AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF TEA IN WAYANAD DISTRICT

by

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(Admn. No. 2018-11-125)

THESIS

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2020

DECLARATION

I, hereby declare that this thesis entitled "**AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF TEA IN WAYANAD DISTRICT**" is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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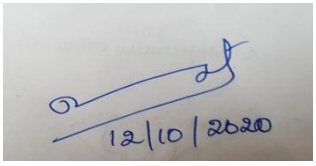

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(Marupilla Supriya)

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LIST OF ABBREVATIONS

ANN	Artificial Neural Network
BCR	Benefit Cost Ratio
BHS	Brown Hydromorphic Soil
BLFs	Bought Leaf Factories
CAC	Codex Alimentarius Commission
CTC	Crush Tear Curl
et al	Co worker
FYM	Farm Yard Manure
GAP	Good Agricultural Practice
GOI	Government of India
GOK	Government of Kerala
HSC	Higher Secondary
HUL	Hindustan Unilever
IRDP	Integrated Rural Development Programme
ITC	International Tea Committee
KAU	Kerala Agricultural University
MFC	Marginal Factor Cost
MOP	Muriate of Potash
MPP	Marginal Physical Product
MRL	Maximum Residue Limit
MVP	Marginal Value Product
OLS	Ordinary Least Square
R^2	Coefficient of Multiple Determination
SLTB	Sri Lanka Transport Board
STGs	Small Tea Growers
TMCO	Tea Marketing Control Order
VIF	Variance Inflation Factor

LIST OF SYMBOLS

^{0}C	Degree Celsius
ha^{-1}	Per hectare
%	Per cent
₹	Rupees
<	Less than
>	Greater than
≤	Lesser than or equal to
Ha	Hectares
Kg	Kilogram
Sq.km	Square Kilometre
Kg^{-1}	Per Kilogram
M	Metre
Mm	Millimetre
MT	Million tonnes
T	Tonnes
q	Quintal

Introduction

1. INTRODUCTION

Tea is considered to be one among the world's hottest beverages. It is known as the queen of beverages and is an evergreen perennial crop. Tender shoots of the tea plant "*Camellia sinensis*" comprising two to three leaves and bud are used for making the commercial Black (fermented) or Green (unfermented) tea. Tea is the dried leaf of a bush that contains theine and it gives a very cheap and relaxing drink when added to the boiling water along with sugar and milk. So it is India's most significant beverage crop (Kiruthiga and Damodaran, 2016). Tea is commonly grown in areas with annual rainfall ranging from 1150 to 1400 mm. The ideal temperature for growth is 35^0C and 4 hours average daily sunshine. Deep, well drained, acidic soils having a P_H range from 4.5-6 is ideal for the crop. It can be grown 2000 feet to 6000 feet above mean sea level. Humidity levels can affect the production and yield of tea, with 80-90% relative humidity considered optimal during the growing season of tea plants. Wild plants can reach up to 9 m in length, but on the tea plantations they are cut back to a bush about a metre in height so workers can easily pluck the leaves. The plant produces pointed, dark leathery, small leaves.

India is the world's second-largest tea producer, after China. There is a wide range of tea in the country including CTC tea, green tea, orthodox tea and organic tea. Unlike several other tea growing and exporting nations, in addition to green tea, India also has a manufacturing base for both CTC tea and orthodox tea. The country offers specialty teas of high quality such as Darjeeling, Assam Orthodox and high-range Nilgiri tea, Munnar tea with distinct aroma, strength, colour and flavour. India's tea industry is around 172 years old and is probably one of the only industries that has maintained its production leadership over the last 150 years. Indian tea is among the world's finest due to clear geographical indications, heavy investment in tea processing units, continuous innovation, improved product variety and strategic expansion of the sector (Tea Board of India, 2018).

1.1 AN OVERVIEW OF TEA STATISTICS

Tea is cultivated in over 32 countries worldwide covering an area of more than 2.5 million hectares. China, India, Kenya, Sri Lanka, Vietnam, Indonesia are leading tea producing countries. Together, these six countries constituted 83 per cent of the world's total tea production, and 80 per cent of the world's tea exports. In 2018, China

is the largest tea producer with an annual production of 2.62 million tonnes out of 5.89 million tonnes of total world tea production. It constitutes 44.3 per cent of the world‘s production followed closely by India (22.7%). India's share of world tea exports was 12.9 per cent (0.256 million tonnes) out of 1.86 million tonnes of total export. (ITC Annual Bulletin of Statistics, 2019). The production of tea in major tea producing countries in the world is given in Table 1.

Table 1. Production of tea in major growing countries of the world (2014-18)

Sl. No	**Country**	**Production in thousand tonnes**				
		2014	**2015**	**2016**	**2017**	**2018**
1	China	2095.72 (40.20)	2249.00 (42.50)	2404.95 (43.10)	2496.41 (43.80)	2616.00 (44.30)
2	India	1207.31 (23.10)	1208.66 (22.80)	1267.36 (22.70)	1321.76 (23.10)	1338.63 (22.70)
3	Kenya	445.11 (8.50)	399.21 (7.50)	473.01 (8.40)	439.86 (7.70)	493.00 (8.30)
4	Sri Lanka	338.03 (6.40)	328.96 (6.20)	292.57 (5.20)	307.72 (5.40)	304.01 (5.10)
5	Vietnam	175.00 (3.30)	170.00 (3.20)	180.00 (3.22)	175.00 (3.00)	163.00 (2.70)
6	Indonesia	144.37 (2.70)	132.62 (2.50)	137.02 (2.40)	134.00 (2.30)	131.00 (2.20)
7	Others	803.43 (15.40)	796.43 (15.07)	818.73 (14.60)	823.24 (14.40)	851.01 (14.43)
8	**Total**	**5208.97 (100)**	**5284.388 (100)**	**5573.64 (100)**	**5697.99 (100)**	**5896.65 (100)**

Note: Figures in the parentheses indicate percentages
Source: ITC Annual Bulletin of Statistics, 2019.

1.2 GEOGRAPHICAL DISTRIBUTION OF TEA

In India the major tea growing areas are concentrated in Assam, West Bengal, Tamil Nadu and Kerala. Karnataka, Tripura, Himachal Pradesh, Uttaranchal, Arunachal Pradesh, Manipur, Sikkim, Nagaland, Meghalaya, Mizoram and Bihar are other areas where tea is grown to a limited extent. Area, production and productivity of tea in different states of India in 2017 -18 is presented in Table 2. Area and production was given for fresh green tea leaf whereas, Productivity was given for processed dry tea leaf.

Table 2. Area, Production and Productivity of tea in different states of India (2017-18)

Sl. No	State	Area (ha)	Production (tonnes)	Productivity (kg/ha)
1	Assam	337690.35 (53.04)	675170 (51.08)	2394
2	West Bengal	148121.74 (23.20)	384510 (29.09)	2706
3	Others North India	49816.95 (7.82)	27430 (2.07)	522
4	North India	535629.04 (84.10)	1087110 (82.20)	2281
5	Tamil Nadu	62885.13 (9.80)	166900 (12.60)	2674
6	Kerala	35871.16 (5.63)	62350 (4.71)	1738
7	Karnataka	2171.74 (0.34)	5400 (0.40)	2486
8	South India	100928.03 (15.80)	234650 (17.70)	2327
9	All India	636557.07 (100.00)	1321760 (100.00)	2076

Note: Figures in the brackets indicate percentage to column total

Source: Tea Statistics, Tea Board India, 2019.

Tea plantations in India can be largely grouped into two regions, North India and South India, which occupy 84.10 per cent and 15.80 per cent of India’s total tea area, respectively. The important tea growing states are Assam and West Bengal representing 53.04 per cent and 23.20 per cent of North India's area under cultivation, respectively. The other 7.82 per cent are located in Bihar, Manipur, Sikkim, Arunachal Pradesh, Nagaland, Tripura, Uttar Pradesh, Orissa Meghalaya and Himachal Pradesh. South India occupies 15.8 per cent of the tea area (100928.03 ha)

and produces 24.16 per cent of production (204552 tonnes). In South India , the major tea growing states are Tamil Nadu, Kerala and Karnataka contributing 62.30, 35.50 and 2.20 per cent respectively. Tamil Nadu occupies 9.8% (62885.13 ha), Kerala occupies 5.63% (3581.16 ha) and Karnataka 0.4% (2171.74 ha) tea area of India. Area, production and productivity of tea in India for last 10 years are presented in Table 3. Area and production was given for fresh green tea leaf whereas, Productivity was given for processed dry tea leaf.

Table 3. Area, Production and Productivity of tea in India for last 10 years (2009-19)

Sl. No	Year	Area (ha)	Production (tonnes)	Productivity (kg/ha)
1	2009-10	572.00	979.90	1703
2	2010-11	575.80	966.40	1668
3	2011-12	579.35	1115.70	1891
4	2012-13	563.98	1126.30	2013
5	2013-14	563.98	1200	2143
6	2014-15	566.66	1207.30	2113
7	2015-16	569.89	1208.66	2176
8	2016-17	573.20	1267.36	2211
9	2017-18	578.39	1321.76	2076
10	2018-19	582.60	1338.63	2297

Source: Tea Statistics, Tea Board India.

1.3 TEA CULTIVATION IN KERALA

Kerala tea cultivation has the unique benefit of being grown in a wide variety of agro-climate areas, giving rise to a range of distinct teas, each with a specific quality attribute such as strength and black leaf appearance, cup brightness, aroma and flavour. Kerala grows both CTC and orthodox tea varieties and these varieties are eminently suitable for mixing components for national and international blends. There is also ample space for sustainable and biodynamic tea cultivation as well. The unique benefit of Kerala is that it is highly appropriate for ready to drink teas (RDT), such as ice tea and flavoured teas. Kerala produces tea all year round, allowing good quality throughout the year and eliminating the need to store stocks.

Tea is one of Kerala's main plantation crops and the state is the fourth largest producer of the crop representing 4.71 per cent of the country's total domestic output. The State's tea production has shown a marginal increase since 2015-16 despite the area under the crop remaining the same. In 2017-18, tea production increased by 1.2 per cent compared to 2016-17. In Kerala, tea is cultivated under 30,205 ha. In 2017-18, Idukki district stood first in area and production with 21,970 ha under tea and 44.9 MT respectively, followed by Wayanad with 5,306 ha and production of 12.4 MT respectively. Other major tea producing districts are Thiruvananthapuram, Kollam, Kottayam and Palakkad. Though tea is grown in all these districts, the spatial concentration in two districts, Idukki and Wayanad, is considerable. The two districts together constitute 87.24 per cent of Kerala’s total tea production. Idukki has 72.40 per cent and Wayanad has 14.84 per cent of the State’s tea growing area (Tea Board, 2000). In 2017-18 cash crops (cashew, pepper, rubber, cardamom, coconut, coffee and tea) constituted 61.6 per cent. The area under crops like rubber, cardamom, coffee and tea was 27.3 per cent of the total cropped area in Kerala.

Though tea cultivation in Wayanad was started in the 1870s, the organised planting of tea was started only in 1892. The credit goes to Parry and Company, which planted it on a large scale on their Perindotti estate in South Wayanad. After 1892, the coffee estates and cinchona plantations were transformed into tea gardens. Vigorous planting activities were started during this period and many bamboo forests were destroyed for the cultivation of tea in Wayanad. The first experiment of Parry and Company in Wayanad clearly showed that well-planted tea will grow very well and that the agro-climatic conditions of Wayanad were suitable for its large-scale cultivation. The success of Parry and Company and the increasing demand of tea in the European market attracted new tea companies to Wayanad. The availability of land and cheap labour strengthened the drive of the European companies. The joint-stock companies like Harrison & Crossfield, Pierce-Leslie, and Kerala Tea Company were the big European companies which invested large amounts of capital in Indian tea plantations in Wayanad during the late nineteenth century. Within a short span of eight years more than 10,000 acres of land was brought under tea cultivation. Area, Production and Productivity of tea in Kerala and Wayanad is presented in Table 4 and 5 respectively. Area and production was given for fresh green tea leaf whereas, Productivity was given for processed dry tea leaf.

Table 4. Area, Production and Productivity of tea in Kerala for last five years (2014-19)

Particulars	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**
Area (ha)	30.2	30.2	30.2	35.8	36.4
Production (tonnes)	65.1	57.8	61.5	62	60.76
Productivity (kg/ha)	2158	1917	2036	1732	1666

Source: Tea Statistics, Tea Board India, 2019.

Table 5. Area, Production and Productivity of tea in Wayanad for last ten years (2010-19)

Year	**Area (ha)**	**Production (tonnes)**	**Productivity (kg/ha)**
2010-11	6343	9366	1477
2011-12	6472	9686	1496
2012-13	5200	12389	2382
2013-14	5300	15300	2886
2014-15	5306	15435	2910
2015-16	5306	15435	2910
2016-17	5306	12438	2344
2017-18	5470	9578	1750
2018-19	5898	9350	1585
2018-19	5980	14250	2380

Source: Tea Statistics, Tea Board India, 2019.

Major tea producers and tea brands in Kerala

Tata Tea and Harrisons Malayalam, Ram Bahadur Thakur (RBT) group, MMJ group, Mahavir Plantations, Heiliyburia tea are primary tea producers operating in Kerala. There are two brands available in Kerala: Brooke bond and Harrison Malayalam. The popular forms of tea available in Kerala are CTC and leaf tea.

1.4 MARKETING OF TEA

Tea is sold through various channels such as i) auction sales, (ii) joint contract sales (iii) forward sales by distribution or purchasing agents, (iv) direct packaging and retailing of the products. Of these, the most common marketing channel is that of public auctions. South India has three auction centres and Kerala has one auction centre in Kochi. Tea trade is highly sensitive, domestic demand and the remaining unexported excess tea within the country dictate the price levels. In addition to this many farmers who were not taking part in the auctions sold through the commission agents also.

The increasing costs of inputs such as labour, fertilizers, manures and other plant protection materials, on the one hand, and the spiralling marketing costs, increasing the marketing margin, widening the price spread and temporal price variation, on the other hand eliminated the tea plantations profitability. Tea price has fluctuated widely in the recent past due to unstable foreign and domestic markets. India's share of total international tea trade was also slightly declining year after year due to the competition from the other tea producing countries in the world such as China, Kenya, Sri Lanka, Turkey and Vietnam.

Eventhough tea plantations occupies immense importance, much studies has not been done in this area, especially in Wayanad district of Kerala. Realising this factor the present study attempts to study the production and marketing of tea in Wayanad with the given objectives.

1. To study the input use pattern in tea cultivation
2. To analyze the costs and returns from tea cultivation
3. To examine the resource use efficiency in tea
4. To study the marketing aspects of tea
5. To study the constraints in the production and marketing of tea.

1.5 SCOPE OF THE STUDY

The results of the study provide information on cost and returns from tea cultivation which would be useful to the producers, researchers and policy makers to take suitable measures to improve the production of tea. Reorganization of resource use would contribute to the economic efficiency resulting in higher production, lesser

costs and to increase profits. The study of price spread and the role of middlemen would be great relevance to the policy makers in fixing the remunerative price and to remove drawbacks in the marketing of tea.

1.6 LIMITATIONS OF THE STUDY

The research was performed over a short period of time in a small region of diverse agro-climatic and socio-economic circumstances, thereby suffering from disadvantages. The conclusions drawn are with identical conditions specific to that region and state. The required primary data on tea cultivation were collected from the farmers using a pre-tested schedule of interviews and hence have some limitations.

1.7 ORGANIZATION OF THE THESIS

This thesis has been presented in the order as mentioned below:

1. Introduction: This chapter comprises detailed background of the problems, objectives, scope and limitation of the study.

2. Review of literature: This chapter includes the results and findings of the past studies related to the research topics.

3. Materials and methods: This includes the description of study area, source of data, method of data collection and different statistical tools used for the analysis of collected data and different variables.

4. Results and discussion: This chapter contains the results from the analysis and interpretation of the study.

5. Summary: This chapter pointed out the result findings and policy implications.

1.8 FUTURE LINE OF WORK

This study was conducted exclusively on tea crop of Wayanad district. Similar studies can be extended to other areas to get a clear picture of production and marketing aspects of tea. An in-depth study including different crops in the state will be useful for formulating appropriate policies. These comparative studies can be used to provide basis for policy recommendations to increase the tea production in the state. Considering the importance of the research problem, future studies can also be conducted in the areas where farmers are facing constraints in production and marketing of tea.

Review of Literature

2. REVIEW OF LITERATURE

A critical review of the past studies relating to the research problem is essential to find the appropriate methodology and to support the findings of the research. The present study attempts to examine the pattern of input usage, costs and returns, the efficiency of resource usage, marketing and the constraints in tea production and marketing. An extensive literature survey was done to identify similar studies related to the present problems. The reviews obtained related to the study are provided under the following sub-headings.

2.1 Studies on growth in area, production and productivity of tea over the years.

2.2 Studies on input use pattern

2.3 Studies on costs and returns analysis

2.4 Studies on resource use efficiency

2.5 Studies on marketing

2.6 Studies on constraints in the production and marketing of tea.

2.1 STUDIES ON GROWTH IN AREA, PRODUCTION AND PRODUCTIVITY OF TEA OVER THE YEARS

Sisodia (1969) found that, India was the largest producer, exporter and consumer of the tea in the world. According to the study tea was remained as a good source of revenue for the state governments. The industry gave employment to labour force of about one million. Further, the study reported that the total export earning share of tea in India varies from 14 per cent to 20 per cent.

Reddy (1991) analyzed the trend in area, production and productivity of tea in India during 1953-77. Negative growth in production and productivity was observed during the period. There was decrease in India's export share in the total world export. He further suggested that the state of affairs could be improved by rationalization of the central and state tax system and through the setting up of the financial corporations.

Radhakrishnan (1997) observed the potential for the growth of tea plantations in Wayanad district of Kerala. The average yield of tea in Wayanad was 2300 kg/ha during 1997. One of the key factors affecting yield in Wayanad was persistent drought. Further, they added that for increasing productivity, replantation, rejuvenation, pruning, infilling, and shading with trees were the options before planters. By introducing these practices, the yield level of tea in the district could be increased from 25 per cent to 30 per cent.

Haridas (1998) provided a simple image of the tea plantations in Kenya. In Kenya tea was one of the main sources of revenue, and large commercial companies dominated the tea industry. The Kenya Tea Production Authority had tea-growing area of 57,700 hectares. In Kenya, total production and yield levels have both increased. The number of smallholder farmers is also rising.

The Techno -Economic Survey of Small Tea Growers of Kerala by the Tea Board of India (2001) revealed that there were 4892 small tea growers in the districts of Wayanad and Idukki in Kerala registered with tea board. The total area where such growers grew tea was 3796 ha. Besides, there was also a considerable number of unregistered small tea growers. Most of the unregistered tea growers were resided in the Peermade, Veghamon, Kumili and Vandanmedu sub divisions of Idukki districts. The survey revealed that the average size of tea holding was higher (1.13 ha) in Idukki district than in Wayanad district (0.66 ha). Over 59 per cent of the planted area had bushes that were above ten years old and 27 per cent were young tea below five years of age. Only 12 per cent of the total tea area was irrigated in 1996.The average yield of green leaf per ha was 3420 kg (769.5 kg made tea).

According to Joseph (2002), the tea cultivation in Kerala recorded a maximum in 1966 and then started declining up to 1993 and thereafter showing stagnant growth. The area under tea cultivation in Kerala recorded a negative compound growth rate. The production has increased in all states and the whole of India. The area expansion of tea could be visualized through the increasing production scenario of tea in all states of India except Kerala. Although in Kerala area has shown a declining trend, production has increased over the years. The increased tea production in Kerala was majorly attributed by increased productivity. In India, tea productivity has increased

to 1865 kilograms per hectare in 1997 and thereafter showing a declining trend. Sarkar (2009) observed a similar declining trend of tea productivity in India.

Saikia *et al*. (2003) studied the land utilization pattern of the small tea growers of Rajgarh and Naharkatiya regions in the Dibrugarh district of Assam. The study observed that on average each grower had 1.27 ha area under tea, which was 35.38 per cent of his land occupation. Of this 0.45 ha (35.43%) was virgin land and 0.64 ha (56.40%) was under other crops, which was uprooted. Correlation between area and green leaf production was found to be positive but the same was reverse in case of area and productivity.

Sharma and Sharma (2003) conducted a study of tea production and export performance, and recorded positive growth rates for tea area, production and productivity. They further recorded that the share of Indian tea exports in total tea exports in 1950 was as high as 72.17 per cent, which had dropped steadily to 23.79 per cent in 1999.

Karmakar and Banerjee (2005) conducted a tea industry analysis in India, and found India to be the world's largest tea producer and exporter. They added that over the last five years India has produced about 820 million kg of tea annually. India produced 826 million kg of tea in 2002 and 27 per cent of its share of world production.

Arya (2013) examined the Indian tea scenario and observed that world tea production reached 4.73 MT in 2008. At the international level, China dominated the market with a 28.90 per cent share of the total world tea production. In 2010 world tea production reached 1738.41 million kg. India was the market leader with regard to production and consumption until 2005. Moreover, they added that during 2008-09, India was the second largest producer of tea in the world, and produced around 972.77 million kg of tea in 2008-09 as against of 945.27 million kg in 2007- 2008. It was further reported that the tea industry accounted for the employment of more than 2 million people in India.

Ganguli (2014) analysed the land utilization pattern of tea cultivation in Assam and reported that the land area under tea cultivation of the Small Tea Growers (STG) increased by almost 49 per cent in 2007 over 2003, whereas that under estate

cultivation was increased by only one per cent during the same period. The study further highlighted that the production of the STGs increased from 180.66 million kg in 2003 to 257.46 million kg in 2008 (an increase of almost 42.5%) whereas the production of large tea estates increased from 697.47 million kg in 2003 to 723.36 million kg in 2008 (an increase of only 3.7%).

India is the world's second-largest tea manufacturer, after China. The country hosts a wide range of teas including Crush Tear Curl tea, green tea organic tea and orthodox tea. Unlike several other tea growing and exporting nations, in addition to green tea, India also has a manufacturing base for both orthodox tea and CTC tea. India offers speciality teas of high quality, such as Darjeeling, Assam Orthodox and high-range Nilgiri tea, which have a distinct aroma, strength, colour and flavor (Tea Board of India, 2018).

2.2 STUDIES ON INPUT USE PATTERN

In the study "Transfer of Tea Agro Technology to the Small Producer of Kangra Valley in India," Jain (1991) found that the new transfer agro-technology led to the doubling of yield and fivefold increase in price. The effect of modern agro-technology was thus becoming a beneficial one. It has also shown that a dedicated team of professional scientists can transform agro-industry.

The use of nitrogen fertilizers improves yield per unit area under good management in commercial tea plantations with recommended values in India and Kenya ranging from 100 kg N / ha / year (Bonheure *et al*. 1992) to 1200 kg N / ha / year for green tea in Japan (Watanabe, 1995).

According to Hazarika and Subramanian (1999), fertilizer has been a significant input in short-term improvement of tea productivity. Small and medium holders have been found to use less fertilizer (228.98 kg/ha) as compared with large holders (258.53 kg/ha). The small and medium-sized holdings used phosphorous of 30.80 kg/ha and potash of 85 kg/ha, while the large estates used phosphorus of 28.47 kg/ha and potash of 94.87 kg/ha. The recommended dose of N: P: K (kg/ha) was 135:90:135. So there was a large difference in phosphorus and potash use among the respondents.

According to Costa *et al*. (2007), input use pattern in tea cultivation on pooled, small and large farms was noticed and reported that among the human labour utilization, harvesting operation requires more human labour followed by application of manures and fertilizers.

Tea was a food crop for which traces of pesticides were of great concern. As tea is a common beverage worldwide, many people may have been exposed to residues of pesticides by drinking tea. As awareness of this issue increased, many countries took action by setting their own tentative limits for pesticide residues in tea, or by adopting the default MRL values set by international organizations such as the Codex Alimentarius Commission (CAC), or by setting more stringent MRLs on the basis of their own studies (Jaggi *et al*., 2001; Huang *et al*., 2007).

Gurusubramanian *et al.* (2007) attempted to review European Community surveillance study on the extent of residues in Assam and Darjeeling tea. They observed that the recent amendments by international and national regulatory bodies revised MRLs of pesticides in tea. The study further noted that the average usage pattern of chemical pesticides in Assam Valley and Cachar tea was reported to be 11.5 kg/ha, in Dooars and Terai 16.75 kg/ha and in Darjeeling 7.35 kg/ha. In a recent study in Dooars tea gardens, synthetic pesticides made up 85 per cent of the total pesticides used, while 15 per cent were of organic and inorganic origin.

Concerns over food safety have been growing globally. One of the most important issues was the use of pesticides on crops. The maximum residue limit (MRL) is a value that is set to ensure that a pesticide is used in such a way as not to affect consumer health. The MRL value determines the permissible pesticide residue content legally allowed in food or feed crops and is enforced by the guidelines for Good Agricultural Practice (GAP) (Bates, 2002; Mac Lachlan and Hamilton, 2010). GAP has been developed to meet a number of objectives; one of which was to ensure the protection and quality of food products (FAO, 2008).

Agricultural production is a process that incorporates different inputs such as: seeds, fertilizers, pesticides, labour, irrigation water, and machinery. These inputs were seen as essential variables in the study of the quality of output. The study showed that irrigation water, fertilizer (nitrogen, phosphorus, NPK), pesticide, labour

and capital had a significant effect on the efficiency of tea production (Hong and Yabe, 2015).

Soheili-Fard and Salvatian (2015) used an Artificial Neural Network (ANN) in Guilan province, Iran, to investigate the relationship between energy inputs and tea yields. The energy consumption trend was determined in many villages of that region by collecting data from 30 tea farmers using face-to-face questionnaire procedure. The results indicated that total energy consumption and tea production yield were 46144.04 MJ ha-1 and 8419.47 kg ha-1, respectively. A large share of energy consumption was contributed by nitrogen (50.84%). Further, ANN applied sensitivity analysis for robustness of the evaluated mode. The results showed that the farm yard manure had the highest sensitivity rate.

Thapa and Lal (2016) reported that the high usage of inputs like chemical fertilizers and pesticides were one of the inescapable factors leading to land degradation, soil erosion and water contamination in the tea garden. Contaminated water with fertilizers and pesticides were led to potential health threat in the local environment. Besides, Darjeeling Himalaya's tea bushes were already 100 years old and very few re-plants have occurred which has resulted in declining productivity.

2.3 STUDIES ON COSTS AND RETURNS

Pathania (1984) studied the cost of cultivation of tea in the Kangra district of Himachal Pradesh. He observed a negative growth in the case of production and productivity. But, the area under the tea in Himachal was constant over the period under study. He observed that the major constraint faced by the tea growers in the state was scarcity of labour. He suggested that more emphasis should be placed on proper management of tea estates.

Pathania (1991) employed break-even analysis of tea cultivation in Kangra district of Himachal Pradesh to determine the break-even amount of output of tea for different size categories. The break-even output for small tea plantations at different levels of technology used was 620 kg per farm. The break-even output for medium farms have been worked out to be 2000 kg per farm and for large farms 10,500 kg per farm. The break-even output in the overall situation had been estimated at 2,380 kg per farm.

They studied the profitability of tea cultivation during the period 1988-92 in two estates run by the Bangladesh Tea Board. The average production cost of made tea was taken at Rs.32.36 and Rs.42,155 per kg and per ha respectively. Production costs showed a steady trend over the period. In total expense, the high was followed for labour contribution (36.87%) followed by tea manufacturing (18.23%) and establishment (8.87%). In both the tea estates the cost of various components has held a similar pattern. The overall gross margin was taken from Rs.13.14 and Rs. 17,087 per kg and per ha respectively. The overall benefit-cost ratio was found to be1.40 (Saha and Gazi, 1994).

Sharma and Bhuyan (2000) analyzed the investment capital and working capital needed and sources of finance for small scale cultivation of tea in Assam. The per farm and per hectare investment capital needed for the sample tea growers (n= 80, 1981-91) were estimated as Rs.1,00,148 and Rs. 39,629 respectively. The working capital required for the sample growers during 1991 was Rs.10753/ha per annum. For the investment, small tea growers were mostly depended on the equity capital (63.63 %). They also depended on non-equity sources such as relatives and money lenders, but institutional finance was negligible. They further recommended that appropriate measures should be taken to channel the flow of funds from the banking sector to this profitable and emerging area of small tea cultivation.

Based on their tea economics analysis in Himachal Pradesh, Pathania *et al*. (2005), reported that the cost of establishment and cultivation of tea without subsidy on slopy marginal grassy and unirrigated land was Rs 15,906. The annual operational cost of such tea gardens varied from Rs 34,290 to Rs 66,744 in different years. They further reported that the expenditure on labour was maximum in case of plucking operation. Among the different operational cost, labour cost accounted for maximum share (66.31%).

Latif *et al* (2012) performed a cost / benefit analysis of tea production in Pakistan and identified that tea production was spent on an average in Pakistan, Rs. 39600.77, Rs. 23274.51, Rs. 20709.36 and Rs. 20625.69 per acre during the first-fourth years of tea planting. In the 1st year, the sown plants accounted for the largest share (63.24%) of the total cost of Rs. 39600.77 per acre, followed by land rent (25.97%), labour days (7.12%), land preparation (1.44%), irrigation (1.16%) and

fertilizer application (1.06 %). In the second and third years, land rent accounted for higher costs, i.e. 44.13% and 49.60% respectively, followed by planting costs of 31.40% and 23.58% respectively, fertilizers accounted for 12.43% and 13.98% respectively, labour days accounted for 10.06% and 10.62%, and irrigation accounted for 1.98% and 13.98% respectively. In the fourth year, land rent, labour days, fertilizer application, number of plants sown and irrigation accounted for 49.79%, 20.44%, 14.03%, 13.50% and 2.23% of total cost (Rs. 20,625.69) per acre, respectively.

Hazarika *et al*. (2016) worked in Assam on the economics of tea leaf production by small and marginal farmers and reported that tea yield rates were estimated at 42.35%, 34.38% and 31.66% respectively over Cost A_1, Cost B and Cost C. They further recorded that Rs. 98,010, Rs. 82,263 and Rs. 74,240 per hectare per annum over Cost A_1, Cost B and Cost C respectively were the estimated annual constant net cash flows from tea plantations. The approximate benefit-costs ratio was 1.11.

Kiruthiga and Damodaran (2016) tried to estimate the cost of tea cultivation in the Tamil Nadu district of Nilgiri and listed all the tea cultivation operations; harvesting accounted for a greater proportion of the tea cultivation costs followed by manures and pesticides. Farm size group wise analysis of cost of tea cultivation revealed that the cost of cultivation of tea was higher for large farms (Rs. 5,56,838) followed by medium size farms (Rs. 5,35,233) and small size farms (Rs. 5,17,888).

Cost and return analysis was conducted to determine the viability of tea farm enterprise. The report, however, emphasized an overview of the existing tea gardens over one year. Costs relating to initial seedling costs and land planning practices have therefore been ignored (Choudhary *et al*., 2017).

In a survey conducted by Oluyole *et al*. (2017), to analyze costs and returns on one hectare of tea plantation on Taraba state's Mambilla plateau. This shows that the average total cost of one hectare of tea plantation incurred by a farmer was Rs. 1,45,409.21 while the average gross income of one hectare per farmer was Rs. 2,97,098.65. The average net farm income from one hectare was Rs.1,51,689.44 per year. Thus tea production is highly profitable in the study area.

According to Vengoto and Sharma (2018) returns from tea production for different categories of sample farms was calculated and the total gross farm income was Rs. 2,87,775.50/- on an average basis and the net return except and including family labor was Rs. 1,89,444.90/-and Rs. 1,99,331.50/-respectively. The income from farm business was calculated at Rs. 1,86,067.4 and the income from farm labour was Rs. 1,85,767.40/-. The overall net farm income was Rs. 1,76,661.80/-. The overall B:C ratio was estimated to be 1.07.

A study by Imlibenla and Amod Sharma (2019), on the economics of various (small, medium and large) tea plantation farms in Nagaland's Mokokchung district, it was found that the benefit cost ratio for small farms was comparatively lower than that for medium and large farms estimated at 1.70. The cost benefit ratio for medium-sized farms was 2.09 and for large farms it was 2.22. This indicates that both in terms of production and efficiency, the large farms were performing better. This can be due to efficiency of input use in larger farms compared to small farms. Since the benefit cost ratio of all the three farm groups shows more than 1 however, it can therefore be said that the tea plantation benefits the respondents. Saiwan obtained similar findings for tea farmers in Tripura, where the benefit cost ratio for small-scale farms was 2.10, which was lower than larger farms 2.30.

In a study by Imlibenla and Amod Sharma (2019), on Farm Efficiency Measure Analysis of Tea Plantation Crop in Mokokchung District of Nagaland, India' revealed that the cost of tea production for different categories of sampled farmers. Pooled data showed that hired human labour accounted for the largest share of the total cost of 30.70%, followed by owned labour (3.40%). The total cost accounted for tea production in a year was estimated to be Rs 2,67,987.80/- of which variable cost was Rs 98,410.60/- and fixed cost(Rs 35,583.30/-). Pooled data revealed that the remaining items does not contribute much to the total variable cost which includes fertilizer expense (1.30%), miscellaneous (0.80%), planting materials for gap filling (0.40%) and plant protection materials (0.20%). The data reveals that expenditure on fertilizers are comparatively less due to the fact that the soils used for tea cultivation are virgin soils and hence at present soil fertility is not a serious issue in the study area. The fixed cost analysis revealed that depreciation constituted 0.70 per cent of the total cost, imputed rental value on owned land (12.50%) and interest on value of owned fixed capital assets (0.10%), respectively.

2.4 STUDIES ON RESOURCE USE EFFICIENCY

Sharma and Moorti (1990) in their study on "Economics of Technical Change in Tea Farming in Himachal Pradesh" analysed the economic efficiency of small tea farms and comparison between small tea farms (less than 20 acre) with large tea farms (more than 20 acre under tea cultivation).The study indicated that both type of tea farm i.e. small tea farms and large tea farms in Himachal Pradesh are equally efficient in terms of allocating resources. But technically, they are not equally efficient whereas present technology seems to be in favor of small tea farms.

Moorti and Pathania (1994) studied the efficiency of resources use in tea farms in Kangra district of Himachal Pradesh. They conducted that the plantation should use more of the labour and capital input, which have the significant response towards output. The return to scale was found to be increasing.

Sharma and Moorti (1994) found that resources use efficiency, factor demand and product supply elasticity in tea farming in Kangra and Mandi District of Himachal Pradesh were higher than the optimum level. Further, the results showed that with the redistribution of input use, the average output can be increased with a lower level of inputs. Allocative efficiency analysis showed the underutilization of modern inputs (fertilizers and chemicals) and overutilization of land in tea cultivation.

They showed that 29.41 per cent of the total farms running large estates belonged to the most efficient category (96 to 99 %) and 8.82 per cent belonged to the least efficient community (64 to 70%) whereas in small and medium-sized enterprises 15.15 per cent were highly efficient and 3.03 per cent were least efficient. The results also indicated that the better management of resources increased the yield levels of the most efficient tea estates (Hazarika and Subramanian, 1999).

Estimates of the function of Cobb-Douglas production were presented for the two groups of tea estates in Assam. The multiple determination coefficient (R^2) was 0.9728 suggesting that the explanatory variables included in the model for small and medium estates explained 97.28 % of the variation in total green tea leaf production. All of the variables had been expecting signs. The effective area of the estate and the total fertilizer used had a positive and significant influence on the production of green tea leaf among the explaining variables. The coefficient for efficient area of estates

(X_1) was 0.859 and implied that an increase of one per cent in the area would result in an increase of 0.859% in total production of green tea leaves. Similarly, the fertilizer coefficient (X_3) showed that the production will be increased by 0.262% for every one per cent increase in fertilizer used. The variable "proportionate area above 50 years old under tea production" (X_4) was negative and significant. It implied that an increase of one per cent in the area in this group would reduce the production of green leaf tea by 0.092%. This is plausible because after 50 years, the tea productivity declined significantly (Hazarika and Subramanian, 1999).

This research used stochastic frontier approach to estimate the technological efficiency of tea production in the Northern mountainous area of Vietnam. In this area, tea production technical efficiency was found to be 89.6%. It was observed that tea growers had the potential to increase production by 10.4% by properly using the inputs and technology available. Moreover, this result indicates that tea farming in Vietnam is relatively efficient than tea production in some countries, such as: Srilanka, Bangladesh and India. Basnayake *et al*.

(2002) showed that the technical efficiency of small tea producers in Sri Lanka is about 65% on average. The average technical efficiency for Bangladesh was around 59% (Baten *et al*. 2010), and for India, Haridas *et al*. (2012), found an average technical efficiency of 84.53 per cent.

Adedeji *et al*. (2011) shows when the returns to scale is increasing, optimum efficiency has not yet been achieved and farmers are under utilizing the technology which indirectly state that there is a technical inefficiency. In the model land, labour and organic fertilizer significantly affect the organic tea production. When the land is increased by 1 per cent the production increases by 0.217 per cent while the man days of labour is increased by 1 per cent, the amount of production increases by 0.694 per cent. Elasticity of production with respect to organic fertilizer 0.2 per cent which encourage farmers to apply more organic fertilizer in order to increase the production.

Hong and Yabe (2015) studied that low productivity, rising production costs and poor farming practices impede tea production as one of the most significant economic activities for Vietnam's small households. Increasing the resource use efficiency is the short-term strategy to sustain tea production. Research findings showed that the average tea farm production could increase by 10.4% by using the

current technology properly. The sample tea farms' technological performance ranges from 62.1 to 97.2% (average 89.6). Variables like: pesticide, labour, and capital adversely affected tea yields. Irrigation water and chemical fertilizer forms such as: nitrogen, phosphorous, and NPK have shown a positive relationship to tea yield.

Kodagodal and Dharmadasa (2019) identified when cultivated land is increased by 1 percent, output will increase by 0.212%. When the labour is increased by 1 per cent the output will increase by 0.744%. When the organic fertilizer is increased by 1 per cent the output will increase by 0.245%. Among the three inputs used for the production function the elasticity of labour was the highest. Therefore, use of more labour for organic tea production affect the yield largely. The results suggest that mean technical efficiency of organic tea smallholders is 24.7%. Most importantly, the efficiency of organic tea production increases when tea smallholders are educated and young. The results further reveal that efficiency in organic tea production reduces if the tea smallholders diversify their crop cultivation and engage in livestock management.

2.5 STUDIES ON MARKETING

UNCTAD (1982) published a paper called "The Marketing and Processing of Tea," which examined the possibility of growing tea exports from countries by improving the way tea is marketed and processed before export. Mechanisms in small-scale tea farms were suggested to increase the value added, areas for tea cultivation, processing, marketing and tea distribution.

Raman (1991) identified the marketing channels at three levels. The product comes at the first level for auctions whereby the wholesalers come for bids. The wholesalers packet (or loose) tea in the second level, and distribute it among sub-dealers / retailers. The retailers, at the third level, distribute tea to consumers. Many tea plantation companies directly package their products and market it under their brand name.

Harrisons Malayalam Limited's consumer survey on packet teas is conducted by Venugopal (1992), in the town of Calicut. Information concerning the purchase behaviour and advertising effectiveness are collected from retailers and consumers in the city. The study shows that the low income community has preference for packet

tea as the main user of tea, while medium and high income groups are. Kanan Devan stood first in marketing amongst the branded tea.

Karmakar and Banergee (2005) observed that all the small tea growers sold their green leaf either to nearby big tea gardens or to bought leaf factories and average price varied from Rs. 6.70 to Rs. 9.35 depending upon the quality. They found that the maximum price of green leaf varied from 11.50 to 12.00 per kg during 1998-99 and in some cases the price was Rs. 13.00 per kg. Almost all the growers faced difficulties in procurement of essential inputs like fertilizers, herbicides and pesticide due to problems of transport or irregular availability in the retail market. All the growers maintained 15 days to 20 days plucking rounds. Green tea leaf was sold to factories owned by large growers either by direct sale or through middleman and 50 per cent of the surveyed gardens sent their green leaf to factories within a distance of 2 to 5 kms, 20 per cent sold to their leaf to factories located over 10 kms from the farm. The overall price realized by the small grower's leaf was Rs 5.11, which was very low as compared to other regions.

The Indian domestic tea market is majorly a loose tea market, accounting for around 60 per cent of total tea consumption, whereas packet tea serves the remainder. In the last few years, however, the domestic market has seen a change from loose tea to packaged packet tea. Hindustan Unilever (HUL) and Tata Tea were two big tea companies involved with the branded packet marketing. In India overall domestic consumption, the growth of packet tea has increased. Packet tea's share has grown from a modest 15 per cent in the early 1980s to over 40 per cent today). Big companies sell tea in branded loose and packet tea. The branded tea segment has risen well since 1985 and its share in the overall tea market currently stands at around 40% (Saji, 2005).

Abdul (2007) conducted a study and found that the cost of green leaf production and garden management ranged from Rs 12 to Rs 13 per kg. He further claimed that in the case of INDCO tea factories, production costs were marginally higher due to higher benefits paid to their employees, and the processing costs at INDCO units were Rs 14-15 for produced tea / kg. He expressed the view that the business of linking BLF and STG should be guided by a uniform all-India agreement, formulated by the Tea Board of India. STGs were paid Rs 6.00 to Rs 7.00 per kg of

green leaf in Assam and West Bengal while the average price of CTC tea ranges from Rs 65 to Rs 75 per kg of made tea. In Tamil Nadu and Kerala, STGs were paid Rs 8.00 to Rs 9.00 per kilogram of green leaf, while the average price of CTC tea ranges from Rs 48 to Rs 55 per kilogram of made tea.

During British rule the most common mode of tea disposal was auction. The first formal and organised tea auction centre was founded at the Mincing lane in London. The first foreign auction sale of Indian tea was on 1839, when the first consignment of eight boxes, containing about 350 pounds of Assam tea, was placed up for London Auction. The first auction centre in India was established in Kolkata on 1861, with the growth of the tea industry. It is the second tea auction centre in the world. Nine of the world's 14 auction centres are located in India. Amritsar, Calcutta, Cochin, Coimbatore, Coonoor (two centres), Guwahati, Jalpaiguri, Siliguri (Hazarika, 2008).

Before the Tea Marketing Control Order (TMCO) 2003, although the tea producers were required to sell seventy-five percent of the output by auction, this rule was implemented only in the years 1986, 1987 and 1988. The amount of auction sales began to decline as of 1987. Just 50 per cent of the overall production was sold by auction in 1998. Between 1999 and 2008, the amount of the auction floated about 55 per cent of the total output. This means that tea growers prefer other selling methods such as direct sales through forward contracts and ex garden sales. The advantage of direct selling to auction sale is that the period of time needed in the entire auction process is around two weeks long. Furthermore, auction transactions are often more costly for producers compared with private sales due to transaction costs. Also, indirect marketing tea is sold at much higher prices as compared to the auction price (Saji, 2008).

India's share of world exporting tea has also shown a downward trend. India's export share in total world exports was 20.86 per cent during 1986, dropping to l8.50 per cent in 1990, 15.51 per cent in 1995, 12.70 per cent in 2005 and 12.34 per cent in 2008. India's share of world exports in 1986-95 was on average 22.70 per cent, down to 16.09 per cent during 1996-2008 (Tea Statistics, Tea Board of India, 2008).

The share of North India in all the India auction is higher than that of South India. North India's auction share is between 65-77 per cent between 1986 and 2008,

which is 22-35 per cent in the case of South India. High demand for North Indian tea also influences the price of the auction. North Indian tea has always fetched higher prices from 1986 onward than South Indian tea. The auction prices in North India and South India in the year 1986 were, Rs.21.86 and Rs.19.22. They were, in 1994, Rs.43.88 and Rs. 31.38. In the later periods this price difference grew wider. In the later periods this price gap grew wider. The auction prices were Rs.70.34 and 44.64 in 2000, Rs.71.62 and Rs.50.79 in 2006, and Rs.95.27 and Rs.66.27 in 2008, respectively. (Tea Statistics, Tea Board of India, 2008).

In a study entitled "Production of India's Tea Exports; A Comparative Analysis of Major Tea Countries of the World," Nagoor (2009), found that tea, a foreign exchange commodity, was steadily declining in Indian agricultural exports. The export output over the past decades shows a dramatic decline in the percentage of India's tea exports in total world tea exports.

In a study by Hilal and Mubarak (2014), when considering Pakistan, it is one of the world's biggest tea-consuming countries and one of the lucrative markets for Sri Lankan tea. In reality, Pakistan Tea's market size is 160 – 170 million kg/annum. Pakistan's tea imports are also rising rapidly each year. Interestingly, imports from Sri Lanka are dropping from 3640 MT to 702 MT in 2007 with a market share of just 0.66% (SLTB, 2007). By comparison, market share of Kenya in Pakistan increase from 53.93 per cent to 65.85 per cent in 2007 (SLTB, 2007). It is due to the fact that the increasing price of Sri Lankan tea derived from increased cost of production.

In Kerala, Kiran *et al.* (2014) conducted a study on tea marketing and distribution activities and recorded various marketing channels and costs involved in each marketing channel. Channel I: Small Grower- Bought Leaf Factories – Auction - National Buyers-Retailer - Ultimate Consumer.

Channel II: Small Grower – Plantation Estate – Auction – Brands – Ultimate Consumer.

Channel III: Small Grower – Bought Leaf Factories - National Buyers – Brands – Ultimate Consumer.

Channel IV: Small Grower – Estate Factories – National Buyers – Brands - Retailing - Ultimate Consumer.

They announced that the producer's marketing costs of one quintal of tea amounted to Rs.352/- in Channel-I, Rs. 346/- in Channel-II, Rs.249/- in Channel-III and Rs. 229/- in Channel-IV, respectively.

The marketing costs were determined by calculating the costs incurred during the tea marketing process. The costs incurred after harvesting the crop before it hits the customers are usually the marketing costs. It covers transportation costs, processing costs, storage costs, market fees, packaging, loading and unloading weighing charges and labour charges. The marketing costs were measured at different marketing levels and eventually the overall marketing costs were measured (Choudhary *et al*., 2017).

This study reveals that the marketing efficiency is the ratio of market output to the market input. A detailed study of marketing efficiency on the produce of sampled respondents had been determined in this segment. Here, the researcher had used Shepherd's method to assess the efficiency of the two channels. The marketing efficiency in Channel-I was estimated to be 14.10 and in Channel-II it was 15.30. Hence, it can be concluded that Channel-II is more efficient than Channel-I. This shows that as intermediaries increases between producer and consumer, marketing efficiency decreases (Imlibenla and Sharma, 2019).

Two marketing channels were reported in a study by Imlibenla and Sharma (2019), in Mokokchung District on Price Spread and Marketing Efficiency Measure Analysis of Tea Plantation Crop.

Channel 1: Producer Commission agent Processing unit -Wholesaler -Retailer-Consumer

Channel 2: Producer-Processing unit-Wholesaler-Retailer-consumer

In Channel-I, producers sold their produce to commission agents, who in turn sold the purchased tea to processing unit for processing. In Channel-II, the farmers sell their produce directly to tea factory at their own expense. Hence, they get better price for their produce as compared to those who sell through commission agents. The total marketing cost incurred in Channel-I was Rs 7.08/- per kg and the total cost incurred in channel-II was Rs 6.55/-, which showed that total marketing cost was more in Channel-I as compared to Channel-II. The total margin observed in Chanel-I was Rs

77.94/-, which was slightly higher than Rs 76.94/- as obtained in Channel-II. The marketing efficiency in Channel-I was estimated to be 14.1 and in Channel-II it was 15.3. In case of channel-I, producer's share in consumer price was Rs 15.00/-, which is less than Rs 17.00/- as obtained in channel-II, respectively. So it was found out that Channel-II was more efficient than Channel-I.

2.6 STUDIES ON CONSTRAINTS IN PRODUCTION AND MARKETING OF TEA

NCAER (1961) conducted a survey of small tea gardens in north-eastern India, West Bengal and Tripura to explore their tea plantation problems and weaknesses. The main objective of programme was to examine whether the plantation is able to cover cost of production or not. It was revealed that the poor returns to tea planters are due to scarcity of labour, capital etc.

Harber (1971) conducted a study entitled "Tea Industry in New Guinea," the climatic conditions and soil potential are important for tea development. He concluded that the region where tea is grown must have the appropriate climate and soil for producing tea and entering the world market on the basis of competition. He also suggested providing enough labour to conduct the field work, which is mainly leaf plucking, and also found in his study that labour in New Guinea was not readily available and did not conform to the plucking requirement which resulted in tea production declining.

The Tea Board of India conducted a study in 1979, with a view to knowing the various constraints faced by the small tea growers of Himachal Pradesh. The study revealed that about 98.5% of area under tea had bushes of over 50 years ago which was beyond the economic age and around 35% of the total grant area was found to be unutilized. Vacancy ratio was estimated to be high as 50%. The yield rate for the small tea garden was established at 177 kg of made tea per ha, which was lowest in the country. The study further revealed that the small growers continued to incur losses from the plantation and income from other crops like potatoes and rice was found to be sufficient enough to compensate the loss on account of tea (Techno-Economic Survey of Small Tea Gardens in Kangra, Himachal Pradesh,1979)

Economics of technical changes in tea farming in Himachal Pradesh was studied by Sharmah and Moorthi (1990), who found that small tea farms and other tea farms in Himachal Pradesh were found to be allocative efficient. Present technology seems to be in favour of small tea farmers. They concluded that the main constraints in tea farms were lack of labour, lack of extension and lack of skilled labour.

Mohan (1995) and Sukarchakia (1999) researched the Darjeeling tea problems. The most significant issue has been the lack of quality control in Indian tea. Substandard teas are mixed with Darjeeling tea and market it as Darjeeling tea; as a result people are suspicious of buying it with a high price. Darjeeling tea production costs are high, and people are prepared to buy it at a high price. But it's a reality that only about 10 to 11 million kg of total annual production was in Darjeeling. But in the world market about 40 million kg of tea have been sold as Darjeeling tea. Other tea problems in Darjeeling were plants over-age and decreasing productivity.

Hazarika and Subramanian (1999) revealed that lack of adoption of improved technologies, aged plantations, low productivity, slow rate of infilling and climatic factors were some of the important problems in production of tea in Assam.

Tea is a labour-intensive crop and it is important to have ready labour available for picking and processing. With demographic shifts, the rural youth appear to move to urban areas for better work opportunities (Illukpitiya *et al*. 2004; Van der Wal, 2008; Kingsolver, 2010; Madamombe, 2013). This condition has been compounded by the implementation of mechanisation which has resulted in job losses in field operations, while mechanisation has supported the production process.

Kakati (2011) conducted a study on the problems of small tea growers in Assam, and found that the low price of green tea leaf and the minimum income from tea production were the two key problems faced by the small tea growers in Assam's Lakhimpur district. Ahmed (2012) conducted a study on agriculture and rural development, highlighting various issues related to STGs such as debt, financial crisis, low green tea leaf price problem, etc. She considered female employees to be the essential part of the tea industry and faced many problems in the tea industry, such as owner ignorance, lack of ability, etc.

The key factors responsible for Indian tea industry's poor performance were high production costs, tea bushes old age, lack of infrastructure, high prices, labour issues, inefficient tea boards, high labour costs, etc. (Arya, 2013).

Due to low wages, the young workers and the youngster are not willing to work in the tea plantation sector (Chandrabose, 2015).

Goowalla (2015) conducted a study on the issue and prospect of small tea growers in Assam and stated that the problems related to STGs were financial problem, land problem, lack of tea culture and practices training and marketing of green leaves.

Chawla and Highlands (2016) observed in their study that despite India's historic success with the tea industry, the Indian tea sector faces major challenges. The main factors for market failures are as follows:

Decline in world market demand for tea

Defects in system of auction

Poor realization of prices

Defective market structures

Rise in production costs

Small farmers and plantation workers are worst affected by market failures, resulting in the closure of many tea estates.

According to Gupta and Sangeetha (2017), low labour productivity is the main reason behind the problems in tea sector, other variables such as the inability to increase the area under cultivation, the ageing of tea bushes, inadequate replanting of bushes, inadequate investment in plant modernization and labour welfare initiatives, and conventional, inefficient management practices have also contributed towards the near-stagnation of production. While production growth rates in nearly all the major tea producing states have been considerably low and it was worst for Assam. Growth in tea production in Kerala was negative among the southern states, and was exceptionally low in Tamil Nadu. The important aspect of the growth performance of these states in recent years indicate the poor production performance at Assam, as well as North India as a whole during 1998-2004.

Vidya (2018) on the basis of her study on tea economy, reported the causes of declined production of tea in India. The causes were price fluctuations, change in climatic conditions, economic crisis etc., She further reported that tea production was also declining in Kerala and Wayanad. She observed that small tea growers got only Rs. 8.00 or Rs. 10 per kg of raw tea leaves. High cost of transportation was the main problem faced by the tea growers cultivating in less area.

The concept of small tea cultivation in Nagaland is relatively new compared to neighboring states like Assam and most of the tea growers lack technical knowledge of cultivation. The growers mostly rely on factory owners for dispersing their green leaves at a price fixed by the factory owners. In the aspect of marketing, many small tea farmers suffer from obtaining reasonable price for their produce which affects their profitability to a considerable extent (Campus, 2019).

In a study by Das and Mishra (2019), in their study they noticed that among the production constraints non availability of workers in the peak plucking season was considered as major problem faced by small tea growers with 63.98 average score in garret ranking, followed by problem of erratic rainfall, problem of non-availability of inputs at time, unsuitability of certain soil types and lack of technical knowledge about chemical use with an average score of 62.30, 45.72, 41.55 and 40.84 respectively.

In a study by Das and Mishra (2019), in their study they noticed that among the marketing constraints high price fluctuation of green tea leaves was considered as the most important problem faced by the small tea growers. The small tea growers expressed the view that inadequate storage facilities was the second most important constraints in green tea leaf production in the study area. There was no proper processing facility in the study area for green tea leaf produced by the small tea growers. They thought that it was the next important problem faced by them. Unsatisfactory transportation facility and defective weighment of green tea leaves were other constraints as reported by small tea growers.

Materials and Methods

3. MATERIAL AND METHODS

This chapter presents the procedural details in selecting the sample, method of data collection and analytical techniques employed in attaining the objectives of the study. This chapter is presented under the following subheadings.

3.1 Description of the study area

3.2 Sampling design

3.3 Collection of data

3.4 Variables and their measurement

3.5 Tools of analysis

3.1 DESCRIPTION OF THE STUDY AREA

3.1.1 Location

A brief description of study area is most essential to understand the physical, economic and environmental condition in the selected area for the research work. In this view, different characters like topography, area, population, climate, soil types, land utilization pattern, land holding pattern, agriculture and administrative set up are discussed in the following sub-sections.

3.1.1.1 Kerala

Kerala is a state located on the southwestern Malabar Coast of India and is surrounded by Arabian Sea to the West, Karnataka to the North and Northeast, Tamil Nadu to the East and South. It is situated between 8^0 18' and 12^0 48' North latitude and 74^0 52' and 72^0 22' East longitudes. Kerala receives heavy rainfall through southwest monsoon which prevails during June to September and it also receives the rainfall from northeast monsoon during October and December. The average rainfall received was 2,923 mm per annum with 120-140 rainy days per year. The average maximum daily temperature is around 37^0C and the minimum temperature is around 19.80^0C. The major crops cultivated in Kerala are paddy, pulses, pepper, ginger, turmeric, rubber, cardamom, arecanut, banana, coconut, coffee, tea and tapioca. There are 14 districts in Kerala. Among these, Wayanad district has the second highest area

under tea cultivation and hence was selected for the study. Political map of Kerala is given in figure 1.

Figure 1: Political map of Kerala State

3.1.2 Wayanad – topography

The study was under taken in Wayanad district of Kerala state. Wayanad district is situated on the north-eastern portion of Kerala. It lies between the north latitudes 11-27 and 11-58’ 35’’ and the east longitudes 75-47’50’’ and 76-26’35’’.The district is bounded on the north by Kodagu district of Karnataka state, on the east by Mysore district of Karnataka state and Nilgiri district of Tamil Nadu state, on the south by Eranad taluk of Kozhikode district, on the west by koyilandi and Vadakara taluks of Kozhikode district and Thalassery taluk of Kannur district. Political map of Wayanad district is given in figure 2.

3.1.3 Area

Wayanad district comprises of three taluks and four block panchayats. Total area of the district is 2,131 sq.km, consisting of 49 revenue villages. Two blocks, kalpetta and Sulthan Bathery were selected for the study.

3.1.4 Population

Wayanad is the least densely populated district in Kerala with a 8,17,420 population. The sex ratio according to 2011 census was 993 per 1000 males. Population density is 383 per sq.km. The decadal census reveals a mounting increase in population growth. The large tribal population, consisting mainly of Paniyar, Adiyar, Kattunayakan, and Kurichiyans communities is an important characteristic of this district. For the total district population, SC and ST form 4 and 18 per cent respectively. For males (92.5 percent) literacy is greater than for females (82.7 percent). The total number of cultivators in the district is 52,759 and 1,01,630 are farm labourers.

3.1.5 Climate and rainfall

Wayanad enjoys a salubrious tropical humid monsoon climate and the high altitude regions experienced severe cold. The district received normal rainfall of 2632.1 mm during 2017 south west monsoon (GOK, 2018) and during 2018 normal rainfall was more than 3000 mm (GOK, 2019). Lakkidi, Vythiri and Meppadi are the high rainfall areas in the district and annual rain-fall of this region ranges between 3,000 and 4,000 mm. The mean annual temperature of the district is 22.6°C. The high temperatures range from 28.9 to 36.2°C and the minimum temperatures are between

17.0 and 23.4°C (GOK, 2016). This place experiences a high relative humidity during the southwest monsoon season that goes up to 95 percent. The district has the advantage of both the southwest monsoon and the north-east monsoons receiving rainfall.

3.1.6 Topography and soils

We can observe four types of soils in the district, including laterite soil, brown hydromorphic soil (BHS), forest loam and riverine alluvium. It is reddish brown in colour, laterite soil seen in some areas of Wayanad, developed under tropical monsoon climate with alternating wet and dry seasons. Brown hydromorphic soil (BHS) is seen mostly in the district of Wayanad between undulating topography. The BHS is colourfully deep brownish with sandy loam to clayey texture. The BHS is formed by transporting material from the hill slopes and sedimenting them. It is located in the blocks of Mananthawady, Kalpetta and Sulthan Bathery forest soil. They are rich in nitrogen, organic matter and humus. It is dark reddish brown soil created by weathering under forest cover with loamy to silty loam. Alluvial soils are to be found along Kabani rivers, Chaliyar and its tributaries. Riverine alluvium is very dense to the texture of clayey loam with sandy loam. Once paddy had filled a majority of the region under riverine alluvium. These areas are now being used particularly for plantain cultivation of various crops. (GOK, 2018).

3.1.7 Land utilization pattern

This district has total geographical area of 2,12,966 ha in which 79 per cent area is under forest cover (1,69,900 ha) (GOK, 2018) and area for the selected blocks Sulthan Bathery and Kalpetta is 70,376.01 and 77,566.18 ha respectively. From the total geographical area, the net sown area for the district during 2017-18 is 1,13,407 ha (54% of the total area). Gross cropped area in the district is 1,66,875 ha, land under non-agricultural uses is 11,722 ha and cultivable waste land is about 1095 ha. The other land utilization particulars for the year 2017-18 are also furnished in the Table 6.

Table 6. Land utilization pattern in Wayanad district (2017-18)

Sl. No	Particulars	Area (ha)
1	Total geographical area	212966
2	Forests	78700
3	Barren and uncultivable land	97
4	Land put to no agriculture use	11722
5	Cultivable waste	1095
6	Permanent pastures and other grazing lands	0
7	Land under miscellaneous tree crops and groves	43
8	Current fallows	2437
9	Other fallow lands	1246
10	Net area sown	1,13,407
11	Area sown more than once	55257.09
12	Total cropped area	1,68,664

Source: GOK, 2018, Agricultural Statistics, 2017-18.

3.1.8 Agriculture

The main occupation of this district is agriculture. The major crops grown in this district are paddy, pepper, ginger and banana. Coffee and tea are the main crops on the plantations. Wayanad contributes nine per cent of the state's pepper production, the second largest in the country. Similarly, the district of Wayanad holds first place in ginger and coffee production and it contributes to 44 per cent and 79 per cent approximately. More area is under coffee cultivation, which is about 67,426 ha followed by arecanut (12079 ha), rubber (10,800 ha), pepper (10,565 ha) and 10,322 ha of coconut. The demand for bananas is higher (71,357 MT) followed by tapioca (61,696 MT), coffee (52416 MT), paddy (20,647 MT), mango (15,517 MT) and tea (12,438 MT) (GOK, 2017).

3.1.9 Administration

The district is headquartered at Kalpetta with one revenue division, there are three taluks Kalpetta, Mananthavady and Sulthan Bathery. The district comprises fourty nine villages, four block panchayats (Kalpetta, Mananthavady, Sulthan Bathery and Panamaram), 23 village panchayats and 3 muncipalities (GOK, 2017).

Figure 2: Political map of Wayanad district

3.2 SOURCE OF DATA

The research study was conducted in Wayanad district using both primary and secondary data. This district was selected purposively because it has the maximum area under tea cultivation in Kerala after Idukki.

3.2.1 Primary data

For primary data collection, the list of small and large tea growers were collected from the respective village panchayats. From the selected 2 village panchayats, 12 each of small and large farmers were selected randomly, making a total sample size of 48.

3.2.2 Sampling frame

3.2.2.1 Selection of the district

Wayanad district was selected purposively as it is the major producer of tea in Kerala after Idukki district. Idukki district stood first in area and production with 21,970 ha under tea and 44.9 MT respectively, followed by Wayanad with 5,306 ha and production of 12.4 MT respectively.

3.2.2.2 Selection of blocks

Out of four blocks, Kalpetta and Sulthan Bathery blocks which stood first and second respectively in terms of acreage and production were selected purposively for present study.

3.2.2.3 Selection of villages

From the selected two blocks, a list of panchayats under tea plantation was arranged in descending order according to their acreage. One village panchayat from each block having maximum area under tea was selected for the study. The selected villages are Muppainad from Kalpetta block and Ambalavayal from Sulthan Bathery block.

3.2.2.4 Selection of farmers

The list of all the tea growers from the selected village of each block was obtained from their respective village records. The farmers were divided into small and large groups on the basis of operational holding as per the criterion adopted by

Integrated Rural Development Programme. The farmers in the study area were categorized into two groups on the basis of size of land holding, viz., small farmers (≤ 2 ha land) and large farmers (>2 ha of land). From each of the selected village panchayats, 12 farmers each of small and large size were selected. The total sample size of study was thus 48.

SAMPLING FRAME

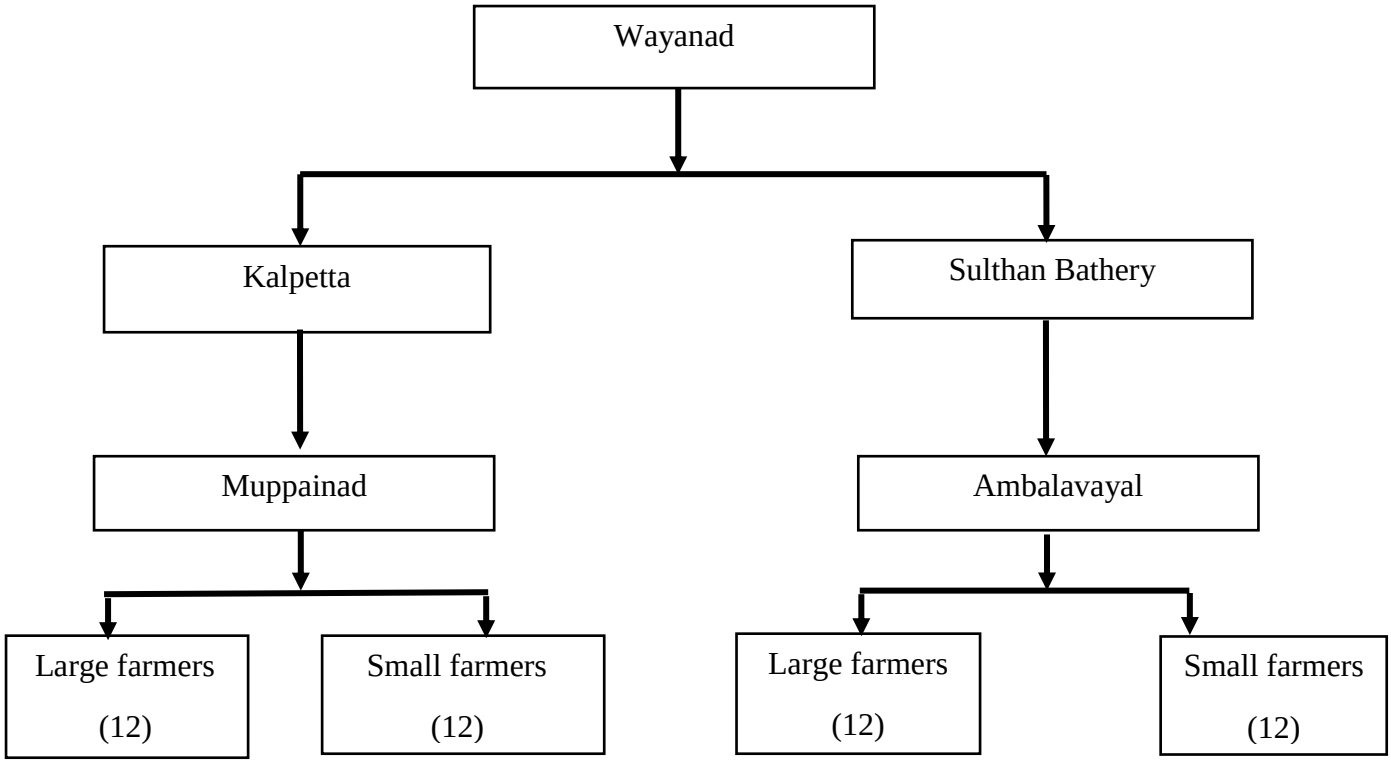


Figure 3: Sampling frame work for the study area

3.2.3 Secondary data

Secondary data was collected from Tea board, Department of Agriculture and Kerala Agricultural University.

3.3 METHODS OF DATA COLLECTION

The data were collected from the respondents through personal interview with the help of pre-tested schedules designed for the purpose to fulfil various objectives in the research study. The data on farm machinery, land holding, cropping pattern and area under tea cultivation of the selected respondents were collected. Data on annual maintenance cost of tea cultivation was also collected.

The data on marketing costs for important marketing channels of tea in the study area were also collected. In addition, an opinion survey was carried out to find out the constraints faced by the farmers in tea cultivation and marketing. At the time of the interview, every effort was made to prove the farmers that the study was being conducted solely for the purpose of research work. The data for the present study pertained to the agricultural year 2019-20.

3.4 VARIABLES AND THEIR MEASUREMENT

The data pertaining to the study were collected under the following headings and analyzed using various tools.

3.4.1 Socio-economic status of the farmers

Socio-economic characteristics of the farmers such as gender, age, education, occupation, farming experience and annual income were collected and categorized into various group.

3.4.2 Quantity of inputs

Quantity of inputs such as quantity of hired labour, family labour, fertilizers, organic manures and plant protection chemicals were collected and used for the analysis of resource use efficiency

3.4.3 Cost of inputs

3.4.3.1 Cost of manures and fertilizers

This includes cost of organic manure and chemical fertilizers purchased by the farmers from the local dealers. Imputed value were used for valuing the manures produced in farmer's field.

3.4.3.2 Cost of plant protection chemicals

The different pesticides, fungicides and insecticides were used by the farmers in order to reduce the risk from pest and diseases. The cost incurred in the purchase of plant protection chemicals were evaluated at the market price.

3.4.3.3 Cost of machinery and implements

The implements such as pump set for irrigation, weed cutter for weeding and tea harvesting machine for harvesting were used for tea farming. The cost incurred for purchase of these implements were evaluated at the market price.

3.4.4 Cost of labour

3.4.4.1 Cost of family labour

The cost incurred for family members involved in farming operation were evaluated at the wage rate paid to the hired labour in that locality.

3.4.4.2 Cost of hired labour

Cost of hired labour mainly refers to the wages that was actually paid to the work rendered by them in the farm. The wage rate for men is ₹500 and the wage rate for women ₹450 in the locality.

3.4.4.3 Cost of machine labour

It involves the cost incurred in the maintenance of the machineries by employing some workers to carry the maintenance work of the machines like fuel, power, lubricants, repair and other expenses which are included under the annual maintenance and repairs. Straight line method was used to find the depreciation of the machinery.

3.4.5 Land revenue

This is the actual revenue rate that was paid by the farmers to the revenue department for their land that they possess. The revenue paid by farmers in the locality was ₹560 per acre per year.

3.4.6 Interest on working capital

Farmers avail the short term loan from the banks to pay for the working capital especially for the annual maintenance of tea cultivation. The banking institution

provided the short term credit to the farmers at the rate of 7 per cent. Hence, the interest on working capital can be worked out with 7 per cent per annum.

3.4.7 Interest on fixed capital

Fixed capital refers to the values of the assets and equipment except land. The farmers borrow long term loan from the banking institution at the rate of 11 per cent per annum. So, the interest on fixed capital can be worked out with 11 per cent per annum.

3.4.8 Rental value of the leased in land

It was the rent paid by the farmers to the leased land for cultivating crops for a year, so the rental value of the leased land was calculated as the rent paid per year. But none of the respondents have leased in land in the selected locality.

3.4.9 Rental value of owned land

It was calculated by taking the rent of land prevailed in the locality.

3.4.10 Depreciation

Depreciation means loss in the value of the asset over a period of time, due to the wear and tear. Straight line method was used to calculate annual rate of depreciation of each of the machinery and implements, then the total depreciation allowance was calculated by aggregating.

Amount of depreciation = (Original cost of the asset-Junk value) /useful life of the asset

(Reddy *et al*., 2016)

3.4.11 Quantity of output

Quantity of tea produced is given as kg/ha.

3.4.12 Marketing cost

These include charges for weighing, loading and unloading, commissioning, rent etc, which were paid per quintal by market functionaries.

3.4.13 Marketing margins

Marketing margins refer to the net shares to the different market intermediaries for a particular quantity of produce, after deducting marketing costs from gross marketing at each stage of marketing.

3.5 TOOLS FOR ANALYSIS

Statistical tools are employed for the analysis of collected data to get the meaningful conclusions. Different tools used in the present study are given below:

3.5.1 Percentages and averages

Socio- economic characteristics of the respondents such as age, education, gender, family size, income, land holdings and year of experience in farming can be examined by using percentage and averages.

3.5.2 Annual maintenance cost

Annual maintenance cost of tea farming can be worked out by the sum total of the various inputs cost used in the production activity. Cost of cultivation of tea for the year 2019-20 was worked out by using cost concepts.

3.5.2.1 Cost concepts

Cost A_1 includes

1. Cost of hired labour
2. Cost of machine labour
3. Cost of manures and fertilizers
4. Cost of plant protection chemicals
5. Land revenue
6. Depreciation on machineries and implements
7. Interest on working capital

8. Miscellaneous expenses

Cost A_2: Cost A_1 + Rental value of leased in land

Cost B: Cost A_2 + Interest on the fixed capital excluding land + rental value of owned land

Cost C: Cost B + Imputed value of family labour

(Raju and Rao, 2015)

3.5.3 Returns

3.5.3.1 Gross return

It can be worked out as the product of total quantity of tea per year with the unit price. The market price of tea during the study period ranged between ₹ 11-12 per kg.

Gross return = Quantity of product * unit price

3.5.3.2 Net return

Net return was worked out by deducting the annual maintenance cost from the gross return.

Net return= Gross return - cost of cultivation

3.5.4 Benefit- Cost ratio

It is the ratio between gross return and total annual expenses incurred for the tea farming.

B-C ratio = Gross return/ Cost of cultivation

3.5.5 Resource use efficiency

Resource use efficiency was estimated using Cobb-Douglas production function for the various resources used in the production process by the small and large farmers. This was carried out in order to know how the beneficiaries are

allocating the resources that they possess and the allocation of resources by them so that we can say who is allocating the resource more efficiently.

The Cobb-Douglas production function is given by:

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}e^n$$

This is modified into a log linear model by application of logarithm.

$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + u$

where, Y= Yield (kg)

X_1 =	Quantity of hired labour (man days)	b_1 =	Regression coefficient of hired labour
X_2 =	Quantity of family labour (man days)	b_2 =	Regression coefficient of family labour
X_3 =	Quantity of manures and fertilizers (kg)	b_3 =	Regression coefficient of manures, fertilizers
X_4 =	Quantity of plant protection chemicals (kg)	b_4=	Regression coefficient of plant protection chemicals

a = Intercept

$b_1 \ldots b_4$ = Regression coefficients of explanatory variables.

e^n = Stochastic error term

The Cobb-Douglas production function was estimated by using OLS method assuming the error term (e) to be independently and normally distributed.

3.5.6 Garrett's ranking technique

Constraints perceived by the respondents for both production and marketing were prioritized by using Garrett's ranking technique by using the following formula:

Per cent position =100 (R_{ij} – 0.5) / N_j

Where,

R_{ij} = Rank given for the i^{th} variable by j^{th} respondents

N_j = Number of variable ranked by j^{th} respondents

(Garrett and Woodworth, 1969)

With the help of Garrett's table, the per cent position estimated is converted into scores.

Using Garrett's table, the percentage position of each rank was converted into score. For each constraint, score of individual respondents were added together and were then divided by the total number of respondents for whom the scores were added. Thus, the ranking was done on the basis of the mean score after arranging it in descending order.

3.5.7 Price spread

It was calculated by taking difference between the price paid by the consumers and the price received by the producers for an equivalent quantity of farm produce.

3.5.8 Producer's share in consumer's rupee

It is the price received by the producers expressed as a percentage in the consumer's price, then the producer's share in consumer's rupee (Ps) may be expressed as follows

$$\mathbf{P_s = P_F/P_C * 100}$$

Results and Discussion

4. RESULTS AND DISCUSSION

This chapter shows the presentation, discussion and interpretation of the results from the current study. The data collected for the study was aimed to draw meaningful conclusions based on the objectives. Primary data was analyzed separately with different statistical tools and the results are presented in this chapter under the following sections.

4.1 Socio-economic characteristics of respondents

4.2 Input use pattern in tea cultivation

4.3 Costs and returns from tea cultivation

4.4 Resource use efficiency in tea

4.5 Marketing aspects of tea

4.6 Constraints faced by the farmers in production and marketing of tea

4.1 SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENT:

The primary data was obtained from 48 tea growers and were divided into two categories as small and large farmers. The primary socioeconomic characteristics such as age, gender, education, family size, occupation and family income were tabulated and analyzed using percentage analysis. The results of the analysis are presented below.

4.1.1 Age

Based on the data collected from the sample farmers regarding the age group, respondents were classified into four groups such as less than 30 (youth), 30-45 (adulthood), 45-60 (middle adulthood), and above 60 years (old) of age (table 7). The average age of small farmers was 55.50 years and for large farmers it was 57.50 years. The average age of total respondents was 56.50 years. Up to 37.50% of small farmers were between the age group of 45 and 60, followed by 33.40% of small farmers under the age group of more than 60 years. Among the large farmers, 54.16% of

respondents were between the age group of 45 and 60 followed by respondents in the age group above 60 years (29.18%).

Table 7. Distribution of respondents based on age

Particulars	<30 years (youth)	30-45 years (adulthood)	45-60 years (middle adulthood)	Above 60 years (old age)	Total	Average
Small farmers	1 (4.10)	6 (25.00)	9 (37.50)	8 (33.40)	24 (100)	55.50
Large farmers	0 (0.00)	4 (16.66)	13 (54.16)	7 (29.18)	24 (100)	57.50
Total	1 (2)	10 (20.80)	22 (45.80)	15 (31.40)	48 (100)	56.50

Note: Figures in parentheses indicate percentage to row total.

It can be inferred that the aversion of younger generation towards agriculture was also observed in the study area.

4.1.2 Gender

The gender distribution of respondents was presented in table 8. It was found that 42 respondents were male and constituted about 87.50 per cent and the remaining 6 respondents were female around 12.50 per cent. Among the small farmers, 20 were male and constitute about 83.30 per cent while only 4 were female (16.70%). Among the large farmers, 22 farmers were male (91.60 %) and 2 were female (8.40%).

Table 8. Distribution of respondents based on gender

Gender	Small farmers	Large farmers	Overall
Male	20 (83.30)	22 (91.60)	42 (87.50)
Female	4 (16.70)	2 (8.40)	6 (12.50)
Total	24 (100)	24 (100)	48 (100)

Note: Figures in parentheses indicate percentage to column total.

It was noticed that even though the labourers were mostly women, the ownership status was dominated by men.

4.1.3 Education

The educational level of the farmers and the adoption of modern cultivation practices are known to be positively related. The educational status of the respondents is classified into six categories, such as illiterate, primary, secondary, pre-degree or HSC, diploma and graduation (table 9). Among the small farmers, 75 per cent of sample farmers completed secondary education and 12.50 per cent completed pre-degree /HSC. Among the large farmers, 62.50 per cent of respondents completed secondary education, followed by 14.59 per cent with pre-degree. Finally, it was evident that almost 33 respondents completed secondary education, 7 respondents completed pre-degree or HSC, 5 respondents completed diploma, 2 respondents completed primary education and one respondent completed graduation which indicated the reluctance of graduated persons entering in to tea farming.

Table 9. Distribution of respondents based on educational status

Particulars	**Small farmers**	**Large farmers**	**Total**
Illiterate	0 (0.00)	0 (0.00)	0 (0.00)
Primary	0 (0.00)	2 (8.34)	2 (4.17)
Secondary	18 (75.00)	15 (62.50)	33 (68.75)
Pre-degree/ HSC	3 (12.50)	4 (16.66)	7 (14.59)
Diploma	2 (8.34)	3 (12.50)	5 (10.41)
Graduation	1 (4.16)	0 0	1 (2.08)
Total	24 (100)	24 (100)	48 (100)

Note: Figures in parentheses indicate percentage to column total.

4.1.4 Family size

The distribution of selected farmers based on size of the family was presented in Table 10. The family size was classified into three categories i.e., less than four members, four to six members and more than six members. Nearly 33 respondents were in the medium-sized category with 4-6 members in their family representing

about 68.75 per cent. Among the small farmers, 66.60 per cent of farmers belonged to the medium-sized group, while in large farmers, 70.80 per cent belonged to the medium-sized group. The average family size of the total respondents was 5.

Table 10. Distribution of respondents based on family size

Size of family	**Small farmers**	**Large farmers**	**Overall**
Small (<4)	3 (12.50)	4 (16.60)	7 (14.58)
Medium (4-6)	16 (66.60)	17 (70.80)	33 (68.75)
Large (>6)	5 (20.90)	3 (12.60)	8 (16.67)
Total	24 (100)	24 (100)	48 (100)
Average size	4.8	5.2	5

Note: Figures in parentheses indicate percentage to column total.

A similar study by Das and Mishra (2019) reported that breaking up of joint family system was the main reason for dominance of tea growers with medium size of families. Apart from that some other factors such as increased level of education, urbanization and income may also be the responsible for this phenomenon.

4.1.5 Occupation

The occupational status of the respondents is classified into two viz., agriculture as the main occupation and the other that considered agriculture as a secondary source of income. The results are presented in table 11. Considering the total number of respondents, almost 93.70 per cent depended on agriculture as the main source of income and the remaining 6.30 per cent of the respondents considered agriculture as a secondary source. They were doing their own business. Of all, 22 small farmers and 23 large farmers considered agriculture as a major occupation.

Table 11. Distribution of respondents based on occupational status

Gender	Small farmers	Large farmers	Total
Agriculture as main	22 (91.60)	23 (95.80)	45 (93.70)
Agriculture as subsidiary	2 (8.40)	1 (4.20)	3 (6.30)
Total	24 (100)	24 (100)	48 (100)

Note: Figures in parentheses indicate percentage to column total.

4.1.6 Annual gross income

The total annual gross income of respondents was calculated as the aggregation of income from agriculture and also from other sources. The results of the distribution of farmers based on annual gross income are presented in table 12. The annual gross income of the farmers has been classified into five categories such as less than ₹ 1 lakh, ₹ 1 to 2 lakh, ₹ 2 to 4 lakh, ₹ 4 to 6 lakh and above ₹ 6 lakh. Almost 62.50 per cent of small farmers belonged to the category of ₹ 1 lakh to 2 lakh followed by the category of less than ₹ 1 lakh (29.16%). In the case of large farmers, 75 per cent of large farmers belonged to the group of ₹ 2 to 4 lakh annual gross income followed by the category of ₹ 4 to 6 lakh (12.50%). It was understood that the income of the large farmers was relatively more when compared to that of small farmers. The average annual gross income of the small farmers was found to be (₹1,76,254) less than that of the large farmers (₹ 3,56,290). The average annual gross income of the respondents was ₹ 2,66,272.

Table 12. Distribution of respondents based on annual gross income

Annual gross income (year)	Small farmers	Large farmers	Total
<1,00,000	7 (29.16)	-	7 (14.58)
1,00,000-2,00,000	15 (62.50)	2 (8.34)	17 (35.41)
2,00,000-4,00,000	2 (8.34)	18 (75)	20 (41.66)
4,00,000-6,00,000	-	3 (12.50)	3 (6.25)
>6,00,000	-	1 (4.17)	1 (2.10)
Total	24 (100)	24 (100)	48 (100)
Average	1,76,254	3,56,290	2,66,272

Note: Figures in parentheses indicate percentage to column total.

4.1.7 Experience in farming

Based on experience in tea farming, farmers were classified into four categories, less than 20 years, 21 to 30 years, 31 to 40 years and 41 to 50 years (table 13). Among the small farmers, almost 66.6 per cent of farmers had experience between 21 and 30 years followed by farmers with less than 20 years (16.66%). Most of the large farmers were in the category of 21 to 30 years of experience (54.16%) followed by the category of 31-40 (20.83%). Both small and large farmers have similar range of experience in farming. It was found that the average farming experience was similar in case of both small and large farmers i.e., 28.30 years and 29.40 years, respectively. The average farming experience of respondents was 28.80 years.

Table 13. Distribution of respondents based on experience in tea farming

Experience in tea farming (years)	Small farmers	Large farmers	Total
Less than 20	4 (16.66)	2 (8.33)	6 (12.50)
21-30	16 (66.66)	13 (54.16)	29 (60.41)
31-40	3 (12.50)	5 (20.83)	8 (16.66)
41-50	1 (4.20)	4 (16.68)	5 (10.41)
Total	24 (100)	24 (100)	48 (100)
Average	28.30	29.40	28.80

Note: Figures in parentheses indicate percentage to column total.

It was stated in a similar study by Vidya (2018) that the majority of the respondents had 21-30 years of experience in tea cultivation. Most of them inherited the plantations from their ancestors and continued to grow tea, as it was highly remunerative compared to other crops.

4.1.8 Details of tea cultivation

Most of the selected respondents cultivated tea in their own land, mainly as a single crop. They were mostly cultivating the local variety ATK with spacing of 3×3 m. They applied manures and fertilizers three times in a year and frequency of harvest is two times a month. Traditionally, majority of the farmers were cultivating tea under rainfed condition. Only few farmers had irrigation system and well that were connected with electric pumpset or with micro irrigation (drip irrigation). The major problems faced by the farmers were shortage of labour for harvesting of tea. The other problems faced by the farmers were high wage rate of labourers and price of tea leaves remained unchanged from many years.

4.1.9 Area under tea cultivation

The area under tea cultivation by the respondents was distributed into five categories as less than 2 acres, 2-4 acres, 4-5 acres, 5- 6 acres and 6-8 acres and shown in table 14. Majority of the small farmers belong to the category of less than 2 acres (83.30%), followed by the category of 2 - 4 acres (12.50%). In case of large farmers, almost 41.60 per cent of the respondents have 5 – 6 acres, followed by 4 - 5 acres (33.30%) and 6 – 8 acres (12.50%). The average area of tea was found to be 1.24 acres for small farmers and 5.41 acres for large farmers. The average area under the tea cultivation was found to be 3.32 acres.

Table 14. Distribution of respondents based on area under tea cultivation

Area (acres)	No. of small farmers	No. of large farmers	Total
<2	20 (83.30)	1 (4.20)	21 (43.75)
2-4	3 (12.50)	2 (8.40)	5 (10.41)
4-5	1 (4.20)	8 (33.30)	9 (18.75)
5-6	-	10 (41.60)	10 (20.80)
6-8	-	3 (12.50)	3 (6.29)
Total	24 (100)	24 (100)	48 (100)
Average	1.24	5.41	3.32

Note: Figures in parentheses indicate percentage to column total.

4.2 INPUT USE PATTERN IN TEA CULTIVATION

4.2.1 Utilization of human labour

Human labour is one of the important input services influencing the cost structure. Every cultural operation requires human labour for its success. The use of this input service depends on the type and size of the enterprise. The operation wise human labour utilization in tea cultivation was presented in table 15.

The best time for planting tea is May to June or September to October. Harvesting starts when the tea bush is 3 years old. In South India harvesting continues throughout the year at weekly intervals during March - May and at intervals of 10 -14 days during the other months. During the peak period harvesting is done at 7 to 10 days interval and during lean period harvesting is done at 10 to 15 days interval.

Table 15. Operation wise human labour utilization in tea cultivation

(in mandays per hectare)

Sl. No.	**Particular**	**Small farmers (mandays)**	**Large farmers (mandays)**	**Pooled (mandays)**
1	Application of fertilizers and manures	14.80 (4.57)	15.60 (3.88)	15.10 (3.97)
2	Plant protection chemicals	12.80 (3.94)	15.40 (3.85)	13.40 (3.52)
3	Pruning	10.75 (3.31)	12.50 (3.08)	11.60 (3.03)
4	Weeding	6.80 (2.09)	8.90 (2.19)	7.20 (1.88)
5	Harvesting	279.49 (86.09)	352.40 (87.00)	335.20 (87.60)
	TOTAL	**324.64 (100)**	**404.80 (100)**	**382.50 (100)**
	Family labour	27.87 (8.60)	30.70 (7.90)	28.10 (7.83)
	Hired labour	296.77 (91.40)	345.10 (91.80)	330.60 (92.16)

Note: Figures in parentheses indicate percentage to column total.

Farm yard manure is used as organic manure to increase soil fertility and productivity. Tea crop is supplied with urea and potash by both the small and large farmers. In general, three fertilizer applications were performed in the study area and, on an average, this operation requires 15.60, 14.80 and 15.10 mandays per hectare respectively on large, small and pooled farms. Tea plantations were attacked by some pests and diseases. Farmers had undertaken plant protection measures to manage them and this operation required 15.40, 12.80 and 13.40 mandays per hectare respectively

on large, small and pooled farms. In the study area, it was observed that small farmers used less plant protection chemicals than large farmers. So number of mandays was less for small farmers than for large farmers.

Weed infestation can be seen in tea cultivation. Hence 1-2 weedings are done by the farmers to keep the tea field free from weeds and this operation required 8.90, 6.80 and 7.20 mandays per hectare on the large, small and pooled farms respectively.

Pruning was undertaken to maintain comfortable bush height and to eliminate branches which were dead and diseased. To maintain the tea field properly, pruning was done once a year either in April-May or in August-September. On an average, total human labour used for this activity was 12.50, 10.75 and 11.60 mandays per hectare on large, small and pooled farms respectively.

Harvesting takes place 1–2 times a month. The activity required 352.40, 279.49, and 335.20 mandays per hectare respectively on large, small and pooled farms.

The total amount of human labour used was 404.80, 324.64 and 382.50 mandays per hectare on large, small and pooled farms respectively, indicating a direct relationship between human labour and the size of the farm. The operations which required labour were harvesting (87.60%) followed by application of fertilizers and manures (3.97%), plant protection chemicals (3.52%), pruning (3.03%) and weeding (1.88%) on pooled farms. Among the family and hired labour, family labour occupied 7.83 per cent and hired labour occupied 92.16 per cent on pooled farms.

In a similar attempt by Costa *et al*. (2007), on input use pattern in tea cultivation on small, large and pooled farms, it was reported that among the various operations, harvesting requires more human labour followed by application of manures and fertilizers.

4.2.2 Material inputs used in cultivation of tea

Production of a commodity not only requires resource services such as human labour but also material inputs such as fertilizers, manures, plant protection chemicals etc .

Table 16 shows that large, small and pooled farms used 475.72, 445.66 and 452.53 kg of urea, and 385.25, 360.50 and 372.15 kg of potash per hectare respectively. Organic manures such as farm yard manure was applied at the rate of 445.30, 385 and 395.62 kg per hectare respectively on large, small and pooled farms.

To control diseases and weeds farmers used plant protection chemicals to the extent of 9.86, 4.54 and 8.61 kg on large, small and pooled farms respectively.

Table 16. Material inputs used in tea cultivation (kg/ha)

Sl. No.	Particulars	Small farmers	Large farmers	Pooled
1	**Fertilizers**			
	Urea (kg)	445.66	475.72	452.53
	Potash (kg)	360.50	385.25	372.15
2	**Organic manures**			
	Farm yard manure (kg)	385	445.30	395.62
	Total (kg)	**1,191.16**	**1,306.27**	**1,220.30**
3	**Plant protection chemicals**			
	Hexaconazole (l)	2.00	4.32	3.54
	Copper oxy chloride (kg)	1.00	2.28	2.10
	Glycel (l)	1.54	3.26	2.97
	Total (kg)	**4.54**	**9.86**	**8.61**

A similar study by Hazarika and Subramanian (1999), stated that fertilizer is a significant input for the short-term improvement of tea productivity. Small and medium holdings have been found to be using less fertilizers (228.98 kg/ha) than large holdings (258.53 kg/ha). The small and medium-sized holdings used 85 kg of potash while the large estates used 94.87 kg of potash per hectare.

4.3 COST OF CULTIVATION OF TEA

Cost of cultivation and related measures were used to compare the relative performance of small and large farmers and it is also important in taking proper decisions in farming. The cost of cultivation refers to the total expenses incurred by the farmer per unit area. Annual maintenance cost of tea cultivation per hectare was calculated separately for small and large farmers using cost concepts and the results are given in tables 17 and 18 respectively.

4.3.1 Annual maintenance cost of tea cultivation for small and large farmers

The annual maintenance cost of cultivation for small farmers is given in Table 17. The total cost of cultivation of small farmers at cost C was found to be ₹1,86,438.82 ha-^{1}. Cost A_1 of the small farmers was ₹ 1,42,803.82 ha-^{1}, among which cost of hired labour contributed highest of about 78.90 per cent, which includes the labour used for pruning, application of fertilizers, plant protection chemicals and harvesting and it was followed by manures and fertilizers which contributed to 6.37 per cent, interest on working capital contributed to 5.62 per cent and plant protection chemicals contributed to 3.16 per cent of cost A_1. Miscellaneous expenses, cost of machine labour and depreciation on machinery and implements shared about 2.45, 1.80 and 1.31 per cent of cost A_1, respectively. The land revenue was very meagre which was 0.39 per cent. The pictorial representation of cost A_1 of the small farmers is given in figure 4. Since none of the small farmers had leased in land, it was found that the rental value of the leased in land was zero. Hence cost A_2 was same as cost A_1 of ₹1,42,803.82 ha-^{1}. Cost B was found to be ₹1,83,338.82 ha-^{1}.

The annual maintenance cost of cultivation for large farmers is presented in table 18. cost A_1, cost A_2, cost B and cost C (total cost of cultivation) were ₹1,99,183.60, ₹1,99,183.60, ₹2,40,933.60 and ₹2,45,143.60 ha-^{1}, respectively. Since none of the large farmers had leased in land, it was found that the rental value of the leased in land was zero. So cost A_2 was same as cost A_1 of ₹1,99,183.60. Out of cost A_1, cost of hired labour contributed to 74.93 per cent, followed by manures and fertilizers (6.93%) and the interest on working capital (5.24%). The cost of plant protection chemicals, machine power and miscellaneous expenses contributed to 4.89, 3.20 and 3.13 per cent, respectively. The rest was shared by depreciation (1.31%) and land revenue (0.33%). The share of different costs in cost A_1 of large farmers is shown in figure 5.

Cost A_1, cost A_2, cost B and cost C were more for large farmers when compared to that of small farmers. The cost of hired labour and machine power was found to be more for large farmers. The cost of manures, fertilizers plant protection chemicals were found to be more for large farmers when compared to that of small farmers. Hired labour contributed the largest share of both small and large farmers cost of cultivation, including labour used for pruning, fertilizer application, plant

protection chemicals, and harvesting. It was found to be more, which increased the total cost of cultivation. This shows that both small and large farmers incurred high amount for cost of harvesting. The miscellaneous cost included the cost incurred for post- harvest operations, transportation cost and cut and removal of old and disease affected plants. The miscellaneous expenses of small farmers was ₹3,500 ha-^{1} and that of large farmers was ₹ 6,250 ha-^{1}.

Annual maintenance cost of cultivation for large farmers was more than small farmers. Large farmers use inputs like manures, fertilizers and plant protection chemicals more systematically comparing to small farmers.

A similar study by Pathania *et al*. (2005), based on economic analysis of tea cultivation in Himachal Pradesh, reported that the cost of hired labour was maximum among all the operational costs. Among the different operational costs, hired labour cost (66.31%) accounted for maximum share.

Table 17. Annual maintenance cost of tea cultivation for small farmers

Sl. No.	**Item**	**Cost (Rs/ha)**	**Percent to cost A_1**
1	Hired labour	1,12,672.50	78.90
2	Machine power	2,580	1.80
3	Manures and fertilizers	9062.50	6.37
4	Plant protection chemicals	4522	3.16
5	Land revenue	560	0.39
6	Depreciation	1875	1.31
7	Interest on working capital	8031.80	5.62
8	Miscellaneous expenses	3500	2.45
	Cost A_1	1,42,803.82	100.00
9	Rental value of leased in land	0	
	Cost A_2	1,42,803.82	
10	Interest on owned fixed capital excluding land	3817	
11	Rental value of owned land	36,718	
	Cost B	1,83,338.82	
12	Imputed value of family labour	3100	
	Cost C	1,86,438.82	

Table 18. Annual maintenance cost of tea cultivation for large farmers

Sl. No.	Item	Cost (Rs/ha)	Percent to cost A_1
1	Hired labour	1,49,257.50	74.93
2	Machine power	6,337.50	3.20
3	Manures and fertilizers	13,812.50	6.93
4	Plant protection chemicals	9,750	4.89
5	Land revenue	662.50	0.33
6	Depreciation	2662.30	1.31
7	Interest on working capital	10,450.30	5.24
8	Miscellaneous expenses	6,250	3.13
	Cost A_1	1,99,183.60	100.00
9	Rental value of leased in land	0	
	Cost A_2	1,99,183.60	
10	Interest on owned fixed capital excluding land	4,900	
11	Rental value of owned land	36,850	
	Cost B	2,40,933.60	
12	Imputed value of family labour	4,210	
	Cost C	2,45,143.60	

Study by Kiruthiga and Damodaran (2016) on economics of tea cultivation in Niligiris district was similar to the present study stating that cost C of tea for the large farmers (₹ 5,56,838 ha^{-1}) was more when compared to that of small farmers (₹5,17,888 ha^{-1}).

Figure 4. Per cent share of cost components at cost A_1 of small farmers

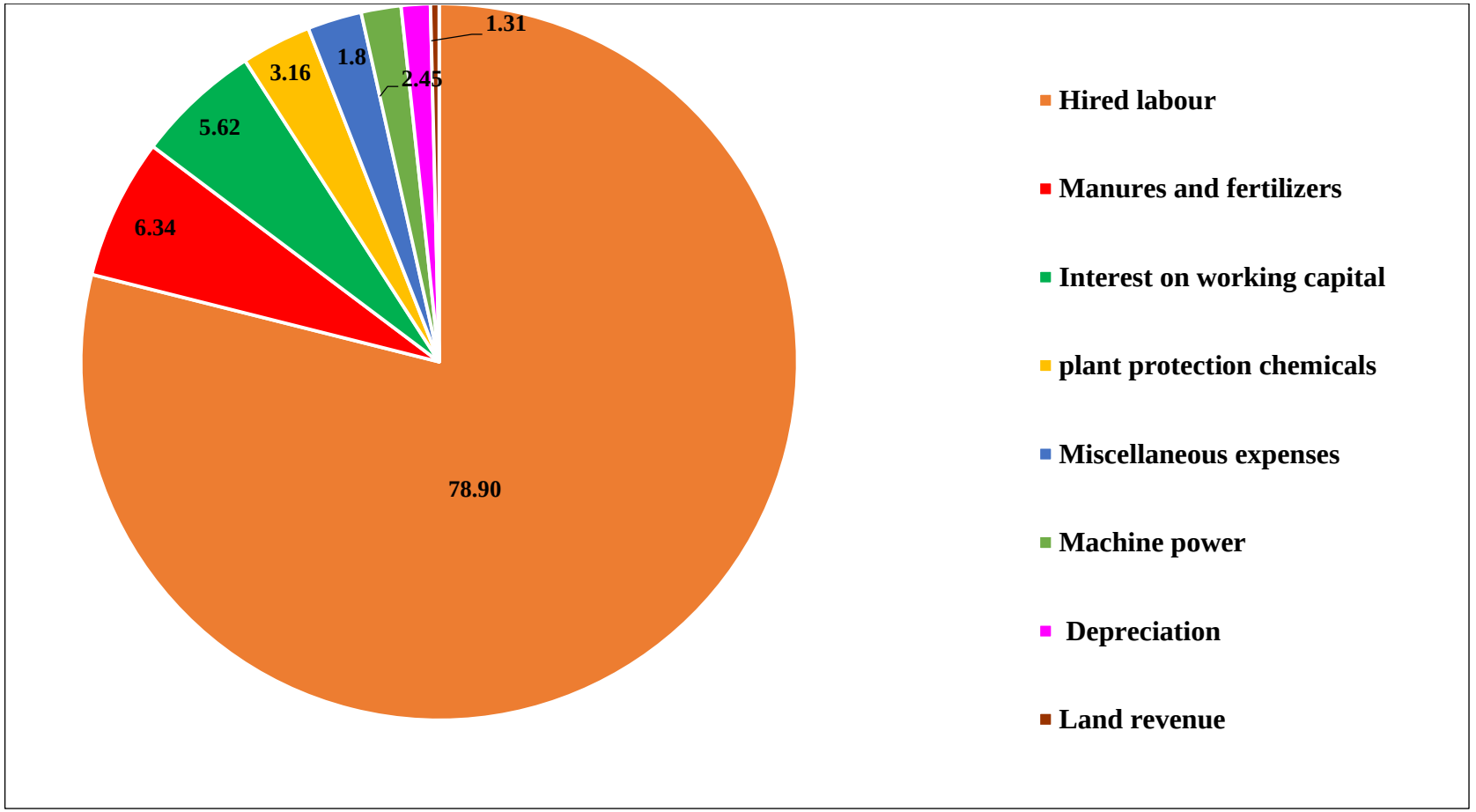
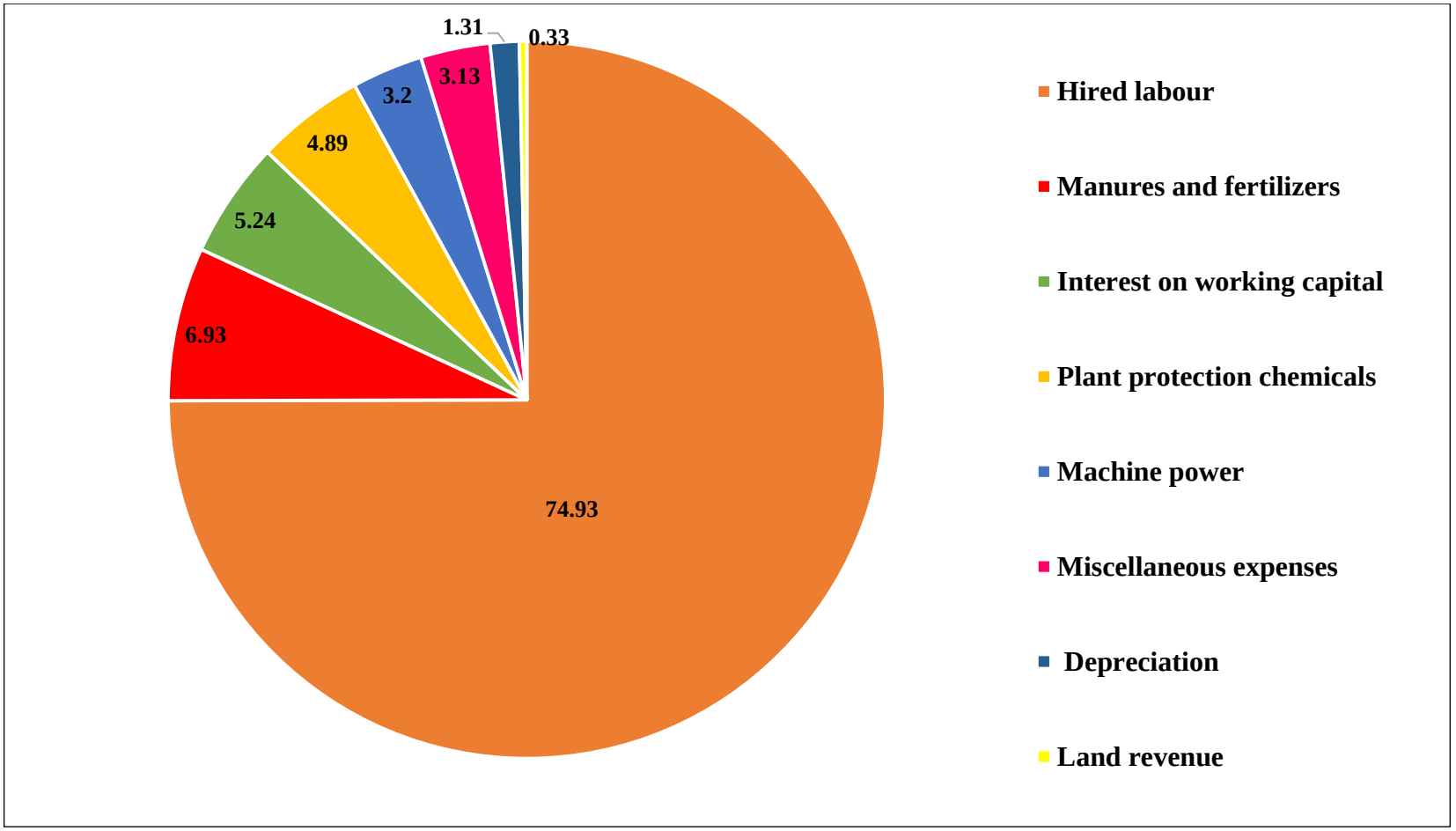


Figure 5. Per cent share of cost components at cost A_1 of large farmers



4.3.2 Annual returns from tea cultivation

The yield obtained by the small and large farmers was 24,762 kg/ha and 36,300 kg/ha of green tea leaves respectively. The average price of green tea leaves during 2020 was 11 ₹/kg. The gross returns of ₹ 2,72,382 ha-^{1} was obtained by small farmers. The net returns at cost A_1 and cost A_2 were found to be same (₹1,29,578.18 ha-^{1}), since the rental value of leased in land to the small farmers was zero. The net return at cost B and cost C were ₹ 89,043.18 ha-1 and ₹ 85,943.18 ha-^{1}, respectively.

For large farmers, the gross returns obtained was ₹ 3,99,300 ha-^{1} and the net returns at cost A_1 and cost A_2 were found to be same (₹2,00,116 ha-^{1}), since the rental value leased in land to the large farmers was zero. The net returns at cost B and cost C were ₹1,58,366.40 and 1,54,156.40 ha-^{1}, respectively. All these results are given in table 19.

Table 19. Annual returns from tea cultivation

Sl. No.	Item	Small farmers	Large farmers
1	Yield (kg/ha)	24,762	36,300
2	Price (₹/kg)	11	11
3	Gross return (₹/ha)	2,72,382	3,99,300
4	Net return at cost A_1 (₹/ha)	1,29,578.18	2,00,116.40
5	Net return at cost A_2 (₹/ha)	1,29,578,18	2,00,116.40
6	Net return at cost B (₹/ha)	89,043.18	1,58,366.40
7	Net return at cost C (₹/ha)	85,943.18	1,54,156.40

Similar result was found in the study conducted by Das and Mishra (2019) in tea plantations of Assam. The net returns received by the tea growers was found to be more for large farmers (₹3,44,842.38 ha^{-1}) when compared to small farmers (₹3,37,897.05ha^{-1}).

4.3.3 Benefit- Cost ratio

The B: C ratio for both small and large farmers was calculated separately and presented in table 20. B: C ratio is a concept of profitability, in which higher value indicates more profit. Large farmers were found to have more profit when compared

to small farmers at various costs. The B: C ratio of small farmers at cost A_1, cost A_2, cost B and cost C was found to be 1.90, 1.90, 1.48 and 1.46 respectively.

In case of large farmers, the B: C ratio at these costs was found to be 2.00, 2.00, 1.64 and 1.62, respectively.

Table 20. B: C ratio of small farmers and large farmers cultivating tea

Particular	**Small farmers**	**Large farmers**
Cost A_1	1.9	2
Cost A_2	1.9	2
Cost B	1.48	1.64
Cost C	1.46	1.62

A similar study was conducted by Imlibenla and Amod Sharma (2019) on the economics of various tea plantations in Nagaland's Mokokchung district. It indicated that the benefit cost ratio of tea for small farms (1.70) was comparatively lesser than that of large farms (2.2).

Similar findings were obtained by Saiwan (2019) for tea growers in Tripura where benefit cost ratio for small farm size was 2.10, which was lesser than that for large sized farms (2.30).

The graphical comparison of annual maintenance cost of cultivation, annual net returns and B:C ratio of small and large farmers is given in figures 6, 7 and 8 respectively.

Figure 6. Comparison of annual maintenance cost of cultivation of small and large farmers

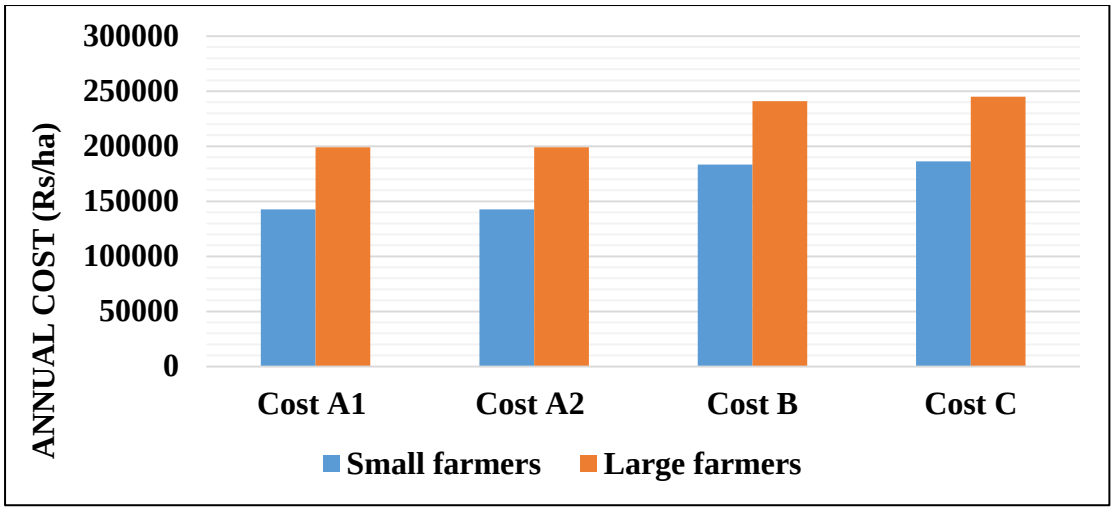


Figure 7. Comparison of annual net returns of small and large farmers

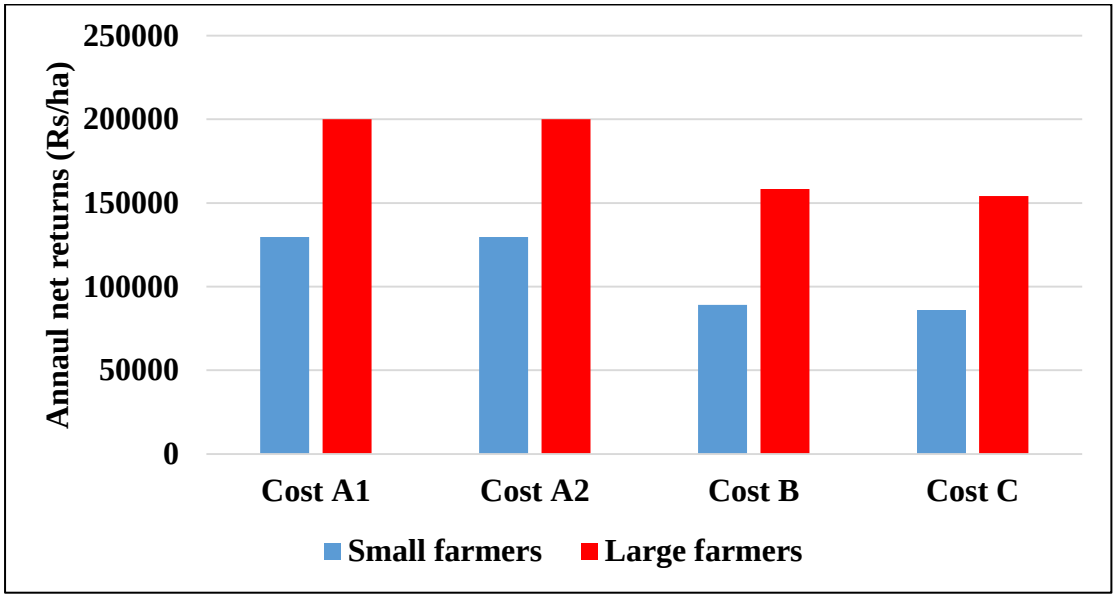
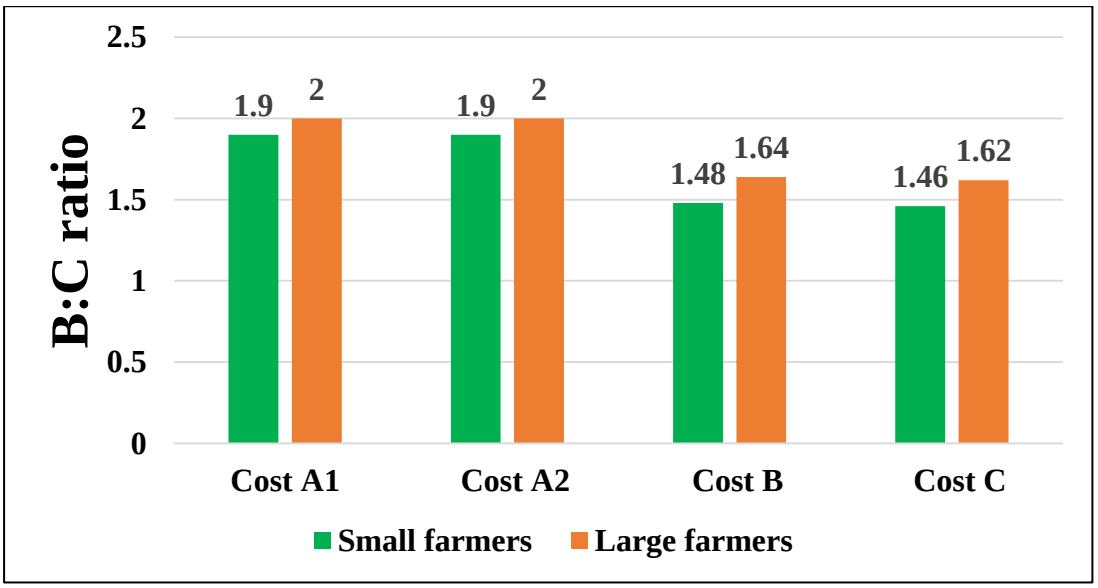


Figure 8. Comparison of B-C ratio of small and large farmers



4.4. RESOURCE USE EFFICIENCY

Resource use efficiency in tea cultivation was estimated by using Cobb-Douglas production function. It can be fitted separately for small and large farmers by using the below function.

4.4.1 Resource use efficiency in tea cultivation by small farmers

The co-efficient of multiple determination (R^2) explained the variation in the dependent variable caused by the independent variables included in the production function. The elasticity of production was given by the estimated regression coefficients (b_i) of respective inputs (X_i). The regression coefficient (b_i) indicates the percentage change in the yield (Y) if the input quantities (X_i) changed by one unit while all other factors remain constant at their geometric mean levels. Variance Inflation Factors (VIF) was also calculated to check the existence of multicollinearity between the independent variables involved in the analysis. The manures used by the respondents include farm yard manure whereas fertilizer includes urea and muriate of potash.

The estimated Cobb-Douglas production function for small farmers is presented in table 21. The coefficient of multiple determination (R^2) for small farmers was 0.71 which indicated that 71 per cent of variation in yield was explained by the independent variables involved in the function such as quantity of hired labour, family labour, fertilizers and manures and plant protection chemicals.

Among the different independent variables, the quantity of hired labour and manures and fertilizers significantly influenced the yield at one per cent level of significance. A one per cent increase in the use of hired labour and manures and fertilizers were found to increase the yield by 0.58 and 0.42 per cent, respectively. The coefficient of plant protection chemicals was found to be positive and it significantly influenced the yield at 5 per cent level of significance. A one per cent increase in use of plant protection chemicals can causes 0.25 per cent increase in yield. The coefficient of family labour (0.05) was positive and found to be insignificant. The Σb_i value refers to returns to scale. It's value was found to be 1.31, which means a simultaneous increase in all the independent variables by one per cent will increase the yield by 1.31 per cent which in turns shows increasing return to scale. The VIF (Variance Inflation factor) value was found to between 1 and 2, hence there was no multicollinearity problem among the independent variables.

Table 21. Estimated production function for small farmers

Sl. No.	Particulars	Coefficient	Standard Error	P Value	VIF
1	Intercept	2.968	0.613	0.000	
2	Quantity of hired labour (man days)	0.584***	0.208	0.009	1.23
3	Quantity of family labour (man days)	0.056	0.047	0.226	1.34
4	Quantity of manures and fertilizers (kg)	0.425***	0.184	0.003	1.35
5	Quantity of plant protection chemicals (kg)	0.254**	0.086	0.022	1.55
6	R^2	0.71			
7	Adjusted R^2	0.65			
8	Calculated F	11.91			
9	Σb_i	1.31			
10	No of observations	24			

** Significant at 5 per cent level
*** Significant at 1 per cent level
Note: Coefficients were obtained with log value

4.4.2 Resource use efficiency in tea cultivation by large farmers

The estimated Cobb-Douglas production function for large farmers is presented in table 22. The coefficient of multiple determination (R^2) for large farmers was 0.90 which indicated that 90 per cent of variation in yield was explained by the independent variables involved in the function such as quantity of hired labour, family labour, fertilizers and manures and plant protection chemicals.

Among the different independent variables, the quantity of hired labour and manures and fertilizers significantly influenced the yield at one per cent level of significance. A one per cent increase in the use of hired labour and manures and fertilizers were found to increase the yield by 0.830 and 0.562 per cent, respectively. The coefficient of plant protection chemicals was found to be positive and it significantly influenced the yield at 5 per cent level of significance. A one per cent increase in use of plant protection chemicals can cause 0.47 per cent increase in yield. The coefficient of family labour was positive and found to be insignificant. Returns to scale was found to be 2.09, which means a simultaneous increase in all the independent variables by one per cent will increase the yield by 2.09 per cent which in

turn shows increasing return to scale. The VIF (Variance Inflation Factor) value was found to between 1 and 2, hence there was no multicollinearity among the independent variables.

Table 22. Estimated production function for large farmers

Sl. No.	Particulars	Coefficient	Standard Error	P Value	VIF
1	Intercept	3.28	0.758	0.000	
2	Quantity of hired labour (man days)	0.830***	0.324	0.000	1.09
3	Quantity of family labour (man days)	0.034	0.102	0.645	1.07
4	Quantity of manures and fertilizers (kg)	0.562***	0.298	0.009	1.06
5	Quantity of plant protection chemicals (kg)	0.470**	0.226	0.024	1.03
6	R^2	0.90			
7	Adjusted R^2	0.88			
8	Calculated F	7.99			
9	Σb_i	2.09			
10	No of observations	24			

** Significant at 5 per cent level
*** Significant at 1 per cent level
Note: Coefficients were obtained with log value

A similar study by Kodagodal and Dharmadasa (2019) in Sri Lanka tea plantations revealed that the yield was significantly affected by hired human labour, manures and fertilizers, and plant protection chemicals. The production would increase by 0.744 per cent when labour increased by one per cent. If the organic fertilizer is increased by 1 per cent, the output will increase by 0.245 per cent.

4.4.2 Marginal Productivity Analysis

Ratio of Marginal Value Product (MVP) to Marginal Factor Cost (MFC) of each input was calculated to study the efficiency of resource use in tea cultivation. MVP of each input was worked out from the corresponding geometric mean and regression coefficient, Allocative efficiency explains how resources in a farm are

efficiently utilized and is examined by the value of K. The allocative efficiency of input use for the small farmers is presented in table 23. The K ratio for all the resources such as quantity of hired labour, family labour, manures and fertilizers and plant protection chemicals were observed to be greater than one, which indicated the underutilization or sub-optimal utilization of resources.

The allocative efficiency of input use for the large farmers is shown in table 24. The K ratio for quantity of hired labour, family labour, manures and fertilizers and plant protection chemicals were observed to be greater than one, which indicated the sub-optimal utilization of resources.

Table 23. Allocative efficiency of input use for small farmers

Sl. No.	**Particulars**	**Geometric Mean**	**MVP**	**MFC**	**MVP/ MFC= K**
1	Yield	10,405.25	-	-	-
2	Quantity of hired labour	118.18	565.57	498.92	1.13
3	Quantity of family labour	2.44	2,384.85	457.4	5.21
4	Quantity of manures and fertilizers	402.92	120.72	9.67	12.48
5	Quantity of plant protection chemicals	2.48	11,721.6	443.52	26.42

Table 24. Allocative efficiency of input use for large farmers

Sl.No.	Particulars	Geometric Mean	MVP	MFC	MVP/ MFC= K
1	Yield	58,174.38	-	-	-
2	Quantity of hired labour	456.88	1268.17	526.67	2.40
3	Quantity of family labour	9.51	2493.96	490.29	5.08
4	Quantity of manures and fertilizers	1,698.36	189.89	11.21	16.93
5	Quantity of plant protection chemicals	20.33	16,138.20	530.41	30.42

In a similar attempt by Moorti and Pathania (1994), on resource use efficiency in tea farms in Kangra district of Himachal Pradesh it was observed that the value of allocative efficiency for all inputs was more than one, which indicated the under-utilization of inputs such as labour, manures and fertilizers and plant protection chemicals both in small and large farms.

4.5 MARKETING OF TEA

The agricultural marketing system provides essential linkages between the agricultural production sector and the non-farm sector in the dynamic and the growing economy. Marketing is as critical to better performance in agriculture as farming itself. In addition to performing physical and encouraging functions of transferring the products from the manufacturers to the customers, the marketing system also performs the functions of discovering the various marketing stages and transmitting the price signals in the marketing chain. An effective marketing system ensures a better price for farm products for farmers and induces them to invest their surpluses in buying modern inputs so that productivity and production can increase. If the producer does not have an easily accessible market outlet where he can sell his produce, he has little incentives to produce more. Therefore, it is necessary to provide sufficient incentive for increased output and this can only be made possible by streamlining the market system.

The study done on the respondent farmers revealed that there existed two marketing channels for tea:

Marketing channel-I

Producer ⇒ Commission agent ⇒ Processing unit ⇒ Wholesaler ⇒ Retailer ⇒ Consumer

Marketing channel-II

Producer ⇒ Processing unit ⇒ Wholesaler ⇒ Retailer ⇒ Consumer

4.5.1 Marketing costs incurred for green tea leaf in two marketing channels (Rs/kg)

The marketing costs were determined by calculating the costs incurred during the tea marketing process. The costs incurred after harvesting the crop before it reaches the customers are usually the marketing costs. It included transportation costs, loading and unloading labour charges, packaging. The marketing costs were measured at different marketing stages and eventually the overall marketing cost was measured.

The activity wise marketing cost incurred at various stages of marketing channel was presented in table 25. The total cost incurred for marketing one kg of green leaf through Channel-I and Channel-II was calculated and the only difference between the two channels is the presence of commission agent in Channel-I. Therefore, marketing cost of processing unit remains almost same in both the channels. After the green leaf is processed in the processing unit, it is being marketed through wholesalers and retailers, therefore, from the point of processing unit the marketing costs remain same in both the channels.

In channel-I, the total cost incurred by the commission agent was Rs. 1.50 per kg of green leaf. Adding up all the cost for fuel, power, wages, factory overheads, general overheads, packing, tax and transportation, the total cost incurred by the processing unit for processing one kg of green tea leaf was Rs 5.22/-. The cost incurred by wholesaler and retailer for marketing processed dry tea leaf were Rs 1.00/- and Rs 1.50/-, respectively. While in Channel-II, the cost incurred by the producer farmer was Rs 0.40/- per kg, cost incurred by the processing unit, wholesaler and retailer were Rs 5.22/-, Rs 1.00/- and Rs 1.50/-, respectively. The total marketing cost incurred in Channel-1 was Rs 9.22/- per kg and the total cost incurred in channel-

II was Rs 8.12/-, which shows that total marketing cost is more in Channel-I as compared to Channel-II.

Table 25. Marketing costs incurred for green tea leaf in two marketing channels (Rs/kg)

Sl. No.	**Particulars**	**Channel-I**	**Channel-II**
A.		**Cost incurred by producer (green tea leaf)**	
1	Transportation cost	0.0	0.40
2	**Sub total**	**0.0**	**0.40**
B.		**Cost incurred by commission agent (green tea leaf)**	
1	Transportation cost	1.00	0.0
2	Labour charge for loading and unloading	0.50	0.0
3	**Sub total**	**1.50**	**0.0**
C.		**Cost incurred by processing unit**	
1	Fuel (firewood)	0.85	0.85
2	Power (electricity)	2.00	2.00
3	wages	0.50	0.50
4	Factory overheads	0.80	0.80
5	General overheads	0.48	0.48
6	Packing	0.24	0.24
7	Tax	0.15	0.15
8	Transportation	0.20	0.20
9	**Sub total**	**5.22**	**5.22**
D.		**Cost incurred by wholesaler (processed dry leaf)**	
1	Transportation cost	1.00	1.00
2	**Sub total**	**1.00**	**1.00**
E.		**Cost incurred by retailer (processed dry leaf)**	
1	Transportation cost	1.50	1.50
2	**Sub total**	**1.50**	**1.50**
3	**Total marketing cost**	**9.22**	**8.12**

Similar studies were carried out by Sharma *et al.* (2010), on production and marketing of Walnut in Budgam district of Jammu and Kashmir and observed that marketing cost in channel -I was more than channel-II as there were more number of intermediaries in channel-I.

4.5.2 Marketing margins involved in the marketing of CTC tea in two channels (Rs/kg)

This study revealed that the marketing margins of commission agents, processing unit, wholesalers and retailers had been calculated considering the value of one kg of green tea leaf till it reaches the consumers in processed form. Marketing margins for both the channels had been calculated separately. In channel-I, marketing margin for commission agent had been estimated as Rs. 0.50 per kg of green leaf. After commission agent, the market intermediaries were same in both the channels. In both the channels, marketing margin obtained by the processing unit was Rs. 63.78/- for processed dry tea leaf. The marketing margin obtained by processing unit was high due to various value addition process carried out during processing. Average marketing margin for the wholesalers was obtained as Rs 13.33/- for processed dry tea leaf which was higher than the marketing margin obtained by the retailers (Rs 12.17/-). So, the total margin observed in Channel-I was Rs 89.78/-, per kg which was slightly higher than Rs 89.28/- per kg as obtained in Channel-II, respectively. Results are presented in table 26.

Table 26. Marketing margins involved in the marketing of CTC tea in two channels (Rs/kg)

Sl. No	Particulars	Channel-I		Channel-II	
		Amount (Rs / kg)	**Percent to consumer's price**	**Amount (Rs / kg)**	**Percent to consumer's price**
1	**Producer's sale price (green tea leaf)**	11	10	12	10.9
	i.Marketing Cost	-	-	0.4	0.36
	ii.Net Price	11	10	13	11.81
2	**Commission agent (green tea leaf)**				
	i. Purchase Price	11	10	-	-
	ii. Marketing Cost	1.5	1.36	-	-
	iii. Marketing margin	**0.5**	0.45	-	-
3	**Processing unit**				
	i. Purchase Price	13	11.81	13	11.81
	ii. Marketing Cost	5.22	4.74	5.22	4.74
	iii. Marketing margin	**63.78**	58.89	**63.78**	57.98
4	**Wholesaler (processed dry leaf)**				
	i. Purchase Price	82	74.54	82	74.54
	ii. Marketing Cost	1	0.9	1	0.9
	iii. Marketing margin	**13.33**	12.11	**13.33**	12.11
5	**Retailer (processed dry leaf)**				
	i. Purchase Price	96.33	87.57	96.3	87.57
	ii. Marketing Cost	1.5	1.36	1.5	1.36
	iii. Marketing margin	**12.17**	11.06	**12.17**	11.06
6	**Consumer's Purchase Price (processed dry leaf)**	110	100	110	100
7	**Total marketing margin**	**89.78**		**89.28**	

4.5.3 Price spread and marketing efficiency analysis in two marketing channels (Rs/kg)

The price spread analysis refers to the difference between price paid by the consumer and the net price received by the farmer for an equivalent quantity of tea leaf. The consumer's price for one kg of processed tea leaf is Rs 330.00/- which is made from 3 kg of green tea leaf. So in order to estimate the producer's share of 1 kg of green tea leaf in consumer's price, the price of processed dry tea has been divided by 3. The producers share in consumer price was found out to be very less which is because of value addition done in the processing unit. In channel-I, producer's share in consumer price was Rs 10.00/-, which is less than Rs 11.81/- as obtained in channel-II, respectively.

The marketing efficiency is the ratio of market output to the marketing input. A detailed study of marketing efficiency on the produce of sampled respondents had been determined in this segment. Here, Shepherd's method and Acharya's method was used to assess the efficiency of the two channels. By Shepherd's method, the marketing efficiency in Channel-I was estimated to be 11.93 and in Channel-II it was 13.54 and by Acharya's method the marketing efficiency in Channel-I was estimated to be 0.11 and in Channel-II it was 0.13. Therefore, it can be concluded that Channel-II was more efficient than Channel-I. This shows that as intermediaries increases between producer and consumer, marketing efficiency decreases. Results are presented in table 27.

Table 27. Price spread and marketing efficiency analysis in two marketing channels (Rs/kg)

Sl. No.	Particulars	Channel-I	Channel-II
1	Producer's price **(for 1 kg green tea leaf)**	11.00	13.00
2	Total marketing cost **(from 1 kg green tea leaf to processed dry tea leaf)**	9.22	8.12
3	Total marketing margin **(from 1 kg green tea leaf to processed dry tea leaf)**	89.78	89.28
4	Consumer's price **(processed dry tea leaf)**	110.00	110.00
5	Producer's share in consumer price (%)	10.00	11.81
6	Price spread	99.00	97.00
7	Marketing efficiency (by Shepherd's method)	11.93	13.54
8	Marketing efficiency (by Acharya's method)	0.11	0.13

Two marketing channels were observed in a similar study by Imlibenla and Sharma (2019), on price spread and marketing efficiency analysis of tea plantation crop in Mokokchung district. In Channel-I, they sold their goods to commission agents, who in turn sold the tea they had purchased to the processing unit. In Channel-II, farmers sell their goods directly at their own expense to the tea factory. The total marketing cost incurred in channel-I was Rs 7.08/- per kg and the total cost incurred in Channel-II was Rs 6.55/-, which indicated that the total marketing cost was more in Channel-I as compared to Channel-II. The total margin observed in Channel-I was Rs 77.94/-, which was slightly higher than Rs 76.94/- as obtained in Channel-II. The marketing efficiency in Channel-I was estimated to be 14.1 and in Channel-II it was 15.3. In case of Channel-I, producer's share in consumer price was Rs 15.00/-, which is less than Rs 17.00/- as obtained in Channel-II, respectively. So it was found that Channel-II was more efficient than Channel-I.

Price spread and marketing efficiency analysis of Channel-1 and Channel-II is given in figures 9 and 10 respectively.

Figure 9. Price spread and marketing efficiency analysis of channel-1

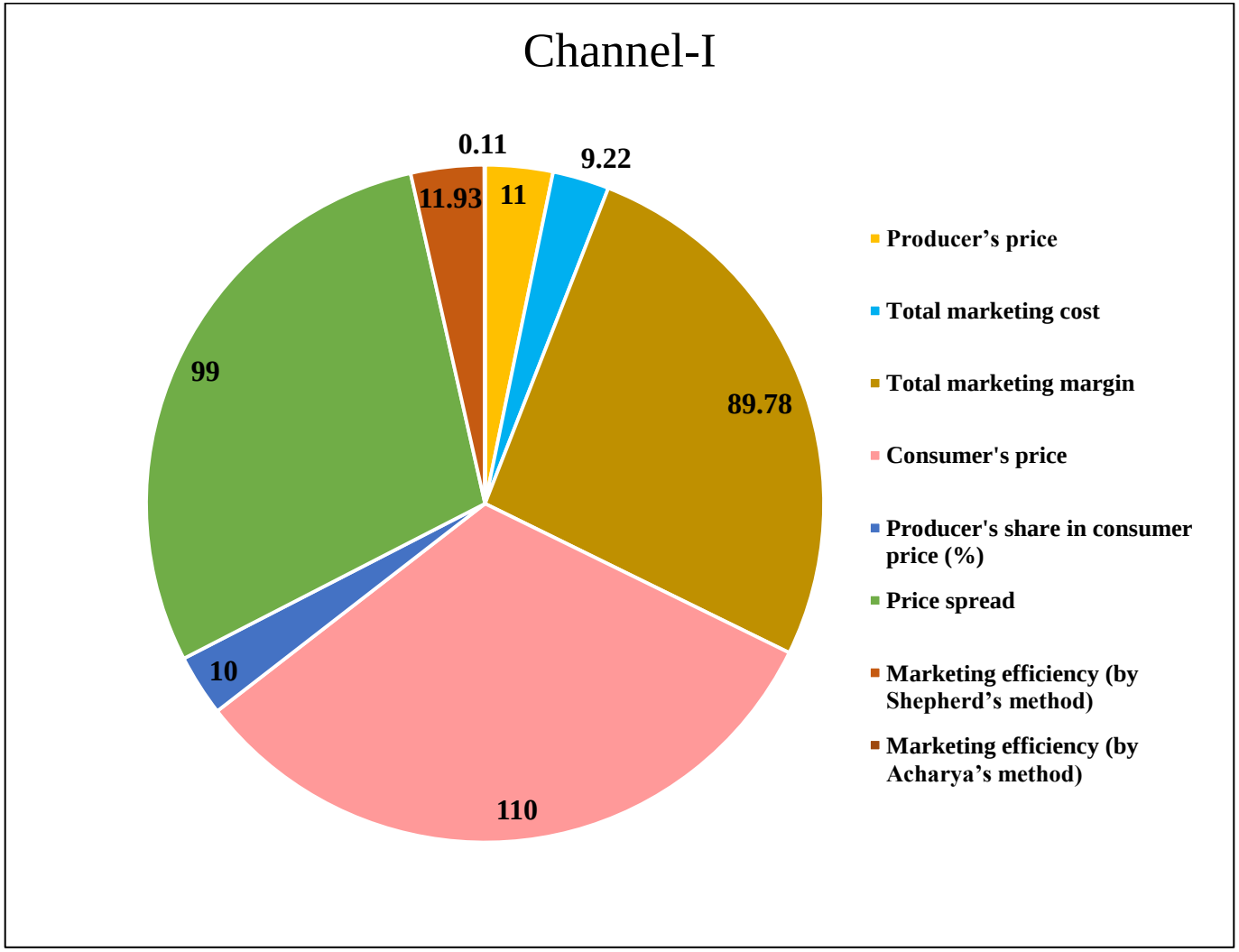
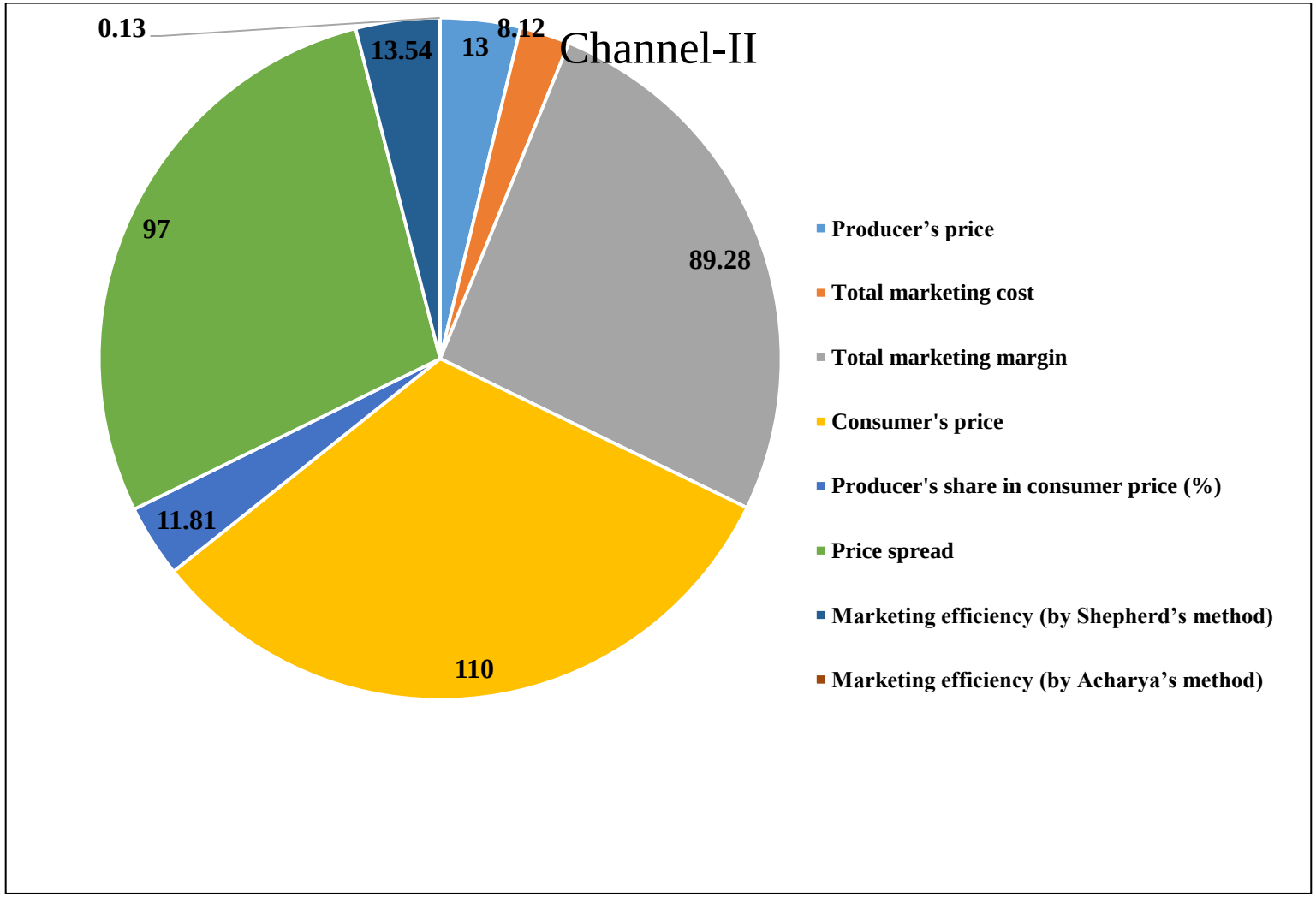


Figure 10. Price spread and marketing efficiency analysis of channel-II



4.6 CONSTRAINTS FACED BY FARMERS IN PRODUCTION AND MARKETING OF TEA

The constraints faced by the respondents in the production and marketing of tea are presented below.

4.6.1 Production constraints faced by tea growers in Wayanad district

The production constraints faced by the tea growers in the Wayanad district were high labour cost, non-availability of labour, lack of adequate finance, high price of input, incidence of pests and diseases, lack of government support, lack of technical knowledge about chemical use, lack of irrigation facilities, unfavourable weather The data related to production constraints were analysed and the findings have been presented in table 28.

The results revealed that, high labour cost was considered as the major problem faced by tea growers with Garret's score of 80.50 followed by problem of non-availability of labour having a score of 69.50. Lack of adequate finance was the next major problem with Garret's score of 62.00 followed by problem of high price of input (56.00). Other production constraints faced by farmers in the study area were incidence of pests and diseases having a score of 50.00 followed by lack of government support (44.00), problem of lack of technical knowledge about chemical use (38.00), problem of lack of irrigation facilities (31.00) and unfavourable weather with the Garrett's score of 19.00.

Table 28. Production constraints faced by tea growers in Wayanad district

Sl. No	Production constraint	Garrett's mean score	Rank
1	High labour cost	80.50	1
2	Non availability of labour	69.50	2
3	Lack of adequate finance	62.00	3
4	High price of input	56.00	4
5	Incidence of pests and diseases	50.00	5
6	Lack of government support	44.00	6
7	Lack of technical knowledge about chemical use	38.00	7
8	Lack of irrigation facilities	31.00	8
9	Unfavourable weather	19.00	9

4.6.2 Marketing constraints faced by tea growers in Wayanad district

Marketing constraints involved problems faced by the tea growers during marketing of green tea leaves. It included high price fluctuation of green tea leaves, exploitation by middle men, high transportation cost, delayed payment, defective and faulty weighing of green tea leaves, lack of market information, lack of adequate storage facilities, lack of adequate processing facilities. The data related to marketing constraints has been presented in table 29.

The results revealed that high price fluctuation of green tea leaves was considered as the most important marketing constraint faced by the tea growers in Wayanad district with Garrett's score of 80.00. The tea growers expressed the view that exploitation by middle men was the second most important constraints in green tea leaf marketing in the study area with Garrett's score of 67.50. Most of the tea cultivators sell their tea leaves to intermediaries and they get only 10 or 11 rupees for one kg of green tea leaves. High transportation cost was the third constraint having a score of 59.50. The cultivators are mainly in hilly areas, the transport facilities are very less in this area and the climatic conditions adversely affected the tea cultivation. The other marketing constraints were delayed payment with Garrett's score of 53.00 followed by defective and faulty weighing of green tea leaves (47.00), lack of market

information (40.50), lack of adequate storage facilities (32.00), and lack of adequate processing facilities with the Garrett's score of 20.00

Table 29. Marketing constraints faced by tea growers in Wayanad district

Sl. No.	Marketing constraint	Garrett's mean score	Rank
1	High price fluctuation of green tea leaves	80.00	1
2	Exploitation by middle men	67.50	2
3	High transportation cost	59.50	3
4	Delayed payment	53.00	4
5	Defective and faulty weighing of green tea leaves	47.00	5
6	Lack of market information	40.50	6
7	Lack of adequate storage facilities	32.00	7
8	Lack of adequate processing facilities	20.00	8

A similar study by Kakati (2011) observed that the low price of green tea leaf and meagre income from tea production were the two key problems faced by the small tea growers in Lakhimpur district of Assam.

A similar study by Vidya (2018) on "Tea economy: special reference from Kerala" reported that high labour cost was the major production constraint and high price fluctuation of green tea leaves was the major marketing constraint faced by small and large farmers in Wayanad district.

Summary

5. SUMMARY

The present study entitled “An economic analysis of production and marketing of tea in Wayanad district” was carried out in Muppainad and Ambalavayal village panchayats of Wayanad district. The specific objectives of the study was to examine the input use pattern, analyze the costs and returns from tea cultivation, to examine the resource use efficiency, to study the marketing aspects and constraints faced by the farmers in the production and marketing of tea.

The study was based on both primary and secondary data. Wayanad district was purposively selected as it is the major producer of tea in Kerala after Idukki district. Out of four blocks, Kalpetta and Sulthan Bathery which stood first and second respectively in terms of acreage and production were selected purposively for present study. The selected villages were Muppainad from Kalpetta block and Ambalavayal from Sulthan Bathery block. The farmers were categorized into two groups on the basis of size of land holding small farmers (≤ 2 ha land) and large farmers (>2 ha of land). From each of the selected village panchayats, 12 farmers each of small and large size will be selected. The total sample size of study was thus 48. For identification and selection of the study location, secondary data pertaining to tea production and marketing were collected from tea board, Department of Agriculture and Kerala Agricultural University. Data regarding socio-economic status physiographic and demographic factors were collected from the official websites and government annual reports.

The socio-economic characteristics of the sample respondents were analyzed. Out of the total respondent farmers, majority of the farmers (45.80%) were in the age group of 45-60 indicating the hesitation of young farmers to engage in tea farming. The average age group of small farmers growing tea was 55.50 and large farmers was 57.50. It was observed that more than three-fourth of the total sample respondents were male who were cultivating tea. All the farmers were literates. Among the small farmers, 75 per cent of respondents completed secondary education and among the large farmers, 62.50 per cent of respondents completed secondary education. Among the small farmers, 66.60 per cent of farmers were in the medium-sized group having 4-6 members in the family, while in large farmers, 70.80 per cent belong to the medium-sized group. Breaking up of joint family system was the main reason for

dominance of tea growers with medium size of families. The average family size of the total respondents was 5. Considering the total number of respondents, almost 93.70 per cent depend on agriculture as the main source of income. It was understood that the income of the large farmers was relatively more when compared to that of small farmers. The average annual gross income of the small farmers was found to be ₹ 1,76,254 and that of the large farmers was ₹ 3,56,290. The average annual gross income of the respondents was ₹ 2,66,272. Both small and large farmers have a similar range of experience in farming. It was found that the average farming experience was similar in case of both small and large farmers i.e., 28.30 years and 29.40 years, respectively. The average farming experience of respondents was 28.80 years. The average area of tea was found to be 1.24 acres for small farmers and 5.41 acres for large farmers. The average area under the tea cultivation was found to be 3.32 acres.

On average, the total amount of human labour utilized was 404.80, 324.64 and 382.50 mandays per hectare on large, small and pooled farms respectively, and thus indicated a direct relationship between human labour and the size of the farm. The major labour needed operations were harvesting (87.60%) followed by application of fertilizers and manures (3.97%), plant protection chemicals (3.52%), pruning (3.03%) and weeding (1.88%) on pooled farms. Among the owned and hired labour, owned labour occupied 7.83 per cent and hired labour occupied 92.16 per cent on pooled farms.

Large, small and pooled farms used 475.72, 445.66 and 452.53 kg of urea and 385.25, 360.50 and 372.15 kg of potash respectively. Organic manures such as farm yard manure was applied 445.30, 385 and 395.62 kg respectively on large, small and pooled farms.

To control diseases and weeds farmers used plant protection chemicals to the extent of 9.86, 4.54 and 8.61 kg on large, small and pooled farms respectively.

Annual maintenance cost of tea cultivation was carried out using cost concepts. The total cost of cultivation (cost C) of tea incurred by the small and large farmers was observed to be ₹ 1,86,438.82 ha^{-1} and ₹ 2,45,143.60 ha^{-1} respectively. The highest percentage of hired labour in cost A_1 was observed for both small and large farmers, followed by manures and fertilizers. Cost of cultivation was found to be more for large farmers than for small farmers. The net return at cost C for small and large farmers was ₹ 85,943.18 ha^{-1} and 1,54,156.40 ha^{-1} respectively. It was found

that profitability was more for large farmers with a B:C ratio of 1.46 while small farmers had a comparatively smaller B:C ratio of 1.62.

Resource use efficiency in tea cultivation was estimated using Cobb-Douglas production function and it was fitted separately for small and large farmers. For small farmers R^2 value obtained was 0.71 which indicated that 71 per cent of variation in yield was explained by the independent variables. All the independent variables were positive, among which quantity of hired labour and manures and fertilizers were significant at 1 per cent level of significance. Quantity of plant protection chemicals was significant at 5 per cent level of significance. Urea and Muriate of potash were the popular fertilizers used by tea farmers. Hexaconazole and Copper oxy chloride were the popular plant protection chemicals used against blister blight. Elasticity of production for the small farmers was 1.31, which represented an increasing returns to scale. For the large farmers, the obtained R^2 value was 0.90 which indicated that 90 per cent of variation in yield was explained by the independent variables. Quantity of family labour was found to positive but non-significant for both the small and large farmers. The quantity of hired labour, manures and fertilizers were significant at 1 per cent level of significance. Quantity of plant protection chemicals was significant at 5 per cent level of significance. The value for returns to scale was obtained 2.09 and hence showed an increasing returns to scale.

Allocative efficiency was examined to know how resources in the farm were efficiently utilized in terms of economic aspects. Marginal productivity analysis showed that, all the independent variables were having a K value more than one, which indicated the suboptimal or underutilization of resources by both small and large farmers. Allocative efficiency of these inputs can be improved only by the enhanced utilization.

The study done on the respondent farmers revealed that there existed two marketing channels of tea:

Marketing channel- I

Producer ⇨ Commission agent ⇨ Processing unit ⇨ Wholesaler ⇨ Retailer ⇨ Consumer

Marketing channel- II

Producer ⇨ Processing unit ⇨ Wholesaler ⇨ Retailer ⇨ Consumer

The total marketing cost incurred in Channel-1 was Rs 9.22/- per kg and the total cost incurred in channel-II was Rs 8.12/-, which shows that total marketing cost is more in Channel-I as compared to Channel-II, respectively. The total margin observed in Channel-I was Rs 89.78/-, which was slightly higher than Rs 89.28/- as obtained in Channel-II, respectively. It can be concluded that Channel-II is more efficient than Channel-I. This shows that as intermediaries increases between producer and consumer, marketing efficiency decreases. For, channel-I, producer's share in consumer price was Rs 10.00/-, which was less than Rs 11.81/- as obtained in channel-II, respectively.

Detailed assessment and interpretation of the constraints faced by tea farmers were required to improve the net return, socio-economic status and also to find policy implications. Garrett's ranking method was used for the constraint analysis. The major constraints faced by small and large were same, the ranking procedure was performed separately for both production and marketing. High labour cost was considered as the major production constraint faced by tea growers and high price fluctuation of green tea leaves was considered as the most important marketing constraint faced by the tea growers in Wayanad district.

Suggestions to improve tea production and marketing of tea in the area

From the light of the study few suggestions are enlisted

- The registration of tea growers with the Tea Board of India is essential for the identification of units such as area, production, productivity and other related data to help small tea growers formulate planning programs. Therefore, it is recommended that the Tea Board take up comprehensive state registration system.
- The fixation of suitable prices based on quality of green tea leaves will help the farmers.

- The tea processing factories can be started in co-operative sector to make it more farmer friendly.
- The role of commission agent can be minimized if direct purchasing by factories is practiced. Marketing of tea leaves and produce should be sold directly to processing units so that the farmers will get remunerative prices for tea leaves.
- Encouraging the domestic per capita consumption of tea will be a standing remedy for the remunerative tea prices and reducing the decline in tea prices.
- Mechanization in the field and factory would also reduce the cost of producing tea. But the investment in machineries is high. If the government had provided some subsidy in this respect it would have been a boon to the plantations.

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Appendix I

APPENDIX – I

KERALA AGRICULTURAL UNIVERSITY

DEPARTMENT OF AGRICULTURAL ECONOMICS

COLLEGE OF AGRICULTURE, VELLAYANI

Schedule for primary data

AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF TEA IN WAYANAD DISTRICT

1. GENERAL INFORMATION

1. Name of the farmer:
2. Age:-
3. Sex:-
4. Address and phone number:

5. Block:
6. Panchayat:
7. Phone number:
8. Year of experience in farming:-:

1. Family Details

Name	Gender (M/F)	Age	*Education	**Occupation		Annual income	
				Primary	Secondary	Primary	Secondary

*01-Primary, 02-Secondary, 03-Pree- degree/HSC, 04-Diploma, 05-Graduate, 06-Post Graduate

**1-Agriculture, 2-Public sector, 3-Private sector, 4-Self employed

2. Inventory resources: Land

S.NO	PARTICULARS	
1.	Total owned area (ha)	
2	Leased in land (ha)	
3	Leased out land (ha)	
4	Total land (ha)	
5.	Net cropped area	
6.	Area under tea	
7.	Value of owned land	
8.	Land revenue	

3. Assets position

S. No.	Particulars	Number	Value (₹)	Year of construction/ purchased	Present value (₹)	Subsidy (₹)	Depreciation (₹)	Maintenance cost (₹)
a.	Farm building							
1.	Farm house							
2.	Cattle shed							
3.	Poultry house							
4.	Pumpset house							
b.	Farm Machinery							
1.	Tea pruning machine							
2.	Tea Plucker							
3.	Bullock cart							
4.	Pumpsets							
5.	Sprayers							
6.	Tea harvester							
7.	Others							

4. Livestock

Sl. No.	Types of animal	Total Number	Annual Expenditure (₹)	Annual income (₹)	Net Return (₹)
1.	Cow				
2.	Goat				
3.	Sheep				
4.	Pig				
5.	Poultry				

5. Crop details

S. No.	Particulars	
1.	Total area under tea	
2.	Type of planting followed	
3.	Variety	
4.	Age of the plantation	
5.	Irrigated/ Rainfed	
6.	Spacing adopted	
7.	No. of bearing leaves	
8.	Harvest	
	No. of harvesting per year	
	Main product (kg) / each harvest	
	Price/kg	

6. Source of irrigation

Sl. No.	Source	Area irrigated for tea
1.	Canal	
2.	Tanks/ Ponds	
3.	Wells/ Bore wells	
4.	Pump set (Electric/ Diesel/ Solar)	
5.	Micro irrigation (Sprinkler/ Drip)	
6.	Others	

7. Annual maintenance cost of cultivation of tea

a) Material cost

			Annual maintenance cost	
Sl. No.	Item	Rate	Qty	Value
1	Hired human labour			
2	Hired machine power			
3	Organic manures a) b) c) d)			
4	Application of Fertilizers on pits a) b) c)			
5	Irrigation			
6	Shading material			
7	Plant protection chemicals			
8	Irrigation			
9	Weedicides			

b) Labour cost

	Skilled labour		Unskilled labour	
	M	F	M	F
Wage rate (Rs/man) days)				

(FL - Family labour; HL – Hired labour; ML – Machine labour)

Item	For one year		
	FL	HL	ML
Application of organic manures			
Fertilizers application			
Weeding and mulching			
Pruning			
Application of plant protection chemicals			
Irrigation			
Harvesting			
Total			
Total cost			

8. Production constraints

Sl. No.	**Constraints/ Problems**	**Rank**
1	Non availability of labours in peak plucking season	
2	High incidence of pest and diseases	
3	High wage rate	
4	High cost of input	
5	Erratic rainfall	
6	Low productivity of the leaves	
7	Lack of irrigation facilities	
8	Lack of adequate finance	
9	Lack of timely support from the government	
10	Lack of technical knowledge about chemical use	

Marketing schedule

1. Details of marketing of tea

a. Total quantity produced:

b. Quantity retained for family consumption:

c. Quantity retained for on-farm uses:

d. Total marketed quantity:

e. Name of the nearest primary market:

f. Distance:

g. Name of the nearest wholesale or secondary market:

h. Distance:

2. Method of sale:

Sl.No.	Method of sale	Quantity	Price/unit
1	Village trader		
2	Commission agent/ brokers		
3	Primary/ retail market		
4	Secondary/wholesale market		
5	Direct sale to consumers		
6	Other modes (specify)		

3. In what form you market in what quantity?

4. Through whom do you market tea?

5. To whom do you sell your produce?

6. What is the frequency of selling?

7. Marketing channels in wayanad district list

a. Channel 1 –

b. Channel 2 –

c. Channel 3 –

d. Specify other channels if any?

8. Do you know through which channel your produce will reach to ultimate consumer?

e. Channel 1 –

f. Channel 2 –

g. Channel 3 –

h. Specify other channels if any?

i. Reasons for sales to the local trader/ wholesaler/ consumer/commission agents/agencies

9. Marketing cost incurred in available channels from producer to ultimate consumer

    a. Channel 1 –

    b. Channel 2 –

    c. Channel 3 –

10. What is the sale price of producer in different channels?

11. What is the purchase price by ultimate consumer in different marketing channels?

12. Cost incurred in marketing per kg

Sl. No	Particulars	Cost (rupees /kg)
1	Labour loading	
2	Cleaning	
3	Grading	
4	Packaging	
5	Packaging and grading	
6	Storage	
7	Rent	
8	Transport cost	
9	Sales tax	
10	Labour unloading	
11	Miscellaneous	
12	Profit margin	

13. Do you know the price at which final intermediary sell the produce to ultimate consumers

14. Are you member of any producer organization / Cooperative / SHG (PDS)

15. Any contractual agreement of selling of the produce?

If yes, since which year?

How the price is determined?

Is there any incentive/bonus?

16. Suggestions for improvement of production and marketing of this crop

17. What support do you expect from the institutions to withstand price volatility?

18. Marketing constraints

Sl. No.	**Constraints/ Problems**	**Rank**
1	Price fluctuation	
2	Exploitation by middle men	
3	Inadequate storage and processing facilities	
4	Lack of market information	
5	High transportation cost	
6	Poor performance of farmer collectives	
7	Delayed payments	
8	Defective and faulty weighing of green tea leaves	

SCHEDULE FOR MARKETING INTERMEDIARIES

1. Type of intermediaries:

2. Basic details a) Name & address:

Sl. No	Particulars	Cost (rupees /kg)
1	Labour loading	
2	Cleaning	
3	Grading	
4	Packaging	
5	Packaging and grading	
6	Storage	
7	Rent	
8	Transport cost	
9	Sales tax	
10	Labour unloading	
11	Miscellaneous	
12	Profit margin	

II. Fixed costs

Sl. No	Particular	Expenditure
1	Rent	
2	Furniture	
3	Staff	
4	License fee	
5	Others	

III. Working costs

Sl. No	Particular	Expenditure
1	Casual labour	
2	Electricity	
3	Water charge	
4	Spoilage	

IV. Value of business:

Total purchase			Total sales		
Quantity	Price/unit	Value (Rs)	Quantity	Price/unit	Value (Rs)

Appendix II

GARRETT RANKING CONVERSION TABLE

The conversion of orders of merits into units of amount of "socres"

Percent	Score	Percent	Score	Percent	Score
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	30.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.94	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33		
20.93	66	81.99	32		

Abstract

AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF TEA IN WAYANAD DISTRICT

by

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THESIS
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ABSTRACT

The present study entitled “An economic analysis of production and marketing of tea in Wayanad district” was conducted during 2019-20. The specific objectives of the study was to know the input use pattern, analyze the costs and returns from tea cultivation, to examine resource use efficiency, to study marketing aspects and constraints in the production and marketing of tea.

The study was based on both primary and secondary data. The study was conducted in Muppainad village from Kalpetta block and Ambalavayal village from Sulthan Bathery block in Wayanad district. Primary data was collected from the farmers through formal interviews. The farmers in the study area were categorized into two groups on the basis of size of land holding small farmers (≤ 2 ha land) and large farmers (>2 ha of land). From each of the selected village panchayats, 12 farmers each of small and large size will be selected. The total sample size of study was thus 48. Secondary data pertaining to tea production and marketing and data regarding socio- economic status physiographic and demographic factors were collected from the official websites and government annual reports.

On average, the total amount of human labour utilized was 404.80, 324.64 and 382.50 mandays per hectare on large, small and pooled farms respectively, and thus indicated a direct relationship between human labour and the size of the farm. The major labour needed operations were harvesting (87.60%) followed by application of fertilizers and manures (3.97%), plant protection chemicals (3.52%), pruning (3.03%) and weeding (1.88%) on pooled farms. Among the owned and hired labour, owned labour occupied 7.83 per cent and hired labour occupied 92.16 per cent on pooled farms.

The annual maintenance Cost of cultivation of tea was carried out using cost concepts. The total cost of cultivation (cost C) of tea incurred by the small and large farmers was found to be ₹ 1,86,438.82 ha^{-1} and ₹ 2,45,143.60 ha^{-1} respectively. It was found that cost of cultivation was more for large farmers than small farmers. For both small and large farmers, per cent share of hired labour in cost A_1 was the highest followed by manures and fertilizers. The net return at cost C for small and large farmers was ₹ 85,943.18 ha^{-1} and 1,54,156.40 ha^{-1} respectively. It was found that

profitability was more for large farmers with a B:C ratio of 1.46 while small farmers had a comparatively smaller B:C ratio of 1.62.

Resource use efficiency in tea cultivation was estimated using Cobb-Douglas production function and it was fitted separately for small and large farmers. The results showed that R^2 value for small and large farms in tea cultivation was 0.71 and 0.90 respectively and it indicated good fit of both the regression models. Marginal productivity analysis showed that, all the independent variables were having a K value more than one, which indicated the suboptimal or underutilization of resources by both small and large farmers. Allocative efficiency of these inputs can be improved only by the enhanced utilization.

The study done on the respondent farmers revealed that there existed two marketing channels of tea:

Marketing channel- I

Producer ⇒ Commission agent ⇒ Processing unit ⇒ Wholesaler ⇒ Retailer ⇒ Consumer

Marketing channel-II

Producer ⇒ Processing unit ⇒ Wholesaler ⇒ Retailer ⇒ Consumer

In channel-1 The total marketing cost incurred was Rs 9.22/- and the total cost incurred in channel-II was Rs 8.12/- per one kg of green tea leaf, which shows that total marketing cost in channel-I is more as compared to channel-II, respectively. The total margin observed in channel-I was Rs 89.78/-, which was slightly higher than Rs 89.28/- per one kg of green tea leaf as obtained in channel-II, respectively. It can be concluded that channel-I is less efficient than channel-II. This shows that as intermediaries increases between producer and consumer, marketing efficiency decreases. In channel-I, producer's share in consumer price was Rs 10.00/-, which is less than Rs 11.81/- per kg of green tea leaf as obtained in channel-II, respectively.

Detailed assessment and interpretation of the constraints faced by tea farmers were required to improve the net return, socio-economic status and also to find policy implications. Garrett's ranking method was used for the constraint analysis. The

major constraints faced by small and large were same, the ranking procedure was performed separately for both production and marketing. High labour cost was considered as the major production constraint faced by tea growers and high price fluctuation of green tea leaves was considered as the most important marketing constraint faced by the tea growers in Wayanad district.

Major portion of the cost of cultivation of tea was occupied by labour cost. So, farmers should get remunerative prices for their produce to compensate the labour cost. In the study area, usage of all of the inputs were under suboptimal levels, this should be further improved by educating or training the farmers with respect to the allocative efficiency of inputs. The role of commission agent can be minimized if direct purchasing by factories is practiced. Marketing of tea leaves and produce should be sold directly to processing units so that the farmers will get remunerative prices for tea leaves. To control high price fluctuation of green tea leaves, the fixation of suitable prices based on quality of green tea leaves will help the farmers. Thus the study can be a guide for planners and policy makers and reference for further studies.