73	100000	2600
Area in Ha.				
2014	11.05	205.54	80.28	0.32
2015	11.05	205.54	80.28	0.32
2016	11.05	205.54	80.28	0.32
Mandays_Male	9983.84	320.50	116368	160
Mandays_Female	6297.92	281.01	64800	35
Age of the farm	13.15	41.96	22	5
Age of the Farmer	50.69	28.50	70	27
Year of Education	10.84	36.07	15	0
No. Of Family Member	5.23	33.25	9	3
No. Of Sales Option	1.30	36.73	2	1
Distance	8.25	143.35	30	0
Quantity of Fertilizer:				
Urea	965.38	149.44	5000	0
MOP	342.30	136.61	1800	0
SSP	292.30	174.69	1500	0
Cow Dung	7026.92	156.08	38250	0
Insecticides	5.65	174.77	30	0
Vitamins	2.73	105.34	10	0
Herbicides	17.5	154.49	100	0.5

Table: 4.3.1 Summary Statistics: Price Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Selling Price of Output				
2014	14.92	10.40	18	13
2015	15.11	12.16	18	12
2016	15.41	13.07	19.5	12.36
Price of Fertilizers:				
Urea	433.84	26.06	800	370
MOP	653.07	34.40	1000	340
SSP	393.07	11.48	450	300
Price of Cow Dung	2861.53	54.82	6000	500
Price of Incecticides	819.23	68.80	2400	400
Price of Vitamins	526.15	50.90	1200	130
Price of Herbicides	588.46	149.84	3500	270
Wage Rate:				
Male	123.07	9.60	150	100
Female	115	7.09	120	100

Table: 4.4.1 Distribution of Linguistic Community		
	Number of Respondents	Percentage of Respondents
Percentage of Assamese	8	61.54%
Percentage of Hindi	2	15.38%
Percentage of Bengali	2	15.38%
Percentage of Nepali	0	0.00%
Others		
Percentage of Adibasi	1	7.69%
Percentage of Rajput (Self-identified)	2	15.38%
Percentage of Karbi	0	0.00%
Percentage of Oriya	0	0.00%
Percentage of Tea Gardener	0	0.00%

Table: 4.5.1 Distribution of Religion of the Respondents		
	Number of Respondents	Percentage of Respondents
Percentage of Hindu	13	100.00%
Percentage of Muslim	0	0.00%
Percentage of Christian	0	0.00%
Percentage of Any Other	0	0.00%
Total	13	

Table: 4.6.1 Distribution of Sale of Tea Leaves		
	Number of Respondents	Percentage of Respondents
Percentage of farms which sold to agents	7	53.85%
Percentage of farms which sold to Estate Factory directly	2	15.38%
Percentage of farms which sold to Bought Leaf Factory directly	4	30.77%
Total	13	

Table: 4.7.1 Percentage Distribution of Different Variables of Sample Tea Growers		
	Number of Respondents	Percentage of Respondents
Percentage of proprietorship	13	100.00%
Percentage of male owned farms	12	92.31%
Percentage of female owned farms	1	7.69%
Percentage of farmers having land documents	13	100.00%
Percentage of farms which are flood prone	4	30.77%
Percentage of farms with TB Registration	7	53.85%
Percentage of farms with AASTGA Registration	6	46.15%
Percentage of farms with TB and AASTGA registration	5	38.46%
Percentage of farmers who have availed any credit	4	30.77%
Percentage of farms which use electricity	4	30.77%
Percentage of farms which use irrigation	5	38.46%
Percentage of farmers who have their own transportation facility	4	30.77%
Percentage of farmers who have reported reduction in their income	4	30.77%
Percentage of farmers who like farming	11	84.62%

APPENDIX III (Sonitpur)				
Table: 4.2.2 Summary Statistics: Quantity Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Output				
2014	17978.44	152.23	125000	0
2015	21405	141.12	128000	0
2016	27187.44	136.92	150000	100
Area in Ha.				
2014	2.48	121.03	12.04	0
2015	2.68	109.83	12.04	0.26
2016	2.95	105.38	12.04	0.26
Mandays_Male	719.58	103.77	3560	40
Mandays_Female	1368.47	138.41	10080	0
Age of the farm	7.52	64.67	19	2
Age of the Farmer	43	22.80	64	24
Year of Education	13.29	23.16	20	7
No. Of Family Member	6.52	55.31	19	3
No. Of Sales Option	1.26	40.41	3	1
Distance	5.55	252.87	76.3	0
Quantity of Fertilizer:				
Urea	1000	145.81	6000	0
MOP	639.03	203.79	6000	0
SSP	668.23	223.64	6370	0
Cow Dung	10302.35	165.21	92000	0
Insecticides	6.89	202.99	80	0
Vitamins	11.69	167.62	100	0
Herbicides	32.80	190.07	300	0

Table: 4.3.2 Summary Statistics: Price Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Selling Price of Output				
2014	17.34	10.59	20	14
2015	17.31	10.18	21	15
2016	17.28	9.66	22	14
Price of Fertilizers:				
Urea	425.88	11.66	600	350
MOP	886.17	23.24	1500	600
SSP	562.35	25.64	1000	350
Price of Cow Dung	1652.94	53.33	4500	200
Price of Incecticides	1082.21	36.01	2000	95
Price of Vitamins	682.76	41.15	1200	24
Price of Herbicides	303.64	15.17	400	200
Wage Rate:				
Male	167.64	29.07	250	100
Female	116.47	9.18	130	90

Table: 4.4.2 Distribution of Linguistic Community		
	Number of Respondents	Percentage of Respondents
Percentage of Assamese	1	2.94%
Percentage of Hindi	0	0.00%
Percentage of Bengali	0	0.00%
Percentage of Nepali	33	97.06%
Others		
Percentage of Adibasi	0	0.00%
Percentage of Rajput (Self-identified)	0	0.00%
Percentage of Karbi	0	0.00%
Percentage of Oriya	0	0.00%
Percentage of Tea Gardener	0	0.00%
Total	34	

Table: 4.5.2 Distribution of Religion of the Respondents		
	Number of Respondents	Percentage of Respondents
Percentage of Hindu	34	100.00%
Percentage of Muslim	0	0.00%
Percentage of Christian	0	0.00%
Percentage of Any Other	0	0.00%
Total	34	

Table: 4.6.2 Distribution of Sale of Tea Leaves		
	Number of Respondents	Percentage of Respondents
Percentage of farms which sold to agents	24	70.59%
Percentage of farms which sold to Estate Factory directly	3	8.82%
Percentage of farms which sold to Bought Leaf Factory directly	9	26.47%

Table: 4.7.2 Percentage Distribution of Different Variables of Sample Tea Growers		
	Number of Respondents	Percentage of Respondents
Percentage of proprietorship	31	91.18%
Percentage of male owned farms	33	97.06%
Percentage of female owned farms	1	2.94%
Percentage of farmers having land documents	32	94.12%
Percentage of farms which are flood prone	2	5.88%
Percentage of farms with TB Registration	23	67.65%
Percentage of farms with AASTGA Registration	16	47.06%
Percentage of farms with TB and AASTGA registration	15	44.12%
Percentage of farmers who have availed any credit	9	26.47%
Percentage of farms which use electricity	2	5.88%
Percentage of farms which use irrigation	22	64.71%
Percentage of farmers who have their own transportation facility	7	20.59%
Percentage of farmers who have reported reduction in their income	13	38.24%
Percentage of farmers who like farming	32	94.12%

APPENDIX IV (Nagaon)				
Table: 4.2.3 Summary Statistics: Quantity Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Output				
2014	16388.38	72.92	48000	0
2015	17781.69	71.14	55000	200
2016	19608.34	70.76	68000	240
Area in Ha.				
2014	2.57	71.64	8.03	0
2015	2.63	69.26	8.03	0.16
2016	2.79	65.98	8.03	0.16
Mandays_Male	728.78	59.39	1872	288
Mandays_Female	1475.31	72.01	4800	288
Age of the farm	13.28	42.98	23	2
Age of the Farmer	45.03	21.91	67	25
Year of Education	11.09	32.001	16	4
No. Of Family Member	5.93	43.40	16	2
No. Of Sales Option	1.53	54.97	5	1
Distance	6.64	170.02	58.67	0
Quantity of Fertilizer:				
Urea	984.06	138	6000	0
MOP	573.43	165.96	5400	0
SSP	527.65	185.66	5400	0
Cow Dung	2977.65	169.72	23800	0
Insecticides	5.32	93.89	20	0
Vitamins	4.29	113.05	15	0
Herbicides	13.55	141.72	80	0

Table: 4.3.3 Summary Statistics: Price Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Selling Price of Output				
2014	17.69	39.94	29.35	9
2015	18.65	40.82	30.6	10
2016	18.05	30.36	27.25	11
Price of Fertilizers:				
Urea	417.18	18.39	680	300
MOP	829.68	16.45	1100	360
SSP	471.71	18.08	750	400
Price of Cow Dung	1534.37	71.31	5000	500
Price of Incecticides	1197.50	31.47	2000	240
Price of Vitamins	728.28	78.89	3000	240
Price of Herbicides	352.34	22.46	700	200
Wage Rate:				
Male	127.65	12.38	150	100
Female	105.93	8.84	120	90

Table: 4.4.3 Distribution of Linguistic Community		
	Number of Respondents	Percentage of Respondents
Percentage of Assamese	17	53.13%
Percentage of Hindi	3	9.38%
Percentage of Bengali	7	21.88%
Percentage of Nepali	0	0.00%
Others		
Percentage of Adibasi	0	0.00%
Percentage of Rajput (Self-identified)	0	0.00%
Percentage of Karbi	5	15.63%
Percentage of Oriya	0	0.00%
Percentage of Tea Gardener	0	0.00%
Total	32	

Table: 4.5.3 Distribution of Religion of the Respondents		
	Number of Respondents	Percentage of Respondents
Percentage of Hindu	24	75.00%
Percentage of Muslim	6	18.75%
Percentage of Christian	2	6.25%
Percentage of Any Other	0	0.00%
Total	32	

Table: 4.6.3 Distribution of Sale of Tea Leaves		
	Number of Respondents	Percentage of Respondents
Percentage of farms which sold to agents	22	68.75%
Percentage of farms which sold to Estate Factory directly	10	31.25%
Percentage of farms which sold to Bought Leaf Factory directly	2	6.25%

Table: 4.7.3 Percentage Distribution of Different Variables of Sample Tea Growers		
	Number of Respondents	Percentage of Respondents
Percentage of proprietorship	32	100.00%
Percentage of male owned farms	30	93.75%
Percentage of female owned farms	2	6.25%
Percentage of farmers having land documents	25	78.13%
Percentage of farms which are flood prone	6	18.75%
Percentage of farms with TB Registration	26	81.25%
Percentage of farms with AASTGA Registration	26	81.25%
Percentage of farms with TB and AASTGA registration	24	75.00%
Percentage of farmers who have availed any credit	12	37.50%
Percentage of farms which use electricity	14	43.75%
Percentage of farms which use irrigation	21	65.63%
Percentage of farmers who have their own transportation facility	9	28.13%
Percentage of farmers who have reported reduction in their income	23	71.88%
Percentage of farmers who like farming	32	100.00%

APPENDIX V (Golaghat)				
Table: 4.2.4 Summary Statistics: Quantity Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Output				
2014	24627.54	106.69	140000	700
2015	25075.41	106.59	150000	700
2016	24565.82	100.10	140000	600
Area in Ha.				
2014	1.95	100.44	9.63	0.16
2015	2.02	97.79	9.63	0.16
2016	2.03	96.91	9.63	0.16
Mandays_Male	862.37	100.21	5184	0
Mandays_Female	870.36	112.77	4320	0
Age of the farm	16.91	44.76	42	4
Age of the Farmer	45.95	25.50	75	19
Year of Education	12.19	22.19	18	5
No. Of Family Member	4.68	37.25	11	2
No. Of Sales Option	2.04	82.82	10	1
Distance	2.80	242.57	30	0
Quantity of Fertilizer:				
Urea	1231.06	116.43	9000	0
MOP	629.92	107.56	3000	0
SSP	720.09	144.43	6000	0
Cow Dung	2616.55	227.92	34000	0
Insecticides	13.65	199.33	180	0
Vitamins	9.74	222.07	150	0
Herbicides	10.56	171.69	100	0

Table: 4.3.4 Summary Statistics: Price Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Selling Price of Output				
2014	14.78	13.95	20	11
2015	15.380	12.83	22	10
2016	15.54	12.38	23	12
Price of Fertilizers:				
Urea	379.51	11.81	480	300
MOP	760.91	21.41	1400	480
SSP	460.08	20.20	800	280
Price of Cow Dung	1288.52	32.95	3000	600
Price of Incecticides	1007.95	54.15	2436	272.5
Price of Vitamins	847.59	41.14	1800	270
Price of Herbicides	481.55	51.82	1600	200
Wage Rate:				
Male	137.09	21.34	250	100
Female	120.54	8.52	150	90

Table: 4.4.4 Distribution of Linguistic Community		
	Number of Respondents	Percentage of Respondents
Percentage of Assamese	61	100.00%
Percentage of Hindi	0	0.00%
Percentage of Bengali	0	0.00%
Percentage of Nepali	0	0.00%
Others		
Percentage of Adibasi	0	0.00%
Percentage of Rajput (Self-Identified)	0	0.00%
Percentage of Karbi	0	0.00%
Percentage of Oriya	0	0.00%
Percentage of Tea Gardener	0	0.00%
Total	61	

Table: 4.5.4 Distribution of Religion of the Respondents		
	Number of Respondents	Percentage of Respondents
Percentage of Hindu	58	95.08%
Percentage of Muslim	3	4.92%
Percentage of Christian	0	0.00%
Percentage of Any Other	0	0.00%
Total	61	

Table: 4.6.4 Distribution of Religion of the Respondents		
	Number of Respondents	Percentage of Respondents
Percentage of Hindu	58	95.08%
Percentage of Muslim	3	4.92%
Percentage of Christian	0	0.00%
Percentage of Any Other	0	0.00%
Total	61	

Table: 4.7.4 Percentage Distribution of Different Variables of Sample Tea Growers		
	Number of Respondents	Percentage of Respondents
Percentage of proprietorship	60	98.36%
Percentage of male owned farms	58	95.08%
Percentage of female owned farms	3	4.92%
Percentage of farmers having land documents	56	91.80%
Percentage of farms which are flood prone	0	0.00%
Percentage of farms with TB Registration	30	49.18%
Percentage of farms with AASTGA Registration	39	63.93%
Percentage of farms with TB and AASTGA registration	29	47.54%
Percentage of farmers who have availed any credit	8	13.11%
Percentage of farms which use electricity	1	1.64%
Percentage of farms which use irrigation	5	8.19%
Percentage of farmers who have their own transportation facility	23	37.70%
Percentage of farmers who have reported reduction in their income	53	86.89%
Percentage of farmers who like farming	45	73.77%

APPENDIX VI (Dibrugarh)				
Table: 4.2.5 Summary Statistics: Quantity Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Output				
2014	27691.64	203.25	400000	250
2015	28794.26	195.15	400000	250
2016	29274.97	188.98	400000	250
Area in Ha.				
2014	3.09	416.01	107	0.08
2015	3.17	405.002	107	0.08
2016	3.31	389.46	107	0.08
Mandays_Male	734.94	123.03	6240	0
Mandays_Female	1061.72	198.08	14472	0
Age of the farm	15.77	47.35	45	4
Age of the Farmer	42.55	29.40	68	21
Year of Education	10.74	29.16	18	0
Area in Ha.				
No. Of Family Member	5.74	46.84	14	3
No. Of Sales Option	3.88	89.15	15	1
Distance	4.45	239.97	70	0
Quantiy of Fertilizer:				
Urea	1020.70	199.20	15000	0
MOP	412.48	169.49	5000	0
SSP	390.73	242.68	6000	0
Cow Dung	1021.42	87.91	2000	0
Incecticides	26.003	572.64	1248	0
Vitamins	5.83	145.36	40	0
Herbicides	10.64	232.05	160	0

Table: 4.3.5 Summary Statistics: Price Variables				
	Mean	**C.V.**	**Maximum**	**Minimum**
Selling Price of Output				
2014	15.39	14.83	21.5	9
2015	15.54	12.77	20	11
2016	15.12	14.42	19	10
Price of Fertilizers:				
Urea	394.42	20.93	800	300
MOP	811.28	20.90	1500	450
SSP	495.14	40.93	1170	220
Price of Cow Dung	1597.78	28.41	3000	300
Price of Incecticides	1025.27	41.62	2500	200
Price of Vitamins	809.17	49.06	2200	200
Price of Herbicides	359.61	53.49	1800	200
Wage Rate:				
Male	129.67	24.28	250	90
Female	113.88	10.70	160	90

Table: 4.4.5 Distribution of Linguistic Community		
	Number of Respondents	Percentage of Respondents
Percentage of Assamese	51	72.86%
Percentage of Hindi	0	0.00%
Percentage of Bengali	3	4.29%
Percentage of Nepali	9	12.86%
Others		
Percentage of Adibasi (Self-identified)	3	4.29%
Percentage of Rajput	0	0.00%
Percentage of Karbi	0	0.00%
Percentage of Oriya	2	2.86%
Percentage of Tea Gardener	2	2.86%
Total	70	

Table: 4.5.5 Distribution of Religion of the Respondents		
	Number of Respondents	Percentage of Respondents
Percentage of Hindu	62	88.57%
Percentage of Muslim	7	10.00%
Percentage of Christian	1	1.43%
Percentage of Any Other	0	0.00%
Total	70	

Table: 4.6.5 Distribution of Sale of Tea Leaves		
	Number of Respondents	Percentage of Respondents
Percentage of farms which sold to agents	49	70.00%
Percentage of farms which sold to Estate Factory directly	3	4.29%
Percentage of farms which sold to Bought Leaf Factory directly	19	27.14%

Table: 4.7.5 Percentage Distribution of Different Variables of Sample Tea Growers		
	Number of Respondents	Percentage of Respondents
Percentage of proprietorship	67	95.71%
Percentage of male owned farms	70	100.00%
Percentage of female owned farms	0	0.00%
Percentage of farmers having land documents	61	87.14%
Percentage of farms which are flood prone	5	7.14%
Percentage of farms with TB Registration	29	41.43%
Percentage of farms with AASTGA Registration	47	67.14%
Percentage of farms with TB and AASTGA registration	26	37.14%
Percentage of farmers who have availed any credit	8	11.42%
Percentage of farms which use electricity	3	4.29%
Percentage of farms which use irrigation	3	4.29%
Percentage of farmers who have their own transportation facility	20	28.57%
Percentage of farmers who have reported reduction in their income	64	91.43%
Percentage of farmers who like farming	62	88.57%

Appendix VII

Theoritical Concern

We explain the theoretical concern briefly as follows:

Suppose the supply of output, which depends on price of output, is modelled in terms of the equation (5.a) given below.

$$\ln Y_i = \beta_1 \ln P_{Yi} + \varepsilon_i \quad \text{..... (5.a)}$$

Here $\ln Y_i$ represents the natural log of supply of output (tea leaves) of the *i*th farmer, $\ln P_{Yi}$ represents the log of price of tea leaves, β_1 is the parameter which represents the coefficient of $\ln P_{Yi}$. ε_i represents the error term, and includes all other controls and contributions to the supply of tea leaves.

The second equation to note in this connection describes how price of green tea leaves change with respect to quantity supplied.

$$\ln P_{Yi} = \alpha_1 \ln Y_i + \upsilon_i \quad \text{..... (5.b)}$$

which introduces additional parameter α_1 and error term υ_i.

In this classic reverse causality situation, the estimate of β_1 is likely to be biased. Let $\widehat{\beta_1}$ be the estimation of β_1. Then the asymptotic bias of the OLS estimator is given by

$$\text{plim } \widehat{\beta_1} - \beta_1 = \frac{\alpha_1(1-\alpha_1\beta_1)}{\alpha_1^2+\lambda} \quad \text{..... (5.c)}$$

where $\lambda = \frac{\sigma_v^2}{\sigma_\varepsilon^2}$ is the ratio of the variance of the error terms.

Analyzing the likely size and direction of bias, we note that if β_1 is small and $\alpha_1 < 0$, then the bias is negative (this is because $\alpha_1 (1 - \alpha_1\beta_1)$ will be negative if this condition is satisfied, which means $\beta_1 >$ plim $\widehat{\beta_1}$). That is, the coefficient of price of output in equation (5.2) is estimated to be of lower value than it actually is.

Appendix VIII (Results of 2SLS)

For the estimation of the first stage, i.e., equation (5.5), the results are given in panel 1 of table 5.1. The second stage results are in panel 2 of table 5.1.

Table: 5.1 (Panel 1)			
First Stage Regression **No. Of Observations = 210** **R-Squared = 0.3507** **Prob > F =0.000**			
Dependent variable: Price of Output (lnP_Y)	**Regression Coefficient**	**SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.093334	0.074661	0.213
Log of Price of MOP (lnP_M)	-0.1014659**	0.049619	0.042
Log of Price of SSP (lnP_S)	0.035605	0.0428148	0.407
Log of Price of Cow Dung (lnP_D)	-0.215606	0.0526494	0.683
Log of Price of Irrigation (lnP_I)	0.0096692	0.0199925	0.629
Log of Price of Vitamin (lnP_V)	-0.0332263*	0.0197477	0.094
Log of Price of Herbicides (lnP_H)	-0.0138945	0.0282613	0.624
Log of wage rate of male workers (lnwa_m)	0.1914207***	0.0549193	0.001
Log of wage rate of female workers (lnwa_f)	-0.2221953*	0.1181425	0.062
Log of farm-size (lnfamsize)	-0.0269164	0.025673	0.296
Dummy for linguistic community (d-ling)	0.0630924**	0.0272979	0.022
Number of Sales Option (Optn)	-0.002496	0.0064155	0.698
Distance from the farm to the processing centre (disn)	-0.0016179	0.0010891	0.139
Dummy for districts with high concentration of STGs (d_dold)	-0.11268***	0.0278113	0.000
Dummy for self-sale (d_selfsale)	0.1463105***	0.0252106	0.000
Constant	3.191309	0.9002916	0.000

Table 5.1 (Panel 2) Instrumental Variables (2SLS) Regression No. of Observations =210 Wald chi2(12) = 54.42 Prob > chi2 = 0.000			
Dependent Variable : Log of Output (lnY)	**Regression Coefficient**	**SE**	**p > | z |**
Log of Price of Output (lnP_Y)	5.3107***	1.225095	0.000
Log of Price of Urea (lnP_U)	-1.865259***	0.6769231	0.006
Log of Price of MOP (lnP_M)	0.2491209	0.5088952	0.624
Log of Price of SSP (lnP_S)	-0.987648**	0.4035945	0.014
Log of Price of Cow-Dung (lnP_D)	-0.1304657	0.5017255	0.795
Log of Price of Irrigation (lnP_I)	0.2210201	0.1883678	0.241
Log of Price of Vitamin (lnP_V)	0.2846655	0.194217	0.143
Log of Price of Herbicides (lnP_H)	0.3351553	0.27045	0.215
Log of wage rate of male workers (lnwa_m)	-1.325012**	0.5898	0.025
Log of wage rate of female workers (lnwa_f)	2.020179*	1.152427	0.080
Log of farm size (lnfamsize)	0.2972352	0.2449948	0.225
Dummy for linguistic community (d-ling)	0.4210801*	0.2341507	0.072
Constant	6.084347	9.981815	0.542

Significance at 1% ***, significance at 5% **, significance at 10% *

Panel 1 in table 5.1 reports the first stage regression. We can see that P_M, P_V, wage rate of male labour, wage rate of female labour, the linguistic community the growers belong to, whether the district where the farmer is located is an old district or not, whether the farmer sells the leaves directly- these variables affect the price statistically significantly. Out of these seven important variables, the sign of male labour wage rate is on the expected line (which is positive), implying that as the wage rate of male labour rises, it tends to raise the price of tea leaves. However, the sign of coefficient for female labour wage rate is surprisingly negative. It has a lower statistically significance than the case of male labour wage. What can explain this negative realtion? One probable explanation is rising female wage rate is leading to some sort of substitution of female labour by other inputs which are responsible for the fall of price. But still this answer is not satisfactory because we donot know the exact mechanism through which decline of price is taking place. More research in this direction can be thought of.

For inputs such as price of MOP, price of vitamin we again find negative sign for the coefficients. Interestingly, we find that it is statistically significant whether the grower belongs to the Assamese community. It implies Assamese community growers tend to get higher price than non-Assamese growers. This could be because of the reason that the small tea growers are

mostly from the Assamese community, they have taken up small tea growing earlier than other people. This probably led to the better skills they have acquired and the skill percolated through social network they have developed among themselves which may have translated in terms of better prices.

Distance affects price negatively which is not surprising. We curiously find that the growers in the districts with high concentration of small tea gardens receive lower price compared to the growers of districts with less concentration of small tea gardens. It is possible that higher supply due to greater concentration contributed to lesser price in districts with higher number of STGs. This effect has dominated the possible positive effects of better infrastructure etc. which these older districts have.

Finally, the growers who sell directly get higher price compared to those who sell through agents and this is not surprising.

Now let us come to the final table which is reported in panel 2 of table 5.1. The regressor variable of our interest is $\ln P_Y$ because its coefficient would give us the price elasticity of supply from which we shall estimate the degree of exploitation. We see from the table that the coefficient is positive (the numerical value is 5.31) and it is highly statistically significant (*p*-value: 0.000). This is not surprising because as we would expect the output produced by the growers will rise as the price of the product rises. As our regression model is of log-log type, it implies that the price elasticity is 5.31.

About the other coefficients reported, we see that price of urea (P_U), price of SSP (P_S), wage rate of male labour (wa_m), wage rate of female labour (wa_f) and the linguistic community the grower belongs to are statistically significant. Price of urea (P_U) and price of SSP (P_S) affect the supply of leaves negatively. This is expected because higher input price tend to raise cost of production and reduce the production level and output supplied by the growers. Similarly, male labour wage rate has a negative impact on the production since it raises the cost.

Female labour wage rate raises output. This is surprising but it is in line with the result of female wage rate in the first panel. And finally - again in line with the first panel - we find that linguistic community of the grower is statistically significant. The Assamese growers tend to grow higher output compared to the non-Assamese growers.

Appendix IX

Table: 5.3 (New Districts) (Panel 1)			
First stage Regressions No. of Observations =79 Prob > F =0.0013 R-squared = 0.4109 Adj R-squared = 0.2820			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.1998792	0.1191233	0.098
Log of Price of MOP (lnP_M)	-0.2013457*	0.1107894	0.074
Log of Price of SSP (lnP_S)	0.0944885	0.0793474	0.238
Log of Price of Cow-Dung (lnP_D)	-0.3019195**	0.132612	0.026
Log of Price of Irrigation (lnP_I)	0.0491651	0.0378931	0.199
Log of Price of Vitamin (lnP_V)	-0.0329515	0.0263153	0.215
Log of Price of Herbicides (lnP_H)	-0.0666431	0.0508457	0.195
Log of Wage Rate of Male Workers (lnwa_m)	0.2768279**	0.1017191	0.008
Log of Wage Rate of Female Workers (lnwa_f)	-0.3011681	0.2332661	0.201
Log of Farm-Size (lnfamsize)	-0.0397829	0.0613947	0.519
Dummy for Linguistic Community (d_ling)	0.0946047*	0.0557505	0.095
Option (Optn)	-0.0088432	0.0319833	0.783
Distance (disn)	-0.0017187	0.0014917	0.254
Dummy for districts with high concentration of STGs (d_dold)	Omitted		
Dummy for self-sale (d_selfsale)	0.1925797***	0.0607271	0.002
Constant	4.842273	1.717243	0.006

Table: 5.3 (New Districts) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations =79 Wald chi2 (12) =36.41 Prob > chi2 = 0.0003 R-squared = 0.0035			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	5.011074*	2.630534	0.057
Log of Price of Urea (lnP_U)	-5.051376***	1.440164	0.000
Log of Price of MOP (lnP_M)	1.890446*	1.111515	0.089
Log of Price of SSP (lnP_S)	-1.210167	0.8321639	0.146
Log of Price of Cow-Dung (lnP_D)	1.875659*	0.9990336	0.060
Log of Price of Irrigation (lnP_I)	-0.3657715	0.5352717	0.494
Log of Price of Vitamin (lnP_V)	0.2638903	0.2546408	0.300
Log of Price of Herbicides (lnP_H)	0.6538504	0.4041236	0.106
Log of Wage Rate of Male Workers (lnwa_m)	-2.854395***	0.974339	0.003
Log of Wage Rate of Female Workers (lnwa_f)	3.473196	2.603008	0.182
Log of Farm-Size (lnfamsize)	0.0707244	0.4350627	0.871
Dummy for Linguistic Community (d_ling)	-0.263662	0.4561528	0.563
Constant	1.925697	20.79389	0.926

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.3 (Old Districts) (Panel 1)			
First stage Regressions **No. of Observations = 131** **Prob > F =0.0001** **R-squared = 0.2692** **Adj R-squared = 0.1810**			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.0578941	0.0578941	0.439
Log of Price of MOP (lnP_M)	-0.0516636	0.044862	0.252
Log of Price of SSP (lnP_S)	-0.0042231	0.0433932	0.923
Log of Price of Cow-Dung (lnP_D)	0.0548893	0.0478713	0.254
Log of Price of Irrigation (lnP_I)	0.0030867	0.0210277	0.884
Log of Price of Vitamin (lnP_V)	-0.0393278	0.0266922	0.143
Log of Price of Herbicides (lnP_H)	0.0187232	0.0222395	0.402
Log of Wage Rate of Male Workers (lnwa_m)	0.1976079***	0.059954	0.001
Log of Wage Rate of Female Workers (lnwa_f)	-0.0357016	0.1341022	0.791
Log of Farm-Size (lnfamsize)	-0.0235078	0.0302991	0.439
Dummy for Linguistic Community (d_ling)	0.048853	0.0293782	0.167
Option (Optn)	-0.0039171	0.0057694	0.499
Distance (disn)	-0.0010242	0.0010416	0.328
Dummy for districts with high concentration of STGs (d_dold)	Omitted		
Dummy for self-sale (d_selfsale)	0.105161***	0.0259072	0.000
Constant	1.661082	0.9986858	0.099

Table: 5.3 (Old Districts) (Panel 2)			
Instrumental Variables (2SLS) Regression **No. of Observations = 131** **Wald Chi2 (12) = 38.53** **Prob > chi2 =0.0001** **R-squared = .**			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	9.275945***	2.974488	0.002
Log of Price of Urea (lnP_U)	-0.5002847	1.129888	0.658
Log of Price of MOP (lnP_M)	-0.1028976	0.6205468	0.868
Log of Price of SSP (lnP_S)	-0.8692448	0.5560277	0.118
Log of Price of Cow-Dung (lnP_D)	-0.7393614	0.5902199	0.210
Log of Price of Irrigation (lnP_I)	0.3723314*	0.2220984	0.094
Log of Price of Vitamin (lnP_V)	0.4063595	0.3336367	0.223
Log of Price of Herbicides (lnP_H)	-0.7928231**	0.3364124	0.018
Log of Wage Rate of Male Workers (lnwa_m)	-1.425465*	0.7679573	0.063
Log of Wage Rate of Female Workers (lnwa_f)	0.1963585	1.705073	0.908
Log of Farm-Size (lnfamsize)	0.4572936	0.3568542	0.200
Dummy for Linguistic Community (d_ling)	0.4696505	0.4908375	0.339
Constant	2.941742	14.94148	0.844

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.3 (Assamese Community) (Panel 1)			
First stage Regressions **No. of Observations = 138** **Prob>F = 0.0000** **R-squared = 0.3637** **Adj R-squared = 0.2913**			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.1016065	0.1153286	0.380
Log of Price of MOP (lnP_M)	-0.0617674	0.0694659	0.376
Log of Price of SSP (lnP_S)	0.0396115	0.0540625	0.465
Log of Price of Cow-Dung (lnP_D)	0.0064478	0.0525779	0.903
Log of Price of Irrigation (lnP_I)	0.028004	0.0231189	0.228
Log of Price of Vitamin (lnP_V)	-0.0628618**	0.0303078	0.040
Log of Price of Herbicides (lnP_H)	0.0012638	0.0243791	0.959
Log of Wage Rate of Male Workers (lnwa_m)	0.2459387***	0.0758773	0.002
Log of Wage Rate of Female Workers (lnwa_f)	-0.2776261*	0.1423247	0.053
Log of Farm-Size (lnfamsize)	-0.0703816	0.0451121	0.121
Dummy for Linguistic Community (d_ling)	Omitted		
Option (Optn)	-0.0040162	0.006389	0.531
Distance (disn)	-0.0014853	0.0010968	0.178
Dummy for districts with high concentration of STGs (d_dold)	-0.1314173**	0.0519858	0.013
Dummy for self-sale (d_selfsale)	0.1566359***	0.0309503	0.000
Constant	2.778382	1.233209	0.026

Table: 5.3 (Assamese Community) (Panel 2)			
Instrumental Variables (2SLS) Regression **No. of Observations = 138** **Wald chi2 (11) = 36.39** **Prob > chi2 = 0.0001** **R-squared = .**			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	4.274804***	1.143529	0.000
Log of Price of Urea (lnP_U)	-1.526135**	0.7679047	0.047
Log of Price of MOP (lnP_M)	-0.2716975	0.4981457	0.585
Log of Price of SSP (lnP_S)	-1.065138**	0.4250738	0.012
Log of Price of Cow-Dung (lnP_D)	-0.1110385	0.4140512	0.789
Log of Price of Irrigation (lnP_I)	0.2369508	0.1678922	0.158
Log of Price of Vitamin (lnP_V)	0.310276	0.2144881	0.148
Log of Price of Herbicides (lnP_H)	-0.3109814	0.299736	0.299
Log of Wage Rate of Male Workers (lnwa_m)	-0.826458	0.5139252	0.108
Log of Wage Rate of Female Workers (lnwa_f)	2.208531*	1.271844	0.082
Log of Farm-Size (lnfamsize)	0.2632748	0.3079672	0.393
Dummy for Linguistic Community (d_ling)	Omitted		
Constant	7.44814	10.40626	0.474

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.3 (Non-Assamese Community) (Panel 1)			
First stage Regressions No. of Observations = 72 Prob>F = 0.0000 R-squared = 0.4785 Adj R-squared = 0.3504			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.0809233	0.1036985	0.438
Log of Price of MOP (lnP_M)	-0.1505814***	0.0501929	0.004
Log of Price of SSP (lnP_S)	0.0285563	0.0436396	0.516
Log of Price of Cow-Dung (lnP_D)	-0.1149833*	0.0677015	0.095
Log of Price of Irrigation (lnP_I)	-0.0096315	0.0230417	0.678
Log of Price of Vitamin (lnP_V)	-0.0046807	0.0140705	0.741
Log of Price of Herbicides (lnP_H)	-0.0895676	0.0549556	0.109
Log of Wage Rate of Male Workers (lnwa_m)	0.1687859**	0.0746505	0.028
Log of Wage Rate of Female Workers (lnwa_f)	-0.1091526	0.1675695	0.517
Log of Farm-Size (lnfamsize)	0.0122118	0.0339874	0.721
Dummy for Linguistic Community (d_ling)	Omitted		
Option (Optn)	-0.0116872	0.0109632	0.291
Distance (disn)	-0.0002631	0.0010423	0.802
Dummy for districts with high concentration of STGs (d_dold)	-0.0709909*	0.0398746	0.080
Dummy for self-sale (d_selfsale)	0.0937916**	0.0416838	0.028
Constant	4.218894	1.527825	0.008

Table: 5.3 (Non-Assamese Community) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 72 Wald chi2 (11) = 18.99 Prob > chi2 = 0.0613 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	10.64315**	4.285148	0.013
Log of Price of Urea (lnP_U)	-2.875045	2.012272	0.153
Log of Price of MOP (lnP_M)	1.983953	1.503006	0.187
Log of Price of SSP (lnP_S)	-0.920896	0.9134021	0.313
Log of Price of Cow-Dung (lnP_D)	1.626053	1.31028	0.215
Log of Price of Irrigation (lnP_I)	0.2003508	0.7297107	0.784
Log of Price of Vitamin (lnP_V)	0.2374435	0.2965989	0.423
Log of Price of Herbicides (lnP_H)	0.1747788	1.177725	0.882
Log of Wage Rate of Male Workers (lnwa_m)	-2.887578**	1.329137	0.030
Log of Wage Rate of Female Workers (lnwa_f)	1.616155	2.872376	0.574
Log of Farm-Size (lnfamsize)	0.4141544	0.600138	0.490
Dummy for Linguistic Community (d_ling)	Omitted		
Constant	-20.23202	27.26083	0.458

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.3 (Single Option) (Panel 1)			
First stage Regressions No. of Observations = 111 Prob>F = 0.0000 R-squared = 0.5153 Adj R-squared = 0.4446			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.0216332	0.1057565	0.838
Log of Price of MOP (lnP_M)	-0.065789	0.0696432	0.347
Log of Price of SSP (lnP_S)	0.0344234	0.0576993	0.552
Log of Price of Cow-Dung (lnP_D)	-0.1060657*	0.0606896	0.084
Log of Price of Irrigation (lnP_I)	0.0200271	0.0203566	0.328
Log of Price of Vitamin (lnP_V)	-0.0212333	0.0208558	0.311
Log of Price of Herbicides (lnP_H)	-0.0404886	0.026434	0.129
Log of Wage Rate of Male Workers (lnwa_m)	0.170341***	0.0615506	0.007
Log of Wage Rate of Female Workers (lnwa_f)	-0.1879152	0.130608	0.153
Log of Farm-Size (lnfamsize)	0.0289677	0.0402422	0.473
Dummy for Linguistic Community (d_ling)	0.0816058	0.0498507	0.105
Option (Optn)	Omitted		
Distance (disn)	-0.0000704	0.0030293	0.982
Dummy for districts with high concentration of STGs (d_dold)	-0.1510998***	0.0549529	0.007
Dummy for self-sale (d_selfsale)	0.1871664***	0.0344492	0.000
Constant	3.937015	1.22552	0.002

Table: 5.3 (Single Option) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 111 Wald chi2 (12) = 50.04 Prob > chi2 = 0.0000 R-squared = 0.1205			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	4.768278***	1.219314	0.000
Log of Price of Urea (lnP_U)	-2.754203***	0.9554165	0.004
Log of Price of MOP (lnP_M)	0.0845546	0.6829308	0.901
Log of Price of SSP (lnP_S)	-0.8202783	0.6849081	0.231
Log of Price of Cow-Dung (lnP_D)	0.9753165	0.5943725	0.101
Log of Price of Irrigation (lnP_I)	0.1326407	0.3387445	0.695
Log of Price of Vitamin (lnP_V)	0.1844792	0.2465791	0.454
Log of Price of Herbicides (lnP_H)	0.1337936	0.3715561	0.719
Log of Wage Rate of Male Workers (lnwa_m)	-1.752105***	0.6519685	0.007
Log of Wage Rate of Female Workers (lnwa_f)	3.325542**	1.648448	0.044
Log of Farm-Size (lnfamsize)	0.0915026	0.343504	0.790
Dummy for Linguistic Community (d_ling)	0.2429379	0.3089055	0.432
Constant	-0.2429154	13.99009	0.986

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.3 (Multiple Options) (Panel 1)			
First stage Regressions No. of Observations = 99 Prob>F = 0.0318 R-squared = 0.2221 Adj R-squared = 0.0815			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.1024537	0.0849076	0.231
Log of Price of MOP (lnP_M)	-0.110177	0.0703167	0.121
Log of Price of SSP (lnP_S)	0.0390279	0.056412	0.491
Log of Price of Cow-Dung (lnP_D)	0.0476055	0.0692431	0.494
Log of Price of Irrigation (lnP_I)	0.0319197	0.0333626	0.341
Log of Price of Vitamin (lnP_V)	-0.0693911**	0.0300872	0.024
Log of Price of Herbicides (lnP_H)	0.222555	0.0341612	0.517
Log of Wage Rate of Male Workers (lnwa_m)	0.2312544***	0.085971	0.009
Log of Wage Rate of Female Workers (lnwa_f)	-0.1218171	0.176048	0.491
Log of Farm-Size (lnfamsize)	0.0081727	0.0473557	0.863
Dummy for Linguistic Community (d_ling)	0.0618014	0.0481171	0.203
Option (Optn)	0.0017328	0.006314	0.784
Distance (disn)	-0.0005969	0.0010342	0.565
Dummy for districts with high concentration of STGs (d_dold)	-0.0819	0.050672	0.110
Dummy for self-sale (d_selfsale)	0.0629588	0.0387097	0.108
Constant	1.809746	1.386133	0.195

Table: 5.3 (Multiple Options) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 99 Wald chi2 (12) = 16.63 Prob > chi2 = 0.1639 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	9.969479**	4.643316	0.032
Log of Price of Urea (lnP_U)	-1.076811	1.317331	0.414
Log of Price of MOP (lnP_M)	0.8124943	0.8625301	0.346
Log of Price of SSP (lnP_S)	-1.224018*	0.6823899	0.073
Log of Price of Cow-Dung (lnP_D)	-1.141275	0.8917494	0.201
Log of Price of Irrigation (lnP_I)	0.0404447	0.3952766	0.919
Log of Price of Vitamin (lnP_V)	0.8232578*	0.4742949	0.083
Log of Price of Herbicides (lnP_H)	-0.9629585**	0.4194743	0.022
Log of Wage Rate of Male Workers (lnwa_m)	-1.887834	1.372172	0.169
Log of Wage Rate of Female Workers (lnwa_f)	0.6855409	2.3613	0.772
Log of Farm-Size (lnfamsize)	0.1529562	0.4827143	0.751
Dummy for Linguistic Community (d_ling)	0.1325324	0.4900113	0.787
Constant	4.650864	19.43692	0.811

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.3 (Self-Sale) (Panel 1)			
First stage Regressions No. of Observations = 78 Prob>F = 0.0004 R-squared = 0.4465 Adj R-squared = 0.3235			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.0326612	0.1713546	0.849
Log of Price of MOP (lnP_M)	-0.0272552	0.1045962	0.795
Log of Price of SSP (lnP_S)	0.0606749	0.0757159	0.426
Log of Price of Cow-Dung (lnP_D)	0.0158163	0.0815889	0.847
Log of Price of Irrigation (lnP_I)	-0.0026882	0.0335503	0.936
Log of Price of Vitamin (lnP_V)	-0.0637731**	0.0304873	0.040
Log of Price of Herbicides (lnP_H)	-0.0268894	0.0390992	0.494
Log of Wage Rate of Male Workers (lnwa_m)	0.2392916**	0.1172599	0.045
Log of Wage Rate of Female Workers (lnwa_f)	-0.4008123**	0.181817	0.031
Log of Farm-Size (lnfamsize)	-0.1006185*	0.0595963	0.096
Dummy for Linguistic Community (d_ling)	0.1460703**	0.0624275	0.022
Option (Optn)	-0.0150923*	0.0085368	0.082
Distance (disn)	-0.001562*	0.0008649	0.076
Dummy for districts with high concentration of STGs (d_dold)	-0.1810285***	0.0667752	0.009
Dummy for self-sale (d_selfsale)	Omitted		
Constant	3.883209	1.810585	0.036

Table: 5.3 (Self-Sale) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 78 Wald chi2 (12) = 14.58 Prob > chi2 = 0.2651 R-squared = 0.0378			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	2.669997	1.845274	0.148
Log of Price of Urea (lnP_U)	-1.326994	1.793714	0.459
Log of Price of MOP (lnP_M)	0.4201072	0.6639416	0.527
Log of Price of SSP (lnP_S)	-1.425989*	0.8015288	0.075
Log of Price of Cow-Dung (lnP_D)	0.4456646	0.5261731	0.397
Log of Price of Irrigation (lnP_I)	0.5746189	0.3682455	0.119
Log of Price of Vitamin (lnP_V)	0.8016922**	0.3388871	0.018
Log of Price of Herbicides (lnP_H)	0.2710149	0.3418031	0.428
Log of Wage Rate of Male Workers (lnwa_m)	-1.412164	0.8598362	0.101
Log of Wage Rate of Female Workers (lnwa_f)	2.597054	1.814915	0.152
Log of Farm-Size (lnfamsize)	0.2369106	0.343028	0.490
Dummy for Linguistic Community (d_ling)	-0.3603707	0.370671	0.331
Constant	-2.981209	14.92576	0.842

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.3 (Other Sources) (Panel 1)			
First stage Regressions No. of Observations = 132 Prob>F = 0.0002 R-squared = 0.2097 Adj R-squared = 0.1151			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.1010349	0.0626409	0.109
Log of Price of MOP (lnP_M)	-0.109149**	0.0449317	0.017
Log of Price of SSP (lnP_S)	0.049704	0.0476518	0.299
Log of Price of Cow-Dung (lnP_D)	-0.0418103	0.0531439	0.433
Log of Price of Irrigation (lnP_I)	0.0380558*	0.0214281	0.078
Log of Price of Vitamin (lnP_V)	-0.0265101	0.0193986	0.174
Log of Price of Herbicides (lnP_H)	-0.0006822	0.0254536	0.979
Log of Wage Rate of Male Workers (lnwa_m)	0.1685808***	0.0554546	0.003
Log of Wage Rate of Female Workers (lnwa_f)	-0.0056618	0.1399381	0.968
Log of Farm-Size (lnfamsize)	0.0195356	0.0328395	0.553
Dummy for Linguistic Community (d_ling)	0.0335079	0.0371627	0.369
Option (Optn)	0.0086175	0.0069275	0.216
Distance (disn)	-0.0017025	0.0015319	0.269
Dummy for districts with high concentration of STGs (d_dold)	-0.0685326*	0.0390856	0.082
Dummy for self-sale (d_selfsale)	Omitted		
Constant	1.917711	1.061649	0.073

Table: 5.3 (Other Sources) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 132 Wald chi2 (12) = 26.75 Prob > chi2 = 0.0084 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p > | z |**
Log of Price of Output (lnP_Y)	5.003468	3.938743	0.204
Log of Price of Urea (lnP_U)	-1.345202	0.9434656	0.154
Log of Price of MOP (lnP_M)	-0.3362634	0.6594494	0.610
Log of Price of SSP (lnP_S)	-1.163162**	0.503759	0.021
Log of Price of Cow-Dung (lnP_D)	-0.6784994	0.5001382	0.175
Log of Price of Irrigation (lnP_I)	-0.1001066	0.2437015	0.681
Log of Price of Vitamin (lnP_V)	-0.0416495	0.1934635	0.830
Log of Price of Herbicides (lnP_H)	-0.7770635***	0.2872199	0.007
Log of Wage Rate of Male Workers (lnwa_m)	-0.880628	0.9341678	0.346
Log of Wage Rate of Female Workers (lnwa_f)	0.0678348	1.404201	0.961
Log of Farm-Size (lnfamsize)	0.0280455	0.3217199	0.931
Dummy for Linguistic Community (d_ling)	0.5549492**	0.2402176	0.021
Constant	26.98929	11.38158	0.018

Significance at 1% ***, significance at 5% **, significance at 10% *

Appendix X

Table: 5.4 (New Districts-Without Option) (Panel 1)			
First stage Regressions No. of Observations = 79 Prob>F = 0.0008 R-squared = 0.4103 Adj R-squared = 0.2923			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.2010467*	0.1188891	0.096
Log of Price of MOP (lnP_M)	-0.2025403*	0.1095293	0.069
Log of Price of SSP (lnP_S)	0.0956624	0.0780852	0.225
Log of Price of Cow-Dung (lnP_D)	-0.3005711**	0.1323728	0.026
Log of Price of Irrigation (lnP_I)	0.047833	0.0374571	0.206
Log of Price of Vitamin (lnP_V)	-0.0340474	0.0259437	0.194
Log of Price of Herbicides (lnP_H)	-0.0651134	0.0504009	0.201
Log of Wage Rate of Male Workers (lnwa_m)	0.2790542***	0.0995243	0.007
Log of Wage Rate of Female Workers (lnwa_f)	-0.3086084	0.2301583	0.185
Log of Farm-Size (lnfamsize)	-0.0408223	0.0603531	0.501
Dummy for Linguistic Community (d_ling)	0.0920369*	0.054845	0.098
Distance (disn)	-0.0019342	0.0014476	0.186
Dummy for districts with high concentration of STGs (d_dold)	Omitted		
Dummy for self-sale (d_selfsale)	0.1948536***	0.0613078	0.002
Constant	4.848659	1.700587	0.006

Table: 5.4 (New Districts-Without Option) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 79 Wald chi2 (12) = 36.52 Prob > chi2 = 0.0003 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p >| z |**
Log of Price of Output (lnP_Y)	5.265221*	2.711876	0.052
Log of Price of Urea (lnP_U)	-5.096887***	1.454186	0.000
Log of Price of MOP (lnP_M)	1.975699*	1.127126	0.080
Log of Price of SSP (lnP_S)	-1.244142	0.8358443	0.137
Log of Price of Cow-Dung (lnP_D)	1.953317*	1.011012	0.053
Log of Price of Irrigation (lnP_I)	-0.3753051	0.5407568	0.488
Log of Price of Vitamin (lnP_V)	0.2716856	0.2583012	0.293
Log of Price of Herbicides (lnP_H)	0.6796895*	0.4098921	0.097
Log of Wage Rate of Male Workers (lnwa_m)	-2.934074***	0.9847047	0.003
Log of Wage Rate of Female Workers (lnwa_f)	3.622092	2.640513	0.170
Log of Farm-Size (lnfamsize)	0.0826725	0.4474622	0.853
Dummy for Linguistic Community (d_ling)	-0.2932708	0.4700443	0.533
Constant	0.1148579	21.22195	0.996

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.4 (Old Districts-Without Option) (Panel 1)			
First stage Regressions No. of Observations = 131 Prob>F = 0.0000 R-squared = 0.2663 Adj R-squared = 0.1847			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.056187	0.0736169	0.447
Log of Price of MOP (lnP_M)	-0.0546288	0.0449546	0.227
Log of Price of SSP (lnP_S)	0.0014839	0.0452465	0.974
Log of Price of Cow-Dung (lnP_D)	0.0532251	0.0481213	0.271
Log of Price of Irrigation (lnP_I)	0.005719	0.0203198	0.779
Log of Price of Vitamin (lnP_V)	-0.0395708	0.0269263	0.144
Log of Price of Herbicides (lnP_H)	0.0184418	0.0222267	0.408
Log of Wage Rate of Male Workers (lnwa_m)	0.193319***	0.0580382	0.001
Log of Wage Rate of Female Workers (lnwa_f)	-0.0298566	0.1313523	0.821
Log of Farm-Size (lnfamsize)	-0.022271	0.030086	0.461
Dummy for Linguistic Community (d_ling)	0.0433299	0.0287659	0.135
Distance (disn)	-0.0010354	0.0010537	0.328
Dummy for districts with high concentration of STGs (d_dold)	Omitted		
Dummy for self-sale (d_selfsale)	0.1042448***	0.025736	0.000
Constant	1.633856	0.9885809	0.101

Table: 5.4 (Old Districts-Without Option) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 131 Wald chi2 (12) = 36.99 Prob > chi2 = 0.0002 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p >| z |**
Log of Price of Output (lnP_Y)	9.888876***	3.087792	0.001
Log of Price of Urea (lnP_U)	-0.4616028	1.152799	0.689
Log of Price of MOP (lnP_M)	-0.0587205	0.6367767	0.927
Log of Price of SSP (lnP_S)	-0.8829213	0.5762947	0.126
Log of Price of Cow-Dung (lnP_D)	-0.7815434	0.6053673	0.197
Log of Price of Irrigation (lnP_I)	0.3638998	0.231337	0.116
Log of Price of Vitamin (lnP_V)	0.4265952	0.3486152	0.221
Log of Price of Herbicides (lnP_H)	-0.8044816**	0.3446571	0.020
Log of Wage Rate of Male Workers (lnwa_m)	-1.551714*	0.8029569	0.053
Log of Wage Rate of Female Workers (lnwa_f)	0.1353939	1.756859	0.939
Log of Farm-Size (lnfamsize)	0.4609619	0.3685846	0.211
Dummy for Linguistic Community (d_ling)	0.4274779	0.5007721	0.393
Constant	2.064427	15.57983	0.895

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.4 (Assamese Community-Without Option) (Panel 1)			
First stage Regressions No. of Observations = 138 Prob>F = 0.0000 R-squared = 0.3623 Adj R-squared = 0.2955			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.1025915	0.11491	0.374
Log of Price of MOP (lnP_M)	-0.0657788	0.0684968	0.339
Log of Price of SSP (lnP_S)	0.0449173	0.0540681	0.408
Log of Price of Cow-Dung (lnP_D)	0.0038933	0.052585	0.941
Log of Price of Irrigation (lnP_I)	0.0291447	0.0229325	0.206
Log of Price of Vitamin (lnP_V)	-0.0636631**	0.0305979	0.040
Log of Price of Herbicides (lnP_H)	0.0014727	0.0245135	0.952
Log of Wage Rate of Male Workers (lnwa_m)	0.2405216***	0.0729105	0.001
Log of Wage Rate of Female Workers (lnwa_f)	-0.2749417*	0.1400381	0.052
Log of Farm-Size (lnfamsize)	-0.0691502	0.0444325	0.122
Dummy for Linguistic Community (d_ling)	Omitted		
Distance (disn)	-0.0015124	0.0010939	0.169
Dummy for districts with high concentration of STGs (d_dold)	-0.1338915**	0.0515538	0.011
Dummy for self-sale (d_selfsale)	0.1564157***	0.0309887	0.000
Constant	2.786844	1.215434	0.024

Table: 5.4 (Assamese Community-Without Option) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 138 Wald chi2 (11) = 36.75 Prob > chi2 = 0.0001 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p >| z |**
Log of Price of Output (lnP_Y)	4.453295***	1.171922	0.000
Log of Price of Urea (lnP_U)	-1.532651	0.7766468	0.048
Log of Price of MOP (lnP_M)	-0.2410404	0.5040387	0.632
Log of Price of SSP (lnP_S)	-1.077024**	0.430218	0.012
Log of Price of Cow-Dung (lnP_D)	-0.1125289	0.4190166	0.788
Log of Price of Irrigation (lnP_I)	0.2320337	0.1702592	0.173
Log of Price of Vitamin (lnP_V)	0.3239183	0.2185214	0.138
Log of Price of Herbicides (lnP_H)	-0.3093535	0.3011045	0.304
Log of Wage Rate of Male Workers (lnwa_m)	-0.8745635*	0.5218965	0.094
Log of Wage Rate of Female Workers (lnwa_f)	2.28097*	1.29214	0.078
Log of Farm-Size (lnfamsize)	0.2726046	0.3129497	0.384
Dummy for Linguistic Community (d_ling)	Omitted		
Constant	6.683072	10.60122	0.528

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.4 (Non-Assamese Community-Without Option) (Panel 1)			
First stage Regressions No. of Observations = 72 Prob>F = 0.0000 R-squared = 0.4727 Adj R-squared = 0.3545			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.0871628	0.1029905	0.401
Log of Price of MOP (lnP_M)	-0.1526722***	0.0495563	0.003
Log of Price of SSP (lnP_S)	0.0382957	0.0433936	0.381
Log of Price of Cow-Dung (lnP_D)	-0.1072226	0.0673631	0.117
Log of Price of Irrigation (lnP_I)	-0.0037361	0.0221067	0.866
Log of Price of Vitamin (lnP_V)	-0.0066773	0.0137457	0.629
Log of Price of Herbicides (lnP_H)	-0.0902114	0.0542783	0.102
Log of Wage Rate of Male Workers (lnwa_m)	0.1623309**	0.0743791	0.033
Log of Wage Rate of Female Workers (lnwa_f)	-0.0933934	0.1678795	0.580
Log of Farm-Size (lnfamsize)	0.0091489	0.0334197	0.785
Dummy for Linguistic Community (d_ling)	Omitted		
Distance (disn)	-0.0006157	0.0009459	0.518
Dummy for districts with high concentration of STGs (d_dold)	-0.0866482**	0.035979	0.019
Dummy for self-sale (d_selfsale)	0.096948**	1.541858	0.021
Constant	4.003219	1.541858	0.012

Table: 5.4 (Non-Assamese Community-Without Option) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 72 Wald chi2 (11) = 17.33 Prob > chi2 = 0.0986 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p >| z |**
Log of Price of Output (lnP_Y)	9.759449**	4.278343	0.023
Log of Price of Urea (lnP_U)	-2.777981	1.843747	0.153
Log of Price of MOP (lnP_M)	1.829414	1.463426	0.211
Log of Price of SSP (lnP_S)	-0.8965789	0.8942786	0.316
Log of Price of Cow-Dung (lnP_D)	1.439227	1.281497	0.261
Log of Price of Irrigation (lnP_I)	0.1980738	0.7170429	0.782
Log of Price of Vitamin (lnP_V)	0.2246311	0.2917763	0.441
Log of Price of Herbicides (lnP_H)	0.0413931	1.152743	0.971
Log of Wage Rate of Male Workers (lnwa_m)	-2.701851**	1.294134	0.037
Log of Wage Rate of Female Workers (lnwa_f)	1.464456	2.795595	0.600
Log of Farm-Size (lnfamsize)	0.4115874	0.5767375	0.475
Dummy for Linguistic Community (d_ling)	Omitted		
Constant	-15.4852	26.82043	0.564

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.4 (Single Option-Without Option) (Panel 1)			
First stage Regressions **No. of Observations = 111** **Prob>F = 0.0000** **R-squared = 0.5153** **Adj R-squared = 0.4446**			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.0216332	0.1052042	0.838
Log of Price of MOP (lnP_M)	-0.065789	0.0692795	0.345
Log of Price of SSP (lnP_S)	0.0344234	0.057398	0.550
Log of Price of Cow-Dung (lnP_D)	-0.1060657*	0.0603726	0.082
Log of Price of Irrigation (lnP_I)	-0.0200271	0.0202503	0.325
Log of Price of Vitamin (lnP_V)	-0.0212333	0.0207469	0.309
Log of Price of Herbicides (lnP_H)	-0.0404886	0.0262959	0.127
Log of Wage Rate of Male Workers (lnwa_m)	0.170341***	0.0612292	0.007
Log of Wage Rate of Female Workers (lnwa_f)	-0.1879152	0.129926	0.151
Log of Farm-Size (lnfamsize)	-0.0289677	0.040032	0.471
Dummy for Linguistic Community (d_ling)	0.0816058	0.0495903	0.103
Distance (disn)	-0.0000704	0.0030135	0.981
Dummy for districts with high concentration of STGs (d_dold)	-0.1510998***	0.0546659	0.007
Dummy for self-sale (d_selfsale)	0.1871664***	0.0342693	0.000
Constant	3.937015	1.219125	0.002

Table: 5.4 (Single Option-Without Option) (Panel 2)			
Instrumental Variables (2SLS) Regression **No. of Observations = 111** **Wald chi2 (12) = 50.04** **Prob > chi2 = 0.0000** **R-squared = 0.1205**			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p >| z |**
Log of Price of Output (lnP_Y)	4.768278***	1.219314	0.000
Log of Price of Urea (lnP_U)	-2.754203***	0.9554165	0.004
Log of Price of MOP (lnP_M)	0.0845546	0.6829308	0.901
Log of Price of SSP (lnP_S)	-0.8202783	0.6849081	0.231
Log of Price of Cow-Dung (lnP_D)	0.9753165	0.5943725	0.101
Log of Price of Irrigation (lnP_I)	0.1326407	0.3387445	0.695
Log of Price of Vitamin (lnP_V)	0.1844792	0.2465791	0.454
Log of Price of Herbicides (lnP_H)	0.1337936	0.3715561	0.719
Log of Wage Rate of Male Workers (lnwa_m)	-1.752105***	0.6519685	0.007
Log of Wage Rate of Female Workers (lnwa_f)	3.325542**	1.648448	0.044
Log of Farm-Size (lnfamsize)	0.0915026	0.343504	0.790
Dummy for Linguistic Community (d_ling)	0.2429379	0.3089055	0.432
Constant	-0.2429154	13.99009	0.986

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.4 (Multiple Options-Without Option) (Panel 1)			
First stage Regressions **No. of Observations = 99** **Prob>F = 0.0349** **R-squared = 0.2218** **Adj R-squared = 0.0921**			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.1000905	0.0852225	0.244
Log of Price of MOP (lnP_M)	-0.1084331	0.0691761	0.121
Log of Price of SSP (lnP_S)	0.0369661	0.0546075	0.500
Log of Price of Cow-Dung (lnP_D)	0.485413	0.0684017	0.480
Log of Price of Irrigation (lnP_I)	0.0297595	0.0310052	0.340
Log of Price of Vitamin (lnP_V)	-0.0683636**	0.0301083	0.026
Log of Price of Herbicides (lnP_H)	0.0230833	0.333559	0.491
Log of Wage Rate of Male Workers (lnwa_m)	0.2335102***	0.0832473	0.006
Log of Wage Rate of Female Workers (lnwa_f)	-0.1229115	0.173406	0.480
Log of Farm-Size (lnfamsize)	0.0080011	0.0470183	0.865
Dummy for Linguistic Community (d_ling)	0.0616368	0.0478262	0.201
Distance (disn)	-0.0006074	0.0010234	0.554
Dummy for districts with high concentration of STGs (d_dold)	-0.0806989	0.050042	0.111
Dummy for self-sale (d_selfsale)	0.0637698*	0.0377113	0.095
Constant	1.820051	1.376591	0.190

Table: 5.4 (Multiple Options-Without Option) (Panel 2)			
Instrumental Variables (2SLS) Regression **No. of Observations = 99** **Wald chi2 (12) = 16.88** **Prob > chi2 = 0.2218** **R-squared = .**			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p >| z |**
Log of Price of Output (lnP_Y)	9.824527**	4.593964	0.032
Log of Price of Urea (lnP_U)	-1.066877	1.3076	0.415
Log of Price of MOP (lnP_M)	0.7950119	0.8606795	0.356
Log of Price of SSP (lnP_S)	-1.218917*	0.6778984	0.072
Log of Price of Cow-Dung (lnP_D)	-1.136385	0.8827166	0.198
Log of Price of Irrigation (lnP_I)	0.0473649	0.3923321	0.904
Log of Price of Vitamin (lnP_V)	0.8116351*	0.4671857	0.082
Log of Price of Herbicides (lnP_H)	-0.9612895**	0.4154892	0.021
Log of Wage Rate of Male Workers (lnwa_m)	-1.848731	1.347179	0.170
Log of Wage Rate of Female Workers (lnwa_f)	0.664729	2.326608	0.775
Log of Farm-Size (lnfamsize)	0.1572566	0.478673	0.743
Dummy for Linguistic Community (d_ling)	0.1400728	0.4862626	0.773
Constant	4.952432	19.22653	0.797

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.4 (SelfSale-Without Option) (Panel 1)			
First stage Regressions **No. of Observations = 78** **Prob>F = 0.0003** **R-squared = 0.4304** **Adj R-squared = 0.3147**			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.0382139	0.1736754	0.827
Log of Price of MOP (lnP_M)	-0.0198302	0.1049912	0.851
Log of Price of SSP (lnP_S)	0.0669833	0.077808	0.393
Log of Price of Cow-Dung (lnP_D)	0.0257446	0.0774662	0.741
Log of Price of Irrigation (lnP_I)	-0.0066325	0.032376	0.838
Log of Price of Vitamin (lnP_V)	-0.0617735**	0.0303316	0.046
Log of Price of Herbicides (lnP_H)	-0.0264812	0.0388284	0.498
Log of Wage Rate of Male Workers (lnwa_m)	0.2363735**	0.1166976	0.047
Log of Wage Rate of Female Workers (lnwa_f)	-0.393007**	0.1830374	0.036
Log of Farm-Size (lnfamsize)	-0.0987661	0.0594649	0.102
Dummy for Linguistic Community (d_ling)	0.1496669**	0.0623656	0.019
Distance (disn)	-0.0018017**	0.0008324	0.034
Dummy for districts with high concentration of STGs (d_dold)	-0.1974413***	0.0665134	0.004
Dummy for self-sale (d_selfsale)	Omitted		
Constant	3.657581	1.77857	0.044

Table: 5.4 (SelfSale-Without Option) (Panel 2)			
Instrumental Variables (2SLS) Regression **No. of Observations = 78** **Wald chi2 (12) = 15.20** **Prob > chi2 = 0.2308** **R-squared = .**			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p >| z |**
Log of Price of Output (lnP_Y)	3.693241*	2.080048	0.076
Log of Price of Urea (lnP_U)	-1.591825	1.892627	0.400
Log of Price of MOP (lnP_M)	0.5333222	0.7065239	0.450
Log of Price of SSP (lnP_S)	-1.492306*	0.8238018	0.070
Log of Price of Cow-Dung (lnP_D)	0.4394315	0.5674427	0.439
Log of Price of Irrigation (lnP_I)	0.5945425	0.3799323	0.118
Log of Price of Vitamin (lnP_V)	0.8987054**	0.3631337	0.013
Log of Price of Herbicides (lnP_H)	0.3132452	0.3532787	0.375
Log of Wage Rate of Male Workers (lnwa_m)	-1.731401*	0.937833	0.065
Log of Wage Rate of Female Workers (lnwa_f)	3.408967*	1.928505	0.077
Log of Farm-Size (lnfamsize)	0.3323836	0.3730406	0.373
Dummy for Linguistic Community (d_ling)	-0.4588147	0.4077815	0.261
Constant	-8.004168	15.47636	0.605

Significance at 1% ***, significance at 5% **, significance at 10% *

Table: 5.4 (Other Sources-Without Option) (Panel 1)			
First stage Regressions No. of Observations = 132 Prob>F = 0.0007 R-squared = 0.2013 Adj R-squared = 0.1134			
Dependent Variable: Log of Price of Output (lnP_Y)	**Regression Coefficient**	**Robust SE**	**p > | t |**
Log of Price of Urea (lnP_U)	0.0976615	0.621838	0.119
Log of Price of MOP (lnP_M)	-0.100032**	0.0451453	0.029
Log of Price of SSP (lnP_S)	0.0386021	0.0459658	0.403
Log of Price of Cow-Dung (lnP_D)	-0.0368977	0.0536337	0.493
Log of Price of Irrigation (lnP_I)	0.0313332	0.0208602	0.136
Log of Price of Vitamin (lnP_V)	-0.0239916	0.0191492	0.213
Log of Price of Herbicides (lnP_H)	-0.0011754	0.0248269	0.962
Log of Wage Rate of Male Workers (lnwa_m)	0.1766799***	0.0549822	0.002
Log of Wage Rate of Female Workers (lnwa_f)	-0.0124977	0.1394032	0.929
Log of Farm-Size (lnfamsize)	0.0179679	0.0328278	0.585
Dummy for Linguistic Community (d_ling)	0.0310111	0.036745	0.400
Distance (disn)	-0.0017803	0.0015644	0.257
Dummy for districts with high concentration of STGs (d_dold)	-0.0605288	0.0373424	0.108
Dummy for self-sale (d_selfsale)	Omitted		
Constant	1.950818	1.069435	0.071

Table: 5.4 (Other Sources-Without Option) (Panel 2)			
Instrumental Variables (2SLS) Regression No. of Observations = 132 Wald chi2 (12) = 27.00 Prob > chi2 = 0.0077 R-squared = .			
Dependent Variable: Log of Output (lnY)	**Regression Coefficient**	**Robust SE**	**p >| z |**
Log of Price of Output (lnP_Y)	4.801441	4.766391	0.314
Log of Price of Urea (lnP_U)	-1.320845	0.9981539	0.186
Log of Price of MOP (lnP_M)	-0.353053	0.6998701	0.614
Log of Price of SSP (lnP_S)	-1.157184**	0.5101663	0.023
Log of Price of Cow-Dung (lnP_D)	-0.6889281	0.4964745	0.165
Log of Price of Irrigation (lnP_I)	-0.0928037	0.2594216	0.721
Log of Price of Vitamin (lnP_V)	-0.0469274	0.1943285	0.809
Log of Price of Herbicides (lnP_H)	-0.7785106***	0.2871219	0.007
Log of Wage Rate of Male Workers (lnwa_m)	-0.8387634	1.062899	0.430
Log of Wage Rate of Female Workers (lnwa_f)	0.0575716	1.38124	0.967
Log of Farm-Size (lnfamsize)	0.0313129	0.3286239	0.924
Dummy for Linguistic Community (d_ling)	0.5551222**	0.2381928	0.020
Constant	27.37102	11.96102	0.022

Significance at 1% ***, significance at 5% **, significance at 10% *

Appendix XI

Table: 5.4			
Production Function (Model 1) No. of Observations = 210 Prob > F = 0.000 R-squared = 0.6078			
Dependent Variable: log of Output (lnY)	**Regression Coefficient**	**SE**	**p > | t |**
log of Labour (lnLb)	0.0232753	0.0890334	0.794
log of Land (lnLa)	0.712954***	0.092443	0.000
log of Fertilizer (lnF)	0.1068883**	0.0432016	0.014
log of Pesticides (lnP)	0.0515055	0.0587156	0.381
log of Capital Cost (lnC)	0.0153217	0.0426308	0.720
Constant	8.15608	0.7720016	0.000

Significance at 1% ***, significance at 5% **, significance at 10% *

Appendix XII

Table: 5.7			
Production Function (Model 2) No. of Observations = 210 Prob > F = 0.0000 R-squared = 0.6533			
Dependent Variable: log of Output (lnY)	**Regression Coefficient**	**SE**	**P> | t |**
log of Labour (lnLb)	0.04686	0.0842752	0.579
log of Land (lnLa)	0.71704***	0.0903747	0.000
log of Fertilizer (lnF)	0.06762	0.041554	0.105
log of Pesticides (lnP)	0.04418	0.0565528	0.436
log of Capital Cost (lnC)	0.0925**	0.0431189	0.033
Dummy for linguistic Community (d_ling)	-0.0024	0.1473595	0.987
Dummy for districts with high concentration of STGs (d_dold)	0.64013***	0.1543726	0.000
Constant	7.26637	0.7496771	0.000

Significance at 1% ***, significance at 5% **, significance at 10% *